

Computer algebra independent integration tests

7-Inverse-hyperbolic-functions/7.2-Inverse-hyperbolic-cosine/7.2.2-d-x^m-
a+b-arccosh-c-xⁿ

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Contents

1	Introduction	3
1.1	Listing of CAS systems tested	3
1.2	Results	3
1.3	Performance	5
1.4	list of integrals that has no closed form antiderivative	6
1.5	list of integrals solved by CAS but has no known antiderivative	6
1.6	list of integrals solved by CAS but failed verification	6
1.7	Timing	7
1.8	Verification	7
1.9	Important notes about some of the results	7
1.10	Design of the test system	8
2	detailed summary tables of results	11
2.1	List of integrals sorted by grade for each CAS	11
2.2	Detailed conclusion table per each integral for all CAS systems	13
2.3	Detailed conclusion table specific for Rubi results	37
3	Listing of integrals	41
3.1	$\int x^4 \cosh^{-1}(ax) dx$	41
3.2	$\int x^3 \cosh^{-1}(ax) dx$	45
3.3	$\int x^2 \cosh^{-1}(ax) dx$	48
3.4	$\int x \cosh^{-1}(ax) dx$	51
3.5	$\int \cosh^{-1}(ax) dx$	54
3.6	$\int \frac{\cosh^{-1}(ax)}{x} dx$	57
3.7	$\int \frac{\cosh^{-1}(ax)}{x^2} dx$	60
3.8	$\int \frac{\cosh^{-1}(ax)}{x^3} dx$	63
3.9	$\int \frac{\cosh^{-1}(ax)}{x^4} dx$	66
3.10	$\int \frac{\cosh^{-1}(ax)}{x^5} dx$	69
3.11	$\int \frac{\cosh^{-1}(ax)}{x^6} dx$	72
3.12	$\int x^4 \cosh^{-1}(ax)^2 dx$	75
3.13	$\int x^3 \cosh^{-1}(ax)^2 dx$	79
3.14	$\int x^2 \cosh^{-1}(ax)^2 dx$	82

3.15	$\int x \cosh^{-1}(ax)^2 dx$	85
3.16	$\int \cosh^{-1}(ax)^2 dx$	88
3.17	$\int \frac{\cosh^{-1}(ax)^2}{x} dx$	91
3.18	$\int \frac{\cosh^{-1}(ax)^2}{x^2} dx$	94
3.19	$\int \frac{\cosh^{-1}(ax)^2}{x^3} dx$	97
3.20	$\int \frac{\cosh^{-1}(ax)^2}{x^4} dx$	100
3.21	$\int \frac{\cosh^{-1}(ax)^2}{x^5} dx$	104
3.22	$\int x^4 \cosh^{-1}(ax)^3 dx$	107
3.23	$\int x^3 \cosh^{-1}(ax)^3 dx$	111
3.24	$\int x^2 \cosh^{-1}(ax)^3 dx$	115
3.25	$\int x \cosh^{-1}(ax)^3 dx$	119
3.26	$\int \cosh^{-1}(ax)^3 dx$	123
3.27	$\int \frac{\cosh^{-1}(ax)^3}{x} dx$	126
3.28	$\int \frac{\cosh^{-1}(ax)^3}{x^2} dx$	130
3.29	$\int \frac{\cosh^{-1}(ax)^3}{x^3} dx$	133
3.30	$\int \frac{\cosh^{-1}(ax)^3}{x^4} dx$	137
3.31	$\int \frac{\cosh^{-1}(ax)^3}{x^5} dx$	141
3.32	$\int x^5 \cosh^{-1}(ax)^4 dx$	145
3.33	$\int x^4 \cosh^{-1}(ax)^4 dx$	149
3.34	$\int x^3 \cosh^{-1}(ax)^4 dx$	153
3.35	$\int x^2 \cosh^{-1}(ax)^4 dx$	157
3.36	$\int x \cosh^{-1}(ax)^4 dx$	161
3.37	$\int \cosh^{-1}(ax)^4 dx$	164
3.38	$\int \frac{\cosh^{-1}(ax)^4}{x} dx$	167
3.39	$\int \frac{\cosh^{-1}(ax)^4}{x^2} dx$	171
3.40	$\int \frac{\cosh^{-1}(ax)^4}{x^3} dx$	175
3.41	$\int \frac{\cosh^{-1}(ax)^4}{x^4} dx$	179
3.42	$\int \frac{x^6}{\cosh^{-1}(ax)} dx$	183
3.43	$\int \frac{x^5}{\cosh^{-1}(ax)} dx$	186
3.44	$\int \frac{x^4}{\cosh^{-1}(ax)} dx$	189
3.45	$\int \frac{x^3}{\cosh^{-1}(ax)} dx$	192
3.46	$\int \frac{x^2}{\cosh^{-1}(ax)} dx$	195
3.47	$\int \frac{x}{\cosh^{-1}(ax)} dx$	198
3.48	$\int \frac{1}{\cosh^{-1}(ax)} dx$	201
3.49	$\int \frac{1}{x \cosh^{-1}(ax)} dx$	204
3.50	$\int \frac{1}{x^2 \cosh^{-1}(ax)} dx$	206
3.51	$\int \frac{x^4}{\cosh^{-1}(ax)^2} dx$	208
3.52	$\int \frac{x^3}{\cosh^{-1}(ax)^2} dx$	211
3.53	$\int \frac{x^2}{\cosh^{-1}(ax)^2} dx$	214
3.54	$\int \frac{x}{\cosh^{-1}(ax)^2} dx$	217
3.55	$\int \frac{1}{\cosh^{-1}(ax)^2} dx$	220

3.56	$\int \frac{1}{x \cosh^{-1}(ax)^2} dx$	223
3.57	$\int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx$	225
3.58	$\int \frac{x^4}{\cosh^{-1}(ax)^3} dx$	227
3.59	$\int \frac{x^3}{\cosh^{-1}(ax)^3} dx$	231
3.60	$\int \frac{x^2}{\cosh^{-1}(ax)^3} dx$	235
3.61	$\int \frac{x}{\cosh^{-1}(ax)^3} dx$	239
3.62	$\int \frac{1}{\cosh^{-1}(ax)^3} dx$	243
3.63	$\int \frac{1}{x \cosh^{-1}(ax)^3} dx$	246
3.64	$\int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx$	249
3.65	$\int \frac{x^4}{\cosh^{-1}(ax)^4} dx$	252
3.66	$\int \frac{x^3}{\cosh^{-1}(ax)^4} dx$	256
3.67	$\int \frac{x^2}{\cosh^{-1}(ax)^4} dx$	260
3.68	$\int \frac{x}{\cosh^{-1}(ax)^4} dx$	264
3.69	$\int \frac{1}{\cosh^{-1}(ax)^4} dx$	268
3.70	$\int \frac{1}{x \cosh^{-1}(ax)^4} dx$	272
3.71	$\int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx$	275
3.72	$\int x^4 \sqrt{\cosh^{-1}(ax)} dx$	278
3.73	$\int x^3 \sqrt{\cosh^{-1}(ax)} dx$	282
3.74	$\int x^2 \sqrt{\cosh^{-1}(ax)} dx$	286
3.75	$\int x \sqrt{\cosh^{-1}(ax)} dx$	290
3.76	$\int \sqrt{\cosh^{-1}(ax)} dx$	294
3.77	$\int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx$	297
3.78	$\int x^4 \cosh^{-1}(ax)^{3/2} dx$	299
3.79	$\int x^3 \cosh^{-1}(ax)^{3/2} dx$	303
3.80	$\int x^2 \cosh^{-1}(ax)^{3/2} dx$	307
3.81	$\int x \cosh^{-1}(ax)^{3/2} dx$	311
3.82	$\int \cosh^{-1}(ax)^{3/2} dx$	315
3.83	$\int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx$	318
3.84	$\int x^4 \cosh^{-1}(ax)^{5/2} dx$	320
3.85	$\int x^3 \cosh^{-1}(ax)^{5/2} dx$	324
3.86	$\int x^2 \cosh^{-1}(ax)^{5/2} dx$	328
3.87	$\int x \cosh^{-1}(ax)^{5/2} dx$	332
3.88	$\int \cosh^{-1}(ax)^{5/2} dx$	336
3.89	$\int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx$	340
3.90	$\int \frac{x^4}{\sqrt{\cosh^{-1}(ax)}} dx$	342
3.91	$\int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx$	345
3.92	$\int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx$	348
3.93	$\int \frac{x}{\sqrt{\cosh^{-1}(ax)}} dx$	351
3.94	$\int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx$	354

3.95	$\int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx$	357
3.96	$\int \frac{1}{x^2\sqrt{\cosh^{-1}(ax)}} dx$	359
3.97	$\int \frac{x^4}{\cosh^{-1}(ax)^{3/2}} dx$	361
3.98	$\int \frac{x^3}{\cosh^{-1}(ax)^{3/2}} dx$	364
3.99	$\int \frac{x^2}{\cosh^{-1}(ax)^{3/2}} dx$	367
3.100	$\int \frac{x}{\cosh^{-1}(ax)^{3/2}} dx$	370
3.101	$\int \frac{1}{\cosh^{-1}(ax)^{3/2}} dx$	373
3.102	$\int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx$	376
3.103	$\int \frac{x^4}{\cosh^{-1}(ax)^{5/2}} dx$	378
3.104	$\int \frac{x^3}{\cosh^{-1}(ax)^{5/2}} dx$	382
3.105	$\int \frac{x^2}{\cosh^{-1}(ax)^{5/2}} dx$	386
3.106	$\int \frac{x}{\cosh^{-1}(ax)^{5/2}} dx$	390
3.107	$\int \frac{1}{\cosh^{-1}(ax)^{5/2}} dx$	394
3.108	$\int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx$	398
3.109	$\int \frac{x^4}{\cosh^{-1}(ax)^{7/2}} dx$	400
3.110	$\int \frac{x^3}{\cosh^{-1}(ax)^{7/2}} dx$	404
3.111	$\int \frac{x^2}{\cosh^{-1}(ax)^{7/2}} dx$	408
3.112	$\int \frac{x}{\cosh^{-1}(ax)^{7/2}} dx$	412
3.113	$\int \frac{1}{\cosh^{-1}(ax)^{7/2}} dx$	416
3.114	$\int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx$	420
3.115	$\int x^m \cosh^{-1}(ax)^4 dx$	422
3.116	$\int x^m \cosh^{-1}(ax)^3 dx$	424
3.117	$\int x^m \cosh^{-1}(ax)^2 dx$	426
3.118	$\int x^m \cosh^{-1}(ax) dx$	429
3.119	$\int \frac{x^m}{\cosh^{-1}(ax)} dx$	432
3.120	$\int \frac{x^m}{\cosh^{-1}(ax)^2} dx$	434
3.121	$\int \frac{x^m}{\cosh^{-1}(ax)^3} dx$	436
3.122	$\int x^m \cosh^{-1}(ax)^{3/2} dx$	439
3.123	$\int x^m \sqrt{\cosh^{-1}(ax)} dx$	441
3.124	$\int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx$	443
3.125	$\int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx$	445
3.126	$\int (dx)^m \cosh^{-1}(ax)^n dx$	447
3.127	$\int x^4 \cosh^{-1}(ax)^n dx$	449
3.128	$\int x^3 \cosh^{-1}(ax)^n dx$	452
3.129	$\int x^2 \cosh^{-1}(ax)^n dx$	455
3.130	$\int x \cosh^{-1}(ax)^n dx$	458
3.131	$\int \cosh^{-1}(ax)^n dx$	461
3.132	$\int \frac{\cosh^{-1}(ax)^n}{x} dx$	464
3.133	$\int x^3 (a + b \cosh^{-1}(cx)) dx$	466
3.134	$\int x^2 (a + b \cosh^{-1}(cx)) dx$	470

3.135	$\int x (a + b \cosh^{-1}(cx)) dx$	473
3.136	$\int (a + b \cosh^{-1}(cx)) dx$	476
3.137	$\int \frac{a+b \cosh^{-1}(cx)}{x} dx$	479
3.138	$\int \frac{a+b \cosh^{-1}(cx)}{x^2} dx$	482
3.139	$\int \frac{a+b \cosh^{-1}(cx)}{x^3} dx$	485
3.140	$\int \frac{a+b \cosh^{-1}(cx)}{x^4} dx$	488
3.141	$\int \frac{a+b \cosh^{-1}(cx)}{x^5} dx$	491
3.142	$\int x^2 \sqrt{a + b \cosh^{-1}(cx)} dx$	494
3.143	$\int x \sqrt{a + b \cosh^{-1}(cx)} dx$	498
3.144	$\int \sqrt{a + b \cosh^{-1}(cx)} dx$	502
3.145	$\int x^2 (a + b \cosh^{-1}(cx))^{3/2} dx$	505
3.146	$\int x (a + b \cosh^{-1}(cx))^{3/2} dx$	509
3.147	$\int (a + b \cosh^{-1}(cx))^{3/2} dx$	513
3.148	$\int x^2 (a + b \cosh^{-1}(cx))^{5/2} dx$	517
3.149	$\int x (a + b \cosh^{-1}(cx))^{5/2} dx$	522
3.150	$\int (a + b \cosh^{-1}(cx))^{5/2} dx$	526
3.151	$\int \frac{x^2}{\sqrt{a+b \cosh^{-1}(cx)}} dx$	530
3.152	$\int \frac{x}{\sqrt{a+b \cosh^{-1}(cx)}} dx$	533
3.153	$\int \frac{1}{\sqrt{a+b \cosh^{-1}(cx)}} dx$	536
3.154	$\int \frac{x^2}{(a+b \cosh^{-1}(cx))^{3/2}} dx$	539
3.155	$\int \frac{x}{(a+b \cosh^{-1}(cx))^{3/2}} dx$	543
3.156	$\int \frac{1}{(a+b \cosh^{-1}(cx))^{3/2}} dx$	546
3.157	$\int \frac{x^2}{(a+b \cosh^{-1}(cx))^{5/2}} dx$	549
3.158	$\int \frac{x}{(a+b \cosh^{-1}(cx))^{5/2}} dx$	554
3.159	$\int \frac{1}{(a+b \cosh^{-1}(cx))^{5/2}} dx$	558
3.160	$\int \frac{x^2}{(a+b \cosh^{-1}(cx))^{7/2}} dx$	562
3.161	$\int \frac{x}{(a+b \cosh^{-1}(cx))^{7/2}} dx$	566
3.162	$\int \frac{1}{(a+b \cosh^{-1}(cx))^{7/2}} dx$	570
3.163	$\int \sqrt{fx} (a + b \cosh^{-1}(cx))^2 dx$	574
3.164	$\int (dx)^m (a + b \cosh^{-1}(cx))^2 dx$	577
3.165	$\int (dx)^m (a + b \cosh^{-1}(cx)) dx$	580
3.166	$\int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx$	583

4 Listing of Grading functions

585

Chapter 1

Introduction

This report gives the result of running the computer algebra independent integration problems. The listing of the problems are maintained by and can be downloaded from <https://rulebasedintegration.org>

The number of integrals in this report is [166]. This is test number [189].

1.1 Listing of CAS systems tested

The following systems were tested at this time.

1. Mathematica 12.1 (64 bit) on windows 10.
2. Rubi 4.16.1 in Mathematica 12 on windows 10.
3. Maple 2020 (64 bit) on windows 10.
4. Maxima 5.43 on Linux. (via sagemath 8.9)
5. Fricas 1.3.6 on Linux (via sagemath 9.0)
6. Sympy 1.5 under Python 3.7.3 using Anaconda distribution.
7. Giac/Xcas 1.5 on Linux. (via sagemath 8.9)

Maxima, Fricas and Giac/Xcas were called from inside SageMath. This was done using SageMath integrate command by changing the name of the algorithm to use the different CAS systems.

Sympy was called directly using Python.

1.2 Results

Important note: A number of problems in this test suite have no antiderivative in closed form. This means the antiderivative of these integrals can not be expressed in terms of elementary, special functions or Hypergeometric2F1 functions. RootSum and RootOf are not allowed.

If a CAS returns the above integral unevaluated within the time limit, then the result is counted as passed and assigned an A grade.

However, if CAS times out, then it is assigned an F grade even if the integral is not integrable, as this implies CAS could not determine that the integral is not integrable in the time limit.

If a CAS returns an antiderivative to such an integral, it is assigned an A grade automatically and this special result is listed in the introduction section of each individual test report to make it easy to identify as this can be important result to investigate.

The results given in in the table below reflects the above.

System	solved	Failed
Rubi	% 100. (166)	% 0. (0)
Mathematica	% 100. (166)	% 0. (0)
Maple	% 67.47 (112)	% 32.53 (54)
Maxima	% 33.13 (55)	% 66.87 (111)
Fricas	% 31.33 (52)	% 68.67 (114)
Sympy	% 30.12 (50)	% 69.88 (116)
Giac	% 31.93 (53)	% 68.07 (113)

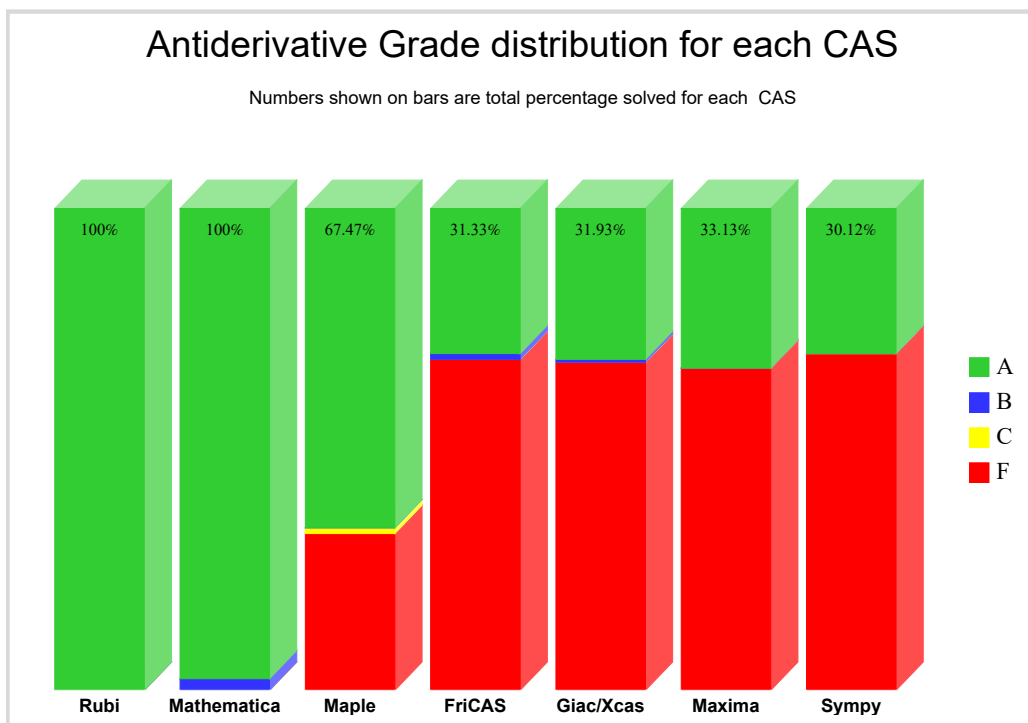
The table below gives additional break down of the grading of quality of the antiderivatives generated by each CAS. The grading is given using the letters A,B,C and F with A being the best quality. The grading is accomplished by comparing the antiderivative generated with the optimal antiderivatives included in the test suite. The following table describes the meaning of these grades.

grade	description
A	Integral was solved and antiderivative is optimal in quality and leaf size.
B	Integral was solved and antiderivative is optimal in quality but leaf size is larger than twice the optimal antiderivatives leaf size.
C	Integral was solved and antiderivative is non-optimal in quality. This can be due to one or more of the following reasons <ol style="list-style-type: none"> 1. antiderivative contains a hypergeometric function and the optimal antiderivative does not. 2. antiderivative contains a special function and the optimal antiderivative does not. 3. antiderivative contains the imaginary unit and the optimal antiderivative does not.
F	Integral was not solved. Either the integral was returned unevaluated within the time limit, or it timed out, or CAS hanged or crashed or an exception was raised.

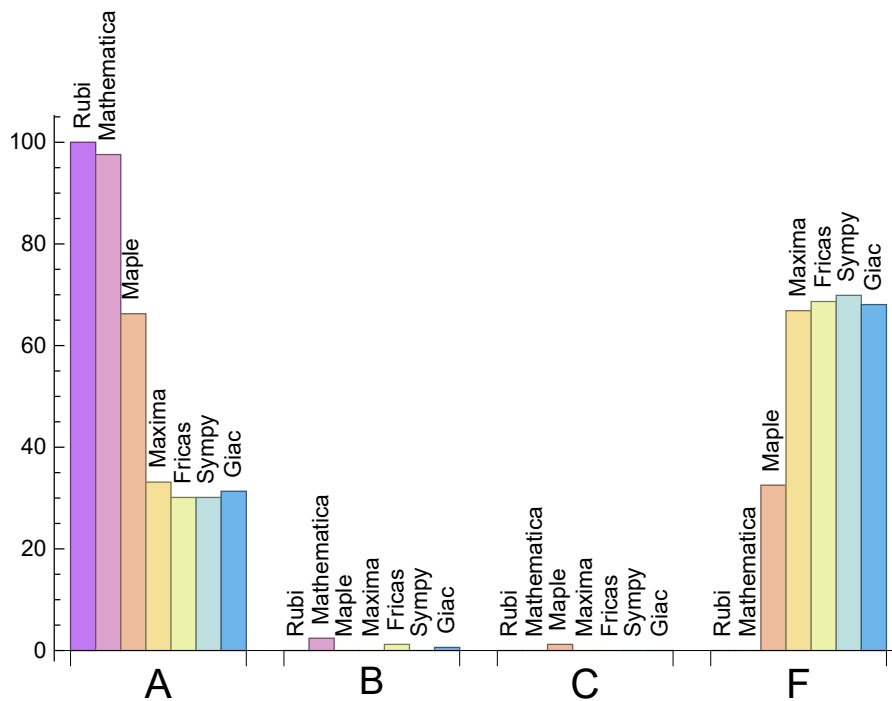
Grading is implemented for all CAS systems. Based on the above, the following table summarizes the grading for this test suite.

System	% A grade	% B grade	% C grade	% F grade
Rubi	100.	0.	0.	0.
Mathematica	97.59	2.41	0.	0.
Maple	66.27	0.	1.2	32.53
Maxima	33.13	0.	0.	66.87
Fricas	30.12	1.2	0.	68.67
Sympy	30.12	0.	0.	69.88
Giac	31.33	0.6	0.	68.07

The following is a Bar chart illustration of the data in the above table.



The figure below compares the CAS systems for each grade level.



1.3 Performance

The table below summarizes the performance of each CAS system in terms of CPU time and leaf size of results.

System	Mean time (sec)	Mean size	Normalized mean	Median size	Normalized median
Rubi	0.36	106.27	0.83	92.	1.
Mathematica	0.69	107.6	0.84	83.5	0.9
Maple	0.08	68.54	0.77	58.5	0.86
Maxima	0.73	49.29	0.6	34.	0.95
Fricas	1.69	145.48	1.67	134.5	1.85
Sympy	1.86	53.34	0.46	13.	0.41
Giac	0.67	59.32	0.73	0.	0.

1.4 list of integrals that has no closed form antiderivative

{49, 50, 56, 57, 63, 64, 70, 71, 77, 83, 89, 95, 96, 102, 108, 114, 115, 116, 119, 120, 121, 122, 123, 124, 125, 126, 132, 166}

1.5 list of integrals solved by CAS but has no known antiderivative

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {}

Sympy {}

Giac {}

1.6 list of integrals solved by CAS but failed verification

The following are integrals solved by CAS but the verification phase failed to verify the anti-derivative produced is correct. This does not mean necessarily that the anti-derivative is wrong, as additional methods of verification might be needed, or more time is needed (3 minutes time limit was used). These integrals are listed here to make it easier to do further investigation to determine why it was not possible to verify the result produced.

Rubi {137}

Mathematica {2, 4, 6, 17, 18, 20, 27, 28, 29, 30, 31, 38, 39, 40, 41, 51, 52, 53, 54, 55, 66, 67, 68, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 94, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 137, 142, 144, 145, 146, 147, 148, 149, 150, 151, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162}

Maple Verification phase not implemented yet.

Maxima Verification phase not implemented yet.

Fricas Verification phase not implemented yet.

Sympy Verification phase not implemented yet.

Giac Verification phase not implemented yet.

1.7 Timing

The command `AboluteTiming[]` was used in Mathematica to obtain the elapsed time for each integrate call. In Maple, the command `Usage` was used as in the following example

```
cpu_time := Usage(assign ('result_of _int',int(expr,x)),output='realtime')
```

For all other CAS systems, the elapsed time to complete each integral was found by taking the difference between the time after the call has completed from the time before the call was made. This was done using Python's `time.time()` call.

All elapsed times shown are in seconds. A time limit of 3 minutes was used for each integral. If the integrate command did not complete within this time limit, the integral was aborted and considered to have failed and assigned an F grade. The time used by failed integrals due to time out is not counted in the final statistics.

1.8 Verification

A verification phase was applied on the result of integration for Rubi and Mathematica. Future version of this report will implement verification for the other CAS systems. For the integrals whose result was not run through a verification phase, it is assumed that the antiderivative produced was correct.

Verification phase has 3 minutes time out. An integral whose result was not verified could still be correct. Further investigation is needed on those integrals which failed verifications. Such integrals are marked in the summary table below and also in each integral separate section so they are easy to identify and locate.

1.9 Important notes about some of the results

1.9.1 Important note about Maxima results

Since these integrals are run in a batch mode, using an automated script, and by using `sagemath` (SageMath uses Maxima), then any integral where Maxima needs an interactive response from the user to answer a question during evaluation of the integral in order to complete the integration, will fail and is counted as failed.

The exception raised is `ValueError`. Therefore Maxima result below is lower than what could result if Maxima was run directly and each question Maxima asks was answered correctly.

The percentage of such failures were not counted for each test file, but for an example, for the Timofeev test file, there were about 30 such integrals out of total 705, or about 4 percent. This pecentage can be higher or lower depending on the specific input test file.

Such integrals can be indentified by looking at the output of the integration in each section for Maxima. If the output was an exception `ValueError` then this is most likely due to this reason.

Maxima integrate was run using SageMath with the following settings set by default

```
'besselexpand : true'
'display2d : false'
'domain : complex'
'keepfloat : true'
'load(to_poly_solve)'
'load(simplify_sum)'
'load(abs_integrate)' 'load(diag)'
```

SageMath loading of Maxima `abs_integrate` was found to cause some problem. So the following code was added to disable this effect.

```
from sage.interfaces.maxima_lib import maxima_lib
maxima_lib.set('extra_definite_integration_methods', '[]')
maxima_lib.set('extra_integration_methods', '[]')
```

See <https://ask.sagemath.org/question/43088/integrate-results-that-are-different-from-using-maxima/> for reference.

1.9.2 Important note about FriCAS and Giac/X-CAS results

There are Few integrals which failed due to SageMath not able to translate the result back to SageMath syntax and not because these CAS system were not able to do the integrations.

These will fail With error Exception raised: NotImplementedError

The number of such cases seems to be very small. About 1 or 2 percent of all integrals.

Hopefully the next version of SageMath will have complete translation of FriCAS and XCAS syntax and I will re-run all the tests again when this happens.

1.9.3 Important note about finding leaf size of antiderivative

For Mathematica, Rubi and Maple, the builtin system function LeafSize is used to find the leaf size of each antiderivative.

The other CAS systems (SageMath and Sympy) do not have special builtin function for this purpose at this time. Therefore the leaf size is determined as follows.

For Fricas, Giac and Maxima (all called via sagemath) the following code is used

#see <https://stackoverflow.com/questions/25202346/how-to-obtain-leaf-count-expression-size-in->

```
def tree(expr):
    if expr.operator() is None:
        return expr
    else:
        return [expr.operator()+map(tree, expr.operands())
```

```
try:
    # 1.35 is a fudge factor since this estimate of leaf count is bit lower than
    #what it should be compared to Mathematica's
    leafCount = round(1.35*len(flatten(tree(anti))))
except Exception as ee:
    leafCount =1
```

For Sympy, called directly from Python, the following code is used

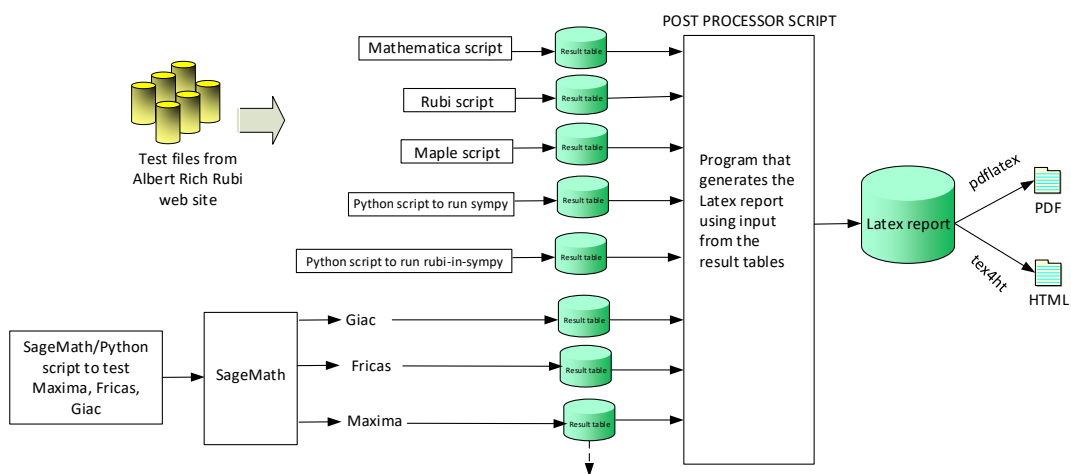
```
try:
    # 1.7 is a fudge factor since it is low side from actual leaf count
    leafCount = round(1.7*count_ops(anti))

except Exception as ee:
    leafCount =1
```

When these cas systems have a builtin function to find the leaf size of expressions, it will be used instead, and these tests run again.

1.10 Design of the test system

The following diagram gives a high level view of the current test build system.



One record (line) per one integral result. The line is CSV comma separated. It contains 13 fields. This is description of each record (line)

1. integer, the problem number.
2. integer. 0 or 1 for failed or passed. (this is not the grade field)
3. integer. Leaf size of result.
4. integer. Leaf size of the optimal antiderivative.
5. number. CPU time used to solve this integral. 0 if failed.
6. string. The integral in Latex format
7. string. The input used in CAS own syntax.
8. string. The result (antiderivative) produced by CAS in Latex format
9. string. The optimal antiderivative in Latex format.
10. integer. 0 or 1. Indicates if problem has known antiderivative or not
11. String. The result (antiderivative) in CAS own syntax.
12. String. The grade of the antiderivative. Can be "A", "B", "C", or "F"
13. String. The optimal antiderivative in CAS own syntax.

High level overview of the CAS independent integration test build system

Nasser M. Abbasi
June 22, 2018

Chapter 2

detailed summary tables of results

2.1 List of integrals sorted by grade for each CAS

2.1.1 Rubi

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166 }

B grade: { }

C grade: { }

F grade: { }

2.1.2 Mathematica

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 149, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166 }

B grade: { 39, 41, 148, 150 }

C grade: { }

F grade: { }

2.1.3 Maple

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 75, 76, 77, 81, 82, 83, 87, 88, 89, 93, 94, 95, 96, 100, 101, 102, 106, 107, 108, 112, 113, 114, 115, 116, 119, 120, 121, 122, 123, 124, 125, 126, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 166 }

B grade: { }

C grade: { 130, 131 }

F grade: { 28, 30, 39, 41, 72, 73, 74, 78, 79, 80, 84, 85, 86, 90, 91, 92, 97, 98, 99, 103, 104, 105, 109, 110, 111, 117, 118, 127, 128, 129, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165 }

2.1.4 Maxima

A grade: { 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 16, 19, 21, 22, 24, 26, 33, 35, 37, 49, 50, 56, 57, 63, 64, 70, 71, 77, 83, 89, 95, 96, 102, 108, 114, 119, 120, 121, 122, 123, 124, 125, 126, 132, 133, 134, 135, 136, 138, 139, 140, 141, 166 }

B grade: { }

C grade: { }

F grade: { 6, 13, 15, 17, 18, 20, 23, 25, 27, 28, 29, 30, 31, 32, 34, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 53, 54, 55, 58, 59, 60, 61, 62, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 115, 116, 117, 118, 127, 128, 129, 130, 131, 137, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165 }

2.1.5 FriCAS

A grade: { 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 21, 22, 23, 24, 25, 26, 32, 33, 34, 35, 36, 37, 49, 50, 56, 57, 63, 64, 70, 71, 115, 116, 119, 120, 121, 126, 132, 133, 134, 135, 136, 139, 140, 141, 166 }

B grade: { 7, 138 }

C grade: { }

F grade: { 6, 17, 18, 20, 27, 28, 29, 30, 31, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 53, 54, 55, 58, 59, 60, 61, 62, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 117, 118, 122, 123, 124, 125, 127, 128, 129, 130, 131, 137, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165 }

2.1.6 SymPy

A grade: { 1, 2, 3, 4, 5, 12, 13, 14, 15, 16, 22, 23, 24, 25, 26, 32, 33, 34, 35, 36, 37, 49, 50, 56, 57, 63, 64, 70, 71, 77, 83, 95, 96, 102, 108, 115, 116, 119, 120, 121, 123, 124, 125, 126, 132, 133, 134, 135, 136, 166 }

B grade: { }

C grade: { }

F grade: { 6, 7, 8, 9, 10, 11, 17, 18, 19, 20, 21, 27, 28, 29, 30, 31, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 53, 54, 55, 58, 59, 60, 61, 62, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, 117, 118, 122, 127, 128, 129, 130, 131, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165 }

2.1.7 Giac

A grade: { 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 16, 21, 22, 24, 26, 33, 35, 37, 49, 50, 56, 57, 63, 64, 70, 71, 77, 83, 89, 95, 96, 102, 108, 114, 115, 116, 119, 120, 121, 122, 123, 124, 125, 126, 132, 133, 134, 135, 136, 166 }

B grade: { 19 }

C grade: { }

F grade: { 6, 13, 15, 17, 18, 20, 23, 25, 27, 28, 29, 30, 31, 32, 34, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 53, 54, 55, 58, 59, 60, 61, 62, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 117, 118, 127, 128, 129, 130, 131, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165 }

2.2 Detailed conclusion table per each integral for all CAS systems

Detailed conclusion table per each integral is given by table below. The elapsed time is in seconds. For failed result it is given as F(-1) if the failure was due to timeout. It is given as F(-2) if the failure was due to an exception being raised, which could indicate a bug in the system. If the failure was due to integral not being evaluated within the time limit, then it is given just an F.

In this table, the column **normalized size** is defined as $\frac{\text{antiderivative leaf size}}{\text{optimal antiderivative leaf size}}$

Problem 1	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	93	93	55	52	92	135	76	90
normalized size	1	1.	0.59	0.56	0.99	1.45	0.82	0.97
time (sec)	N/A	0.037	0.033	0.014	1.092	2.505	2.482	1.23

Problem 2	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	77	77	71	99	116	131	68	109
normalized size	1	1.	0.92	1.29	1.51	1.7	0.88	1.42
time (sec)	N/A	0.03	0.062	0.017	1.144	2.274	1.346	1.353

Problem 3	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	65	65	46	43	65	113	54	70
normalized size	1	1.	0.71	0.66	1.	1.74	0.83	1.08
time (sec)	N/A	0.023	0.023	0.009	1.111	2.402	0.619	1.244

Problem 4	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	49	49	61	77	88	109	44	95
normalized size	1	1.	1.24	1.57	1.8	2.22	0.9	1.94
time (sec)	N/A	0.015	0.025	0.011	1.132	2.346	0.265	1.277

Problem 5	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	30	30	30	29	34	78	26	47
normalized size	1	1.	1.	0.97	1.13	2.6	0.87	1.57
time (sec)	N/A	0.006	0.016	0.001	1.159	2.363	0.208	1.373

Problem 6	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	43	43	42	66	0	0	0	0
normalized size	1	1.	0.98	1.53	0.	0.	0.	0.
time (sec)	N/A	0.059	0.034	0.034	0.	0.	0.	0.

Problem 7	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	B	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	32	32	57	51	32	158	0	49
normalized size	1	1.	1.78	1.59	1.	4.94	0.	1.53
time (sec)	N/A	0.017	0.025	0.013	1.781	2.403	0.	1.396

Problem 8	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	38	38	35	40	36	86	0	68
normalized size	1	1.	0.92	1.05	0.95	2.26	0.	1.79
time (sec)	N/A	0.013	0.007	0.012	1.728	2.419	0.	1.209

Problem 9	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	65	65	78	73	61	215	0	78
normalized size	1	1.	1.2	1.12	0.94	3.31	0.	1.2
time (sec)	N/A	0.027	0.075	0.013	1.827	2.451	0.	1.335

Problem 10	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	66	66	45	50	65	109	0	104
normalized size	1	1.	0.68	0.76	0.98	1.65	0.	1.58
time (sec)	N/A	0.024	0.023	0.012	1.772	2.466	0.	1.345

Problem 11	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	93	93	104	95	88	238	0	103
normalized size	1	1.	1.12	1.02	0.95	2.56	0.	1.11
time (sec)	N/A	0.041	0.044	0.016	1.766	2.519	0.	1.349

Problem 12	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	132	132	80	168	134	234	122	153
normalized size	1	1.	0.61	1.27	1.02	1.77	0.92	1.16
time (sec)	N/A	0.49	0.107	0.04	1.282	2.53	4.914	1.332

Problem 13	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	106	106	77	126	0	205	99	0
normalized size	1	1.	0.73	1.19	0.	1.93	0.93	0.
time (sec)	N/A	0.44	0.072	0.035	0.	2.367	2.876	0.

Problem 14	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	90	90	64	100	95	188	85	120
normalized size	1	1.	0.71	1.11	1.06	2.09	0.94	1.33
time (sec)	N/A	0.311	0.095	0.031	1.181	2.257	1.295	1.323

Problem 15	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	64	64	58	58	0	166	60	0
normalized size	1	1.	0.91	0.91	0.	2.59	0.94	0.
time (sec)	N/A	0.251	0.05	0.029	0.	2.193	0.639	0.

Problem 16	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	39	39	39	39	43	134	39	84
normalized size	1	1.	1.	1.	1.1	3.44	1.	2.15
time (sec)	N/A	0.127	0.02	0.026	1.137	2.325	0.244	1.353

Problem 17	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	62	62	63	98	0	0	0	0
normalized size	1	1.	1.02	1.58	0.	0.	0.	0.
time (sec)	N/A	0.093	0.028	0.029	0.	0.	0.	0.

Problem 18	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	60	60	92	137	0	0	0	0
normalized size	1	1.	1.53	2.28	0.	0.	0.	0.
time (sec)	N/A	0.209	0.251	0.061	0.	0.	0.	0.

Problem 19	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	48	73	53	158	0	149
normalized size	1	1.	1.	1.52	1.1	3.29	0.	3.1
time (sec)	N/A	0.192	0.019	0.063	1.733	2.515	0.	1.425

Problem 20	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	114	114	144	177	0	0	0	0
normalized size	1	1.	1.26	1.55	0.	0.	0.	0.
time (sec)	N/A	0.392	0.243	0.106	0.	0.	0.	0.

Problem 21	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	95	95	69	109	97	194	0	198
normalized size	1	1.	0.73	1.15	1.02	2.04	0.	2.08
time (sec)	N/A	0.365	0.078	0.107	1.555	2.545	0.	1.626

Problem 22	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	231	231	130	246	223	359	206	243
normalized size	1	1.	0.56	1.06	0.97	1.55	0.89	1.05
time (sec)	N/A	0.771	0.117	0.048	1.198	2.419	8.787	1.607

Problem 23	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	183	183	143	184	0	327	170	0
normalized size	1	1.	0.78	1.01	0.	1.79	0.93	0.
time (sec)	N/A	0.666	0.131	0.042	0.	2.528	5.034	0.

Problem 24	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	155	155	103	150	157	281	138	190
normalized size	1	1.	0.66	0.97	1.01	1.81	0.89	1.23
time (sec)	N/A	0.474	0.093	0.037	1.252	2.509	2.599	1.583

Problem 25	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	107	107	113	88	0	261	102	0
normalized size	1	1.	1.06	0.82	0.	2.44	0.95	0.
time (sec)	N/A	0.381	0.082	0.03	0.	2.45	1.258	0.

Problem 26	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	68	68	68	61	77	205	63	132
normalized size	1	1.	1.	0.9	1.13	3.01	0.93	1.94
time (sec)	N/A	0.183	0.025	0.031	1.21	2.476	0.57	1.362

Problem 27	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	87	87	82	132	0	0	0	0
normalized size	1	1.	0.94	1.52	0.	0.	0.	0.
time (sec)	N/A	0.105	0.05	0.037	0.	0.	0.	0.

Problem 28	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	104	104	128	0	0	0	0	0
normalized size	1	1.	1.23	0.	0.	0.	0.	0.
time (sec)	N/A	0.31	0.168	0.099	0.	0.	0.	0.

Problem 29	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	98	98	92	113	0	0	0	0
normalized size	1	1.	0.94	1.15	0.	0.	0.	0.
time (sec)	N/A	0.317	0.794	0.082	0.	0.	0.	0.

Problem 30	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	183	183	201	0	0	0	0	0
normalized size	1	1.	1.1	0.	0.	0.	0.	0.
time (sec)	N/A	0.577	0.546	0.169	0.	0.	0.	0.

Problem 31	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	174	174	220	180	0	0	0	0
normalized size	1	1.	1.26	1.03	0.	0.	0.	0.
time (sec)	N/A	0.578	0.598	0.122	0.	0.	0.	0.

Problem 32	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	306	306	175	344	0	497	275	0
normalized size	1	1.	0.57	1.12	0.	1.62	0.9	0.
time (sec)	N/A	2.193	0.153	0.052	0.	2.398	25.086	0.

Problem 33	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	274	274	158	300	271	466	248	293
normalized size	1	1.	0.58	1.09	0.99	1.7	0.91	1.07
time (sec)	N/A	1.628	0.127	0.05	1.231	2.615	14.652	1.85

Problem 34	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	214	214	143	224	0	402	197	0
normalized size	1	1.	0.67	1.05	0.	1.88	0.92	0.
time (sec)	N/A	1.314	0.109	0.045	0.	2.477	8.668	0.

Problem 35	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	182	182	122	180	193	358	165	230
normalized size	1	1.	0.67	0.99	1.06	1.97	0.91	1.26
time (sec)	N/A	0.881	0.112	0.04	1.205	2.358	5.032	1.779

Problem 36	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	120	120	104	104	0	316	110	0
normalized size	1	1.	0.87	0.87	0.	2.63	0.92	0.
time (sec)	N/A	0.603	0.07	0.033	0.	2.606	2.612	0.

Problem 37	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	77	77	77	71	99	262	70	169
normalized size	1	1.	1.	0.92	1.29	3.4	0.91	2.19
time (sec)	N/A	0.298	0.028	0.033	1.157	2.312	1.181	1.467

Problem 38	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	103	103	103	165	0	0	0	0
normalized size	1	1.	1.	1.6	0.	0.	0.	0.
time (sec)	N/A	0.12	0.029	0.037	0.	0.	0.	0.

Problem 39	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	B	F	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	150	150	478	0	0	0	0	0
normalized size	1	1.	3.19	0.	0.	0.	0.	0.
time (sec)	N/A	0.335	0.648	0.086	0.	0.	0.	0.

Problem 40	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	115	115	112	149	0	0	0	0
normalized size	1	1.	0.97	1.3	0.	0.	0.	0.
time (sec)	N/A	0.358	1.073	0.071	0.	0.	0.	0.

Problem 41	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	B	F	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	268	268	595	0	0	0	0	0
normalized size	1	1.	2.22	0.	0.	0.	0.	0.
time (sec)	N/A	0.802	3.075	0.181	0.	0.	0.	0.

Problem 42	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	55	55	40	40	0	0	0	0
normalized size	1	1.	0.73	0.73	0.	0.	0.	0.
time (sec)	N/A	0.096	0.095	0.039	0.	0.	0.	0.

Problem 43	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	43	43	33	33	0	0	0	0
normalized size	1	1.	0.77	0.77	0.	0.	0.	0.
time (sec)	N/A	0.084	0.083	0.033	0.	0.	0.	0.

Problem 44	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	41	41	31	31	0	0	0	0
normalized size	1	1.	0.76	0.76	0.	0.	0.	0.
time (sec)	N/A	0.08	0.071	0.026	0.	0.	0.	0.

Problem 45	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	29	29	24	24	0	0	0	0
normalized size	1	1.	0.83	0.83	0.	0.	0.	0.
time (sec)	N/A	0.066	0.061	0.027	0.	0.	0.	0.

Problem 46	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	27	27	20	22	0	0	0	0
normalized size	1	1.	0.74	0.81	0.	0.	0.	0.
time (sec)	N/A	0.064	0.052	0.03	0.	0.	0.	0.

Problem 47	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	14	14	14	13	0	0	0	0
normalized size	1	1.	1.	0.93	0.	0.	0.	0.
time (sec)	N/A	0.037	0.022	0.024	0.	0.	0.	0.

Problem 48	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	9	9	9	10	0	0	0	0
normalized size	1	1.	1.	1.11	0.	0.	0.	0.
time (sec)	N/A	0.017	0.022	0.021	0.	0.	0.	0.

Problem 49	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.194	0.065	0.	0.	0.	0.

Problem 50	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.421	0.089	0.	0.	0.	0.

Problem 51	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	73	73	101	83	0	0	0	0
normalized size	1	1.	1.38	1.14	0.	0.	0.	0.
time (sec)	N/A	0.064	0.209	0.037	0.	0.	0.	0.

Problem 52	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	61	61	58	54	0	0	0	0
normalized size	1	1.	0.95	0.89	0.	0.	0.	0.
time (sec)	N/A	0.05	0.231	0.033	0.	0.	0.	0.

Problem 53	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	59	59	58	59	0	0	0	0
normalized size	1	1.	0.98	1.	0.	0.	0.	0.
time (sec)	N/A	0.047	0.226	0.03	0.	0.	0.	0.

Problem 54	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	42	42	44	28	0	0	0	0
normalized size	1	1.	1.05	0.67	0.	0.	0.	0.
time (sec)	N/A	0.025	0.241	0.026	0.	0.	0.	0.

Problem 55	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	39	39	60	33	0	0	0	0
normalized size	1	1.	1.54	0.85	0.	0.	0.	0.
time (sec)	N/A	0.184	0.1	0.026	0.	0.	0.	0.

Problem 56	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.013	4.35	0.05	0.	0.	0.	0.

Problem 57	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	7.917	0.091	0.	0.	0.	0.

Problem 58	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	102	102	107	123	0	0	0	0
normalized size	1	1.	1.05	1.21	0.	0.	0.	0.
time (sec)	N/A	0.645	0.135	0.042	0.	0.	0.	0.

Problem 59	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	87	87	75	82	0	0	0	0
normalized size	1	1.	0.86	0.94	0.	0.	0.	0.
time (sec)	N/A	0.598	0.166	0.036	0.	0.	0.	0.

Problem 60	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	69	84	0	0	0	0
normalized size	1	1.	0.81	0.99	0.	0.	0.	0.
time (sec)	N/A	0.504	0.146	0.029	0.	0.	0.	0.

Problem 61	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	68	68	67	43	0	0	0	0
normalized size	1	1.	0.99	0.63	0.	0.	0.	0.
time (sec)	N/A	0.393	0.049	0.026	0.	0.	0.	0.

Problem 62	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	55	55	55	45	0	0	0	0
normalized size	1	1.	1.	0.82	0.	0.	0.	0.
time (sec)	N/A	0.188	0.042	0.027	0.	0.	0.	0.

Problem 63	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.659	0.065	0.	0.	0.	0.

Problem 64	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.015	2.194	0.089	0.	0.	0.	0.

Problem 65	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	170	170	126	175	0	0	0	0
normalized size	1	1.	0.74	1.03	0.	0.	0.	0.
time (sec)	N/A	0.617	0.609	0.043	0.	0.	0.	0.

Problem 66	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	155	155	188	114	0	0	0	0
normalized size	1	1.	1.21	0.74	0.	0.	0.	0.
time (sec)	N/A	0.588	0.373	0.043	0.	0.	0.	0.

Problem 67	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	153	153	183	121	0	0	0	0
normalized size	1	1.	1.2	0.79	0.	0.	0.	0.
time (sec)	N/A	0.676	0.365	0.035	0.	0.	0.	0.

Problem 68	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	105	105	131	60	0	0	0	0
normalized size	1	1.	1.25	0.57	0.	0.	0.	0.
time (sec)	N/A	0.396	0.294	0.026	0.	0.	0.	0.

Problem 69	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	86	86	116	67	0	0	0	0
normalized size	1	1.	1.35	0.78	0.	0.	0.	0.
time (sec)	N/A	0.378	0.179	0.027	0.	0.	0.	0.

Problem 70	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	9.826	0.069	0.	0.	0.	0.

Problem 71	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.015	11.941	0.093	0.	0.	0.	0.

Problem 72	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	182	182	162	0	0	0	0	0
normalized size	1	1.	0.89	0.	0.	0.	0.	0.
time (sec)	N/A	0.475	0.095	0.183	0.	0.	0.	0.

Problem 73	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	139	139	101	0	0	0	0	0
normalized size	1	1.	0.73	0.	0.	0.	0.	0.
time (sec)	N/A	0.403	0.084	0.103	0.	0.	0.	0.

Problem 74	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	120	120	100	0	0	0	0	0
normalized size	1	1.	0.83	0.	0.	0.	0.	0.
time (sec)	N/A	0.397	0.083	0.089	0.	0.	0.	0.

Problem 75	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	93	93	65	73	0	0	0	0
normalized size	1	1.	0.7	0.78	0.	0.	0.	0.
time (sec)	N/A	0.35	0.075	0.089	0.	0.	0.	0.

Problem 76	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	53	53	45	41	0	0	0	0
normalized size	1	1.	0.85	0.77	0.	0.	0.	0.
time (sec)	N/A	0.219	0.036	0.074	0.	0.	0.	0.

Problem 77	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.013	0.283	0.07	0.	0.	0.	0.

Problem 78	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	345	345	152	0	0	0	0	0
normalized size	1	1.	0.44	0.	0.	0.	0.	0.
time (sec)	N/A	1.115	0.112	0.187	0.	0.	0.	0.

Problem 79	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	209	209	101	0	0	0	0	0
normalized size	1	1.	0.48	0.	0.	0.	0.	0.
time (sec)	N/A	0.874	0.085	0.097	0.	0.	0.	0.

Problem 80	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	189	189	100	0	0	0	0	0
normalized size	1	1.	0.53	0.	0.	0.	0.	0.
time (sec)	N/A	0.64	0.087	0.091	0.	0.	0.	0.

Problem 81	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	127	127	84	105	0	0	0	0
normalized size	1	1.	0.66	0.83	0.	0.	0.	0.
time (sec)	N/A	0.438	0.125	0.112	0.	0.	0.	0.

Problem 82	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	86	86	45	68	0	0	0	0
normalized size	1	1.	0.52	0.79	0.	0.	0.	0.
time (sec)	N/A	0.22	0.029	0.095	0.	0.	0.	0.

Problem 83	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.013	0.289	0.069	0.	0.	0.	0.

Problem 84	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	394	394	162	0	0	0	0	0
normalized size	1	1.	0.41	0.	0.	0.	0.	0.
time (sec)	N/A	1.822	0.097	0.191	0.	0.	0.	0.

Problem 85	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	257	257	101	0	0	0	0	0
normalized size	1	1.	0.39	0.	0.	0.	0.	0.
time (sec)	N/A	1.375	0.083	0.109	0.	0.	0.	0.

Problem 86	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	220	220	100	0	0	0	0	0
normalized size	1	1.	0.45	0.	0.	0.	0.	0.
time (sec)	N/A	1.055	0.082	0.088	0.	0.	0.	0.

Problem 87	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	157	157	92	139	0	0	0	0
normalized size	1	1.	0.59	0.89	0.	0.	0.	0.
time (sec)	N/A	0.709	0.165	0.115	0.	0.	0.	0.

Problem 88	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	99	99	45	81	0	0	0	0
normalized size	1	1.	0.45	0.82	0.	0.	0.	0.
time (sec)	N/A	0.395	0.035	0.098	0.	0.	0.	0.

Problem 89	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	F(-1)	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.294	0.071	0.	0.	0.	0.

Problem 90	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	163	163	150	0	0	0	0	0
normalized size	1	1.	0.92	0.	0.	0.	0.	0.
time (sec)	N/A	0.199	0.11	0.203	0.	0.	0.	0.

Problem 91	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	109	109	101	0	0	0	0	0
normalized size	1	1.	0.93	0.	0.	0.	0.	0.
time (sec)	N/A	0.146	0.086	0.113	0.	0.	0.	0.

Problem 92	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	105	105	100	0	0	0	0	0
normalized size	1	1.	0.95	0.	0.	0.	0.	0.
time (sec)	N/A	0.14	0.083	0.101	0.	0.	0.	0.

Problem 93	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	63	63	49	37	0	0	0	0
normalized size	1	1.	0.78	0.59	0.	0.	0.	0.
time (sec)	N/A	0.077	0.036	0.053	0.	0.	0.	0.

Problem 94	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	43	43	45	26	0	0	0	0
normalized size	1	1.	1.05	0.6	0.	0.	0.	0.
time (sec)	N/A	0.047	0.028	0.043	0.	0.	0.	0.

Problem 95	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.228	0.071	0.	0.	0.	0.

Problem 96	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.617	0.102	0.	0.	0.	0.

Problem 97	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	193	193	201	0	0	0	0	0
normalized size	1	1.	1.04	0.	0.	0.	0.	0.
time (sec)	N/A	0.184	0.292	0.183	0.	0.	0.	0.

Problem 98	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	143	143	124	0	0	0	0	0
normalized size	1	1.	0.87	0.	0.	0.	0.	0.
time (sec)	N/A	0.128	0.159	0.092	0.	0.	0.	0.

Problem 99	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	135	135	139	0	0	0	0	0
normalized size	1	1.	1.03	0.	0.	0.	0.	0.
time (sec)	N/A	0.124	0.166	0.086	0.	0.	0.	0.

Problem 100	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	89	89	63	83	0	0	0	0
normalized size	1	1.	0.71	0.93	0.	0.	0.	0.
time (sec)	N/A	0.066	0.1	0.111	0.	0.	0.	0.

Problem 101	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	68	68	76	66	0	0	0	0
normalized size	1	1.	1.12	0.97	0.	0.	0.	0.
time (sec)	N/A	0.218	0.06	0.095	0.	0.	0.	0.

Problem 102	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.014	0.341	0.066	0.	0.	0.	0.

Problem 103	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	228	228	278	0	0	0	0	0
normalized size	1	1.	1.22	0.	0.	0.	0.	0.
time (sec)	N/A	0.864	1.542	0.174	0.	0.	0.	0.

Problem 104	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	172	172	175	0	0	0	0	0
normalized size	1	1.	1.02	0.	0.	0.	0.	0.
time (sec)	N/A	0.755	0.759	0.102	0.	0.	0.	0.

Problem 105	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	166	166	194	0	0	0	0	0
normalized size	1	1.	1.17	0.	0.	0.	0.	0.
time (sec)	N/A	0.627	0.66	0.086	0.	0.	0.	0.

Problem 106	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	123	123	83	122	0	0	0	0
normalized size	1	1.	0.67	0.99	0.	0.	0.	0.
time (sec)	N/A	0.483	0.255	0.113	0.	0.	0.	0.

Problem 107	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	89	89	121	84	0	0	0	0
normalized size	1	1.	1.36	0.94	0.	0.	0.	0.
time (sec)	N/A	0.234	0.151	0.106	0.	0.	0.	0.

Problem 108	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.015	0.343	0.067	0.	0.	0.	0.

Problem 109	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	300	300	374	0	0	0	0	0
normalized size	1	1.	1.25	0.	0.	0.	0.	0.
time (sec)	N/A	0.932	1.988	0.172	0.	0.	0.	0.

Problem 110	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	244	244	291	0	0	0	0	0
normalized size	1	1.	1.19	0.	0.	0.	0.	0.
time (sec)	N/A	0.757	0.556	0.098	0.	0.	0.	0.

Problem 111	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	237	237	286	0	0	0	0	0
normalized size	1	1.	1.21	0.	0.	0.	0.	0.
time (sec)	N/A	0.848	0.796	0.086	0.	0.	0.	0.

Problem 112	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	157	157	91	153	0	0	0	0
normalized size	1	1.	0.58	0.97	0.	0.	0.	0.
time (sec)	N/A	0.495	0.286	0.118	0.	0.	0.	0.

Problem 113	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	122	122	147	111	0	0	0	0
normalized size	1	1.	1.2	0.91	0.	0.	0.	0.
time (sec)	N/A	0.444	0.181	0.101	0.	0.	0.	0.

Problem 114	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	F(-1)	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.017	0.345	0.066	0.	0.	0.	0.

Problem 115	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	F(-2)	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	58	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.277	1.809	0.646	0.	0.	0.	0.

Problem 116	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	F(-2)	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	58	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.298	1.735	0.569	0.	0.	0.	0.

Problem 117	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F(-2)	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	154	167	143	0	0	0	0	0
normalized size	1	1.08	0.93	0.	0.	0.	0.	0.
time (sec)	N/A	0.238	0.355	0.693	0.	0.	0.	0.

Problem 118	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F(-2)	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	91	91	82	0	0	0	0	0
normalized size	1	1.	0.9	0.	0.	0.	0.	0.
time (sec)	N/A	0.055	0.095	0.676	0.	0.	0.	0.

Problem 119	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.023	1.301	0.485	0.	0.	0.	0.

Problem 120	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.023	1.319	0.576	0.	0.	0.	0.

Problem 121	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.02	1.326	0.457	0.	0.	0.	0.

Problem 122	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	F(-1)	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.019	1.871	0.07	0.	0.	0.	0.

Problem 123	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.016	2.169	0.067	0.	0.	0.	0.

Problem 124	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.016	2.011	0.071	0.	0.	0.	0.

Problem 125	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	F(-2)	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.016	1.932	0.069	0.	0.	0.	0.

Problem 126	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	14	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.019	1.396	0.082	0.	0.	0.	0.

Problem 127	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	173	173	144	0	0	0	0	0
normalized size	1	1.	0.83	0.	0.	0.	0.	0.
time (sec)	N/A	0.247	0.194	0.155	0.	0.	0.	0.

Problem 128	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	117	117	97	0	0	0	0	0
normalized size	1	1.	0.83	0.	0.	0.	0.	0.
time (sec)	N/A	0.191	0.095	0.08	0.	0.	0.	0.

Problem 129	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	113	113	95	0	0	0	0	0
normalized size	1	1.	0.84	0.	0.	0.	0.	0.
time (sec)	N/A	0.182	0.111	0.092	0.	0.	0.	0.

Problem 130	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	59	59	58	38	0	0	0	0
normalized size	1	1.	0.98	0.64	0.	0.	0.	0.
time (sec)	N/A	0.087	0.045	0.031	0.	0.	0.	0.

Problem 131	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	49	49	43	40	0	0	0	0
normalized size	1	1.	0.88	0.82	0.	0.	0.	0.
time (sec)	N/A	0.049	0.024	0.041	0.	0.	0.	0.

Problem 132	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	12	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.017	0.327	0.053	0.	0.	0.	0.

Problem 133	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	84	84	105	109	130	161	87	123
normalized size	1	1.	1.25	1.3	1.55	1.92	1.04	1.46
time (sec)	N/A	0.039	0.037	0.012	1.17	2.459	1.459	1.469

Problem 134	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	54	55	78	140	71	84
normalized size	1	1.	0.76	0.77	1.1	1.97	1.	1.18
time (sec)	N/A	0.03	0.044	0.004	1.172	2.429	0.677	1.453

Problem 135	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	55	55	76	86	101	132	61	108
normalized size	1	1.	1.38	1.56	1.84	2.4	1.11	1.96
time (sec)	N/A	0.02	0.035	0.004	1.15	2.5	0.373	1.433

Problem 136	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	35	35	35	34	41	95	31	55
normalized size	1	1.	1.	0.97	1.17	2.71	0.89	1.57
time (sec)	N/A	0.014	0.021	0.003	1.106	2.493	0.167	1.296

Problem 137	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	F	F	F
verified	N/A	NO	NO	TBD	TBD	TBD	TBD	TBD
size	55	55	48	75	0	0	0	0
normalized size	1	1.	0.87	1.36	0.	0.	0.	0.
time (sec)	N/A	0.077	0.04	0.03	0.	0.	0.	0.

Problem 138	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	B	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	37	37	65	59	43	171	0	0
normalized size	1	1.	1.76	1.59	1.16	4.62	0.	0.
time (sec)	N/A	0.024	0.072	0.004	1.676	2.596	0.	0.

Problem 139	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	43	43	48	52	49	108	0	0
normalized size	1	1.	1.12	1.21	1.14	2.51	0.	0.
time (sec)	N/A	0.02	0.018	0.004	1.74	2.319	0.	0.

Problem 140	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	101	82	73	234	0	0
normalized size	1	1.	1.42	1.15	1.03	3.3	0.	0.
time (sec)	N/A	0.033	0.101	0.006	1.7	2.642	0.	0.

Problem 141	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	72	72	50	62	77	139	0	0
normalized size	1	1.	0.69	0.86	1.07	1.93	0.	0.
time (sec)	N/A	0.032	0.029	0.004	1.645	2.512	0.	0.

Problem 142	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	213	213	214	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.788	0.481	0.109	0.	0.	0.	0.

Problem 143	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	145	145	136	0	0	0	0	0
normalized size	1	1.	0.94	0.	0.	0.	0.	0.
time (sec)	N/A	0.649	0.38	0.108	0.	0.	0.	0.

Problem 144	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	102	102	100	0	0	0	0	0
normalized size	1	1.	0.98	0.	0.	0.	0.	0.
time (sec)	N/A	0.412	0.222	0.092	0.	0.	0.	0.

Problem 145	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	292	292	540	0	0	0	0	0
normalized size	1	1.	1.85	0.	0.	0.	0.	0.
time (sec)	N/A	1.251	2.255	0.099	0.	0.	0.	0.

Problem 146	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	184	184	165	0	0	0	0	0
normalized size	1	1.	0.9	0.	0.	0.	0.	0.
time (sec)	N/A	0.816	1.008	0.106	0.	0.	0.	0.

Problem 147	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	140	140	269	0	0	0	0	0
normalized size	1	1.	1.92	0.	0.	0.	0.	0.
time (sec)	N/A	0.428	0.625	0.094	0.	0.	0.	0.

Problem 148	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	B	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	337	337	924	0	0	0	0	0
normalized size	1	1.	2.74	0.	0.	0.	0.	0.
time (sec)	N/A	2.09	10.694	0.102	0.	0.	0.	0.

Problem 149	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	228	228	207	0	0	0	0	0
normalized size	1	1.	0.91	0.	0.	0.	0.	0.
time (sec)	N/A	1.328	1.88	0.124	0.	0.	0.	0.

Problem 150	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	B	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	160	160	452	0	0	0	0	0
normalized size	1	1.	2.82	0.	0.	0.	0.	0.
time (sec)	N/A	0.751	2.351	0.095	0.	0.	0.	0.

Problem 151	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	194	194	195	0	0	0	0	0
normalized size	1	1.	1.01	0.	0.	0.	0.	0.
time (sec)	N/A	0.36	0.346	0.108	0.	0.	0.	0.

Problem 152	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	107	107	104	0	0	0	0	0
normalized size	1	1.	0.97	0.	0.	0.	0.	0.
time (sec)	N/A	0.185	0.22	0.115	0.	0.	0.	0.

Problem 153	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	88	88	100	0	0	0	0	0
normalized size	1	1.	1.14	0.	0.	0.	0.	0.
time (sec)	N/A	0.105	0.1	0.094	0.	0.	0.	0.

Problem 154	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	231	231	247	0	0	0	0	0
normalized size	1	1.	1.07	0.	0.	0.	0.	0.
time (sec)	N/A	0.31	0.658	0.105	0.	0.	0.	0.

Problem 155	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	140	140	135	0	0	0	0	0
normalized size	1	1.	0.96	0.	0.	0.	0.	0.
time (sec)	N/A	0.155	1.202	0.105	0.	0.	0.	0.

Problem 156	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	120	120	132	0	0	0	0	0
normalized size	1	1.	1.1	0.	0.	0.	0.	0.
time (sec)	N/A	0.41	0.237	0.099	0.	0.	0.	0.

Problem 157	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	276	276	340	0	0	0	0	0
normalized size	1	1.	1.23	0.	0.	0.	0.	0.
time (sec)	N/A	1.33	2.04	0.095	0.	0.	0.	0.

Problem 158	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	188	188	157	0	0	0	0	0
normalized size	1	1.	0.84	0.	0.	0.	0.	0.
time (sec)	N/A	0.893	1.517	0.118	0.	0.	0.	0.

Problem 159	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	148	148	192	0	0	0	0	0
normalized size	1	1.	1.3	0.	0.	0.	0.	0.
time (sec)	N/A	0.456	1.015	0.094	0.	0.	0.	0.

Problem 160	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	361	361	394	0	0	0	0	0
normalized size	1	1.	1.09	0.	0.	0.	0.	0.
time (sec)	N/A	1.627	2.461	0.099	0.	0.	0.	0.

Problem 161	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	229	229	175	0	0	0	0	0
normalized size	1	1.	0.76	0.	0.	0.	0.	0.
time (sec)	N/A	0.87	1.61	0.111	0.	0.	0.	0.

Problem 162	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F(-2)	F(-1)	F
verified	N/A	Yes	NO	TBD	TBD	TBD	TBD	TBD
size	188	188	214	0	0	0	0	0
normalized size	1	1.	1.14	0.	0.	0.	0.	0.
time (sec)	N/A	0.772	0.698	0.109	0.	0.	0.	0.

Problem 163	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F(-2)	F	F	F(-1)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	128	141	118	0	0	0	0	0
normalized size	1	1.1	0.92	0.	0.	0.	0.	0.
time (sec)	N/A	0.285	0.397	0.29	0.	0.	0.	0.

Problem 164	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F(-2)	F	F	F(-1)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	181	194	164	0	0	0	0	0
normalized size	1	1.07	0.91	0.	0.	0.	0.	0.
time (sec)	N/A	0.31	0.246	2.246	0.	0.	0.	0.

Problem 165	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F(-2)	F	F	F(-1)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	106	106	87	0	0	0	0	0
normalized size	1	1.	0.82	0.	0.	0.	0.	0.
time (sec)	N/A	0.053	0.137	2.023	0.	0.	0.	0.

Problem 166	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	N/A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	18	0	0	0	0	0	0	0
normalized size	1	0.	0.	0.	0.	0.	0.	0.
time (sec)	N/A	0.028	0.457	0.811	0.	0.	0.	0.

2.3 Detailed conclusion table specific for Rubi results

The following table is specific to Rubi. It gives additional statistics for each integral. the column **steps** is the number of steps used by Rubi to obtain the antiderivative. The **rules** column is the number of unique rules used. The **integrand size** column is the leaf size of the integrand. Finally the ratio $\frac{\text{number of rules}}{\text{integrand size}}$ is given. The larger this ratio is, the harder the integral was to solve. In this test, problem number [41] had the largest ratio of [1.]

Table 2.1: Rubi specific breakdown of results for each integral

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
1	A	6	4	1.	8	0.5
2	A	5	5	1.	8	0.625
3	A	4	4	1.	8	0.5
4	A	3	3	1.	6	0.5
5	A	2	2	1.	4	0.5
6	A	5	5	1.	8	0.625
7	A	3	3	1.	8	0.375
8	A	2	2	1.	8	0.25
9	A	5	5	1.	8	0.625
10	A	4	4	1.	8	0.5
11	A	7	5	1.	8	0.625
12	A	7	5	1.	10	0.5
13	A	6	4	1.	10	0.4
14	A	5	5	1.	10	0.5
15	A	4	4	1.	8	0.5
16	A	3	3	1.	6	0.5
17	A	6	6	1.	10	0.6
18	A	7	5	1.	10	0.5
19	A	3	3	1.	10	0.3
20	A	9	7	1.	10	0.7
21	A	5	5	1.	10	0.5
22	A	16	7	1.	10	0.7
23	A	12	7	1.	10	0.7
24	A	9	7	1.	10	0.7
25	A	6	5	1.	8	0.625
26	A	4	3	1.	6	0.5
27	A	7	7	1.	10	0.7
28	A	9	6	1.	10	0.6
29	A	7	7	1.	10	0.7
30	A	13	9	1.	10	0.9
31	A	10	9	1.	10	0.9
32	A	23	4	1.	10	0.4
33	A	19	6	1.	10	0.6
34	A	14	4	1.	10	0.4
35	A	11	6	1.	10	0.6

Continued on next page

Table 2.1 – continued from previous page

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
36	A	7	4	1.	8	0.5
37	A	5	3	1.	6	0.5
38	A	8	7	1.	10	0.7
39	A	11	7	1.	10	0.7
40	A	8	8	1.	10	0.8
41	A	19	10	1.	10	1.
42	A	7	3	1.	10	0.3
43	A	6	3	1.	10	0.3
44	A	6	3	1.	10	0.3
45	A	5	3	1.	10	0.3
46	A	5	3	1.	10	0.3
47	A	4	4	1.	8	0.5
48	A	2	2	1.	6	0.333
49	A	0	0	0.	0	0.
50	A	0	0	0.	0	0.
51	A	5	2	1.	10	0.2
52	A	4	2	1.	10	0.2
53	A	4	2	1.	10	0.2
54	A	2	2	1.	8	0.25
55	A	3	3	1.	6	0.5
56	A	0	0	0.	0	0.
57	A	0	0	0.	0	0.
58	A	14	5	1.	10	0.5
59	A	12	6	1.	10	0.6
60	A	10	6	1.	10	0.6
61	A	7	7	1.	8	0.875
62	A	4	4	1.	6	0.667
63	A	0	0	0.	0	0.
64	A	0	0	0.	0	0.
65	A	12	4	1.	10	0.4
66	A	9	4	1.	10	0.4
67	A	10	6	1.	10	0.6
68	A	5	5	1.	8	0.625
69	A	5	4	1.	6	0.667
70	A	0	0	0.	0	0.
71	A	0	0	0.	0	0.
72	A	19	7	1.	12	0.583
73	A	14	7	1.	12	0.583
74	A	14	7	1.	12	0.583
75	A	9	7	1.	10	0.7
76	A	7	6	1.	8	0.75
77	A	0	0	0.	0	0.
78	A	41	10	1.	12	0.833
79	A	25	10	1.	12	0.833

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Table 2.1 – continued from previous page

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
80	A	22	10	1.	12	0.833
81	A	11	10	1.	10	1.
82	A	8	7	1.	8	0.875
83	A	0	0	0.	0	0.
84	A	44	10	1.	12	0.833
85	A	27	9	1.	12	0.75
86	A	24	10	1.	12	0.833
87	A	12	9	1.	10	0.9
88	A	9	7	1.	8	0.875
89	A	0	0	0.	0	0.
90	A	18	6	1.	12	0.5
91	A	13	6	1.	12	0.5
92	A	13	6	1.	12	0.5
93	A	8	7	1.	10	0.7
94	A	6	5	1.	8	0.625
95	A	0	0	0.	0	0.
96	A	0	0	0.	0	0.
97	A	17	5	1.	12	0.417
98	A	12	5	1.	12	0.417
99	A	12	5	1.	12	0.417
100	A	6	5	1.	10	0.5
101	A	7	6	1.	8	0.75
102	A	0	0	0.	0	0.
103	A	34	8	1.	12	0.667
104	A	24	9	1.	12	0.75
105	A	22	9	1.	12	0.75
106	A	11	10	1.	10	1.
107	A	8	7	1.	8	0.875
108	A	0	0	0.	0	0.
109	A	32	7	1.	12	0.583
110	A	21	7	1.	12	0.583
111	A	22	9	1.	12	0.75
112	A	9	8	1.	10	0.8
113	A	9	7	1.	8	0.875
114	A	0	0	0.	0	0.
115	A	0	0	0.	0	0.
116	A	0	0	0.	0	0.
117	A	2	2	1.08	10	0.2
118	A	4	4	1.	8	0.5
119	A	0	0	0.	0	0.
120	A	0	0	0.	0	0.
121	A	0	0	0.	0	0.
122	A	0	0	0.	0	0.
123	A	0	0	0.	0	0.

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Table 2.1 – continued from previous page

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
124	A	0	0	0.	0	0.
125	A	0	0	0.	0	0.
126	A	0	0	0.	0	0.
127	A	12	4	1.	10	0.4
128	A	9	4	1.	10	0.4
129	A	9	4	1.	10	0.4
130	A	6	5	1.	8	0.625
131	A	4	3	1.	6	0.5
132	A	0	0	0.	0	0.
133	A	5	5	1.	12	0.417
134	A	4	4	1.	12	0.333
135	A	3	3	1.	10	0.3
136	A	3	2	1.	8	0.25
137	A	5	5	1.	12	0.417
138	A	3	3	1.	12	0.25
139	A	2	2	1.	12	0.167
140	A	5	5	1.	12	0.417
141	A	4	4	1.	12	0.333
142	A	14	7	1.	16	0.438
143	A	9	7	1.	14	0.5
144	A	7	6	1.	12	0.5
145	A	22	10	1.	16	0.625
146	A	11	10	1.	14	0.714
147	A	8	7	1.	12	0.583
148	A	24	10	1.	16	0.625
149	A	12	9	1.	14	0.643
150	A	9	7	1.	12	0.583
151	A	13	6	1.	16	0.375
152	A	8	7	1.	14	0.5
153	A	6	5	1.	12	0.417
154	A	12	5	1.	16	0.312
155	A	6	5	1.	14	0.357
156	A	7	6	1.	12	0.5
157	A	22	9	1.	16	0.562
158	A	11	10	1.	14	0.714
159	A	8	7	1.	12	0.583
160	A	22	9	1.	16	0.562
161	A	9	8	1.	14	0.571
162	A	9	7	1.	12	0.583
163	A	2	2	1.1	18	0.111
164	A	2	2	1.07	16	0.125
165	A	4	4	1.	14	0.286
166	A	0	0	0.	0	0.

Chapter 3

Listing of integrals

3.1 $\int x^4 \cosh^{-1}(ax) dx$

Optimal. Leaf size=93

$$-\frac{4x^2\sqrt{ax-1}\sqrt{ax+1}}{75a^3} - \frac{8\sqrt{ax-1}\sqrt{ax+1}}{75a^5} - \frac{x^4\sqrt{ax-1}\sqrt{ax+1}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)$$

[Out] $(-8\sqrt{-1+ax}\sqrt{1+ax})/(75a^5) - (4x^2\sqrt{-1+ax}\sqrt{1+ax})/(75a^3) - (x^4\sqrt{-1+ax}\sqrt{1+ax})/(25a) + (x^5\text{ArcCosh}[ax])/5$

Rubi [A] time = 0.0374411, antiderivative size = 93, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 100, 12, 74}

$$-\frac{4x^2\sqrt{ax-1}\sqrt{ax+1}}{75a^3} - \frac{8\sqrt{ax-1}\sqrt{ax+1}}{75a^5} - \frac{x^4\sqrt{ax-1}\sqrt{ax+1}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] Int[x^4*ArcCosh[a*x], x]

[Out] $(-8\sqrt{-1+ax}\sqrt{1+ax})/(75a^5) - (4x^2\sqrt{-1+ax}\sqrt{1+ax})/(75a^3) - (x^4\sqrt{-1+ax}\sqrt{1+ax})/(25a) + (x^5\text{ArcCosh}[ax])/5$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m+1)*(a + b*ArcCosh[c*x])^n)/(d*(m+1)), x] - Dist[(b*c*n)/(d*(m+1)), Int[((d*x)^(m+1)*(a + b*ArcCosh[c*x])^(n-1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 100

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m-1)*(c + d*x)^(n+1)*(e + f*x)^(p+1))/(d*f*(m+n+p+1)), x] + Dist[1/(d*f*(m+n+p+1)), Int[(a + b*x)^(m-2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m+n+p+1) - b*(b*c*e*(m-1) + a*(d*e*(n+1) + c*f*(p+1)) + b*(a*d*f*(2*m+n+p) - b*(d*e*(m+n) + c*f*(m+p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p

}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 74

Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] := Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]

Rubi steps

$$\begin{aligned}
 \int x^4 \cosh^{-1}(ax) dx &= \frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{1}{5}a \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{\int \frac{4x^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{25a} \\
 &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{4 \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{25a} \\
 &= -\frac{4x^2\sqrt{-1+ax}\sqrt{1+ax}}{75a^3} - \frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{4 \int \frac{2x}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{75a^3} \\
 &= -\frac{4x^2\sqrt{-1+ax}\sqrt{1+ax}}{75a^3} - \frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{8 \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{75a^3} \\
 &= -\frac{8\sqrt{-1+ax}\sqrt{1+ax}}{75a^5} - \frac{4x^2\sqrt{-1+ax}\sqrt{1+ax}}{75a^3} - \frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)
 \end{aligned}$$

Mathematica [A] time = 0.0328575, size = 55, normalized size = 0.59

$$\frac{1}{5}x^5 \cosh^{-1}(ax) - \frac{\sqrt{ax-1}\sqrt{ax+1}(3a^4x^4 + 4a^2x^2 + 8)}{75a^5}$$

Antiderivative was successfully verified.

[In] Integrate[x^4*ArcCosh[a*x], x]

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(8 + 4*a^2*x^2 + 3*a^4*x^4))/(75*a^5) + (x^5*ArcCosh[a*x])/5

Maple [A] time = 0.014, size = 52, normalized size = 0.6

$$\frac{1}{a^5} \left(\frac{a^5 x^5 \operatorname{arccosh}(ax)}{5} - \frac{3x^4 a^4 + 4a^2 x^2 + 8}{75} \sqrt{ax-1} \sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x), x)

[Out] $1/a^5*(1/5*a^5*x^5*\operatorname{arccosh}(a*x)-1/75*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}*(3*a^4*x^4+4*a^2*x^2+8))$

Maxima [A] time = 1.09191, size = 92, normalized size = 0.99

$$\frac{1}{5}x^5 \operatorname{arccosh}(ax) - \frac{1}{75} \left(\frac{3\sqrt{a^2x^2-1}x^4}{a^2} + \frac{4\sqrt{a^2x^2-1}x^2}{a^4} + \frac{8\sqrt{a^2x^2-1}}{a^6} \right) a$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x),x, algorithm="maxima")`

[Out] $1/5*x^5*\operatorname{arccosh}(a*x) - 1/75*(3*\sqrt{a^2*x^2 - 1}*x^4/a^2 + 4*\sqrt{a^2*x^2 - 1}*x^2/a^4 + 8*\sqrt{a^2*x^2 - 1}/a^6)*a$

Fricas [A] time = 2.5049, size = 135, normalized size = 1.45

$$\frac{15a^5x^5 \log(ax + \sqrt{a^2x^2-1}) - (3a^4x^4 + 4a^2x^2 + 8)\sqrt{a^2x^2-1}}{75a^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x),x, algorithm="fricas")`

[Out] $1/75*(15*a^5*x^5*\log(a*x + \sqrt{a^2*x^2 - 1}) - (3*a^4*x^4 + 4*a^2*x^2 + 8)*\sqrt{a^2*x^2 - 1})/a^5$

Sympy [A] time = 2.48224, size = 76, normalized size = 0.82

$$\begin{cases} \frac{x^5 \operatorname{acosh}(ax)}{5} - \frac{x^4 \sqrt{a^2x^2-1}}{25a} - \frac{4x^2 \sqrt{a^2x^2-1}}{75a^3} - \frac{8\sqrt{a^2x^2-1}}{75a^5} & \text{for } a \neq 0 \\ \frac{i\pi x^5}{10} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4*acosh(a*x),x)`

[Out] `Piecewise((x**5*acosh(a*x)/5 - x**4*sqrt(a**2*x**2 - 1)/(25*a) - 4*x**2*sqrt(a**2*x**2 - 1)/(75*a**3) - 8*sqrt(a**2*x**2 - 1)/(75*a**5), Ne(a, 0)), (I*pi*x**5/10, True))`

Giac [A] time = 1.22981, size = 90, normalized size = 0.97

$$\frac{1}{5}x^5 \log(ax + \sqrt{a^2x^2-1}) - \frac{3(a^2x^2-1)^{\frac{5}{2}} + 10(a^2x^2-1)^{\frac{3}{2}} + 15\sqrt{a^2x^2-1}}{75a^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x),x, algorithm="giac")`

```
[Out] 1/5*x^5*log(a*x + sqrt(a^2*x^2 - 1)) - 1/75*(3*(a^2*x^2 - 1)^(5/2) + 10*(a^2*x^2 - 1)^(3/2) + 15*sqrt(a^2*x^2 - 1))/a^5
```


3.2 $\int x^3 \cosh^{-1}(ax) dx$

Optimal. Leaf size=77

$$-\frac{3x\sqrt{ax-1}\sqrt{ax+1}}{32a^3} - \frac{3 \cosh^{-1}(ax)}{32a^4} - \frac{x^3\sqrt{ax-1}\sqrt{ax+1}}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax)$$

[Out] $(-3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(32*a^3) - (x^3*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(16*a) - (3*\text{ArcCosh}[a*x])/(32*a^4) + (x^4*\text{ArcCosh}[a*x])/4$

Rubi [A] time = 0.0299139, antiderivative size = 77, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5662, 100, 12, 90, 52}

$$-\frac{3x\sqrt{ax-1}\sqrt{ax+1}}{32a^3} - \frac{3 \cosh^{-1}(ax)}{32a^4} - \frac{x^3\sqrt{ax-1}\sqrt{ax+1}}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] $\text{Int}[x^3*\text{ArcCosh}[a*x], x]$

[Out] $(-3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(32*a^3) - (x^3*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(16*a) - (3*\text{ArcCosh}[a*x])/(32*a^4) + (x^4*\text{ArcCosh}[a*x])/4$

Rule 5662

$\text{Int}[(a_.) + \text{ArcCosh}[(c_.)*(x_.)]*(b_.)]^{(n_.)}*((d_.)*(x_.))^{(m_.)}, x_Symbol]$
 $\rightarrow \text{Simp}[(d*x)^{(m+1)}*(a + b*\text{ArcCosh}[c*x])^n / (d*(m+1)), x] - \text{Dist}[(b*c^n) / (d*(m+1)), \text{Int}[(d*x)^{(m+1)}*(a + b*\text{ArcCosh}[c*x])^{(n-1)} / (\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /;$ FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 100

$\text{Int}[(a_.) + (b_.)*(x_.)]^{(m_.)}*((c_.) + (d_.)*(x_.))^{(n_.)}*((e_.) + (f_.)*(x_.))^{(p_.)}, x_Symbol]$
 $\rightarrow \text{Simp}[(b*(a + b*x)^{(m-1)}*(c + d*x)^{(n+1)}*(e + f*x)^{(p+1)}) / (d*f*(m+n+p+1)), x] + \text{Dist}[1 / (d*f*(m+n+p+1)), \text{Int}[(a + b*x)^{(m-2)}*(c + d*x)^n*(e + f*x)^p * \text{Simp}[a^2*d*f*(m+n+p+1) - b*(b*c*e*(m-1) + a*(d*e*(n+1) + c*f*(p+1))) + b*(a*d*f*(2*m+n+p) - b*(d*e*(m+n) + c*f*(m+p))]*x, x], x] /;$ FreeQ[{a, b, c, d, e, f, n, p}, x] && GtQ[m, 1] && NeQ[m+n+p+1, 0] && IntegerQ[m]

Rule 12

$\text{Int}[(a_)*(u_), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /;$ FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 90

$\text{Int}[(a_.) + (b_.)*(x_.)]^2*((c_.) + (d_.)*(x_.))^{(n_.)}*((e_.) + (f_.)*(x_.))^{(p_.)}, x_Symbol]$
 $\rightarrow \text{Simp}[(b*(a + b*x)*(c + d*x)^{(n+1)}*(e + f*x)^{(p+1)}) / (d*f*(n+p+3)), x] + \text{Dist}[1 / (d*f*(n+p+3)), \text{Int}[(c + d*x)^n*(e + f*x)^p * \text{Simp}[a^2*d*f*(n+p+3) - b*(b*c*e + a*(d*e*(n+1) + c*f*(p+1))) + b*(a*d*f*(n+p+4) - b*(d*e*(n+2) + c*f*(p+2))]*x, x], x] /;$ FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n+p+3, 0]

Rule 52

```
Int[1/(Sqrt[(a_) + (b_.)*(x_)]*Sqrt[(c_) + (d_.)*(x_)]), x_Symbol] :> Simp[
ArcCosh[(b*x)/a]/b, x] /; FreeQ[{a, b, c, d}, x] && EqQ[a + c, 0] && EqQ[b
- d, 0] && GtQ[a, 0]
```

Rubi steps

$$\begin{aligned}
\int x^3 \cosh^{-1}(ax) dx &= \frac{1}{4}x^4 \cosh^{-1}(ax) - \frac{1}{4}a \int \frac{x^4}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax) - \frac{\int \frac{3x^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{16a} \\
&= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax) - \frac{3 \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{16a} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}}{32a^3} - \frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax) - \frac{3 \int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{32a^3} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}}{32a^3} - \frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{16a} - \frac{3 \cosh^{-1}(ax)}{32a^4} + \frac{1}{4}x^4 \cosh^{-1}(ax)
\end{aligned}$$

Mathematica [A] time = 0.0622652, size = 71, normalized size = 0.92

$$\frac{ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2+3) - 8a^4x^4 \cosh^{-1}(ax) + 6 \tanh^{-1}\left(\sqrt{\frac{ax-1}{ax+1}}\right)}{32a^4}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[x^3*ArcCosh[a*x], x]
```

```
[Out] -(a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(3 + 2*a^2*x^2) - 8*a^4*x^4*ArcCosh[a*x]
+ 6*ArcTanh[Sqrt[(-1 + a*x)/(1 + a*x)]])/(32*a^4)
```

Maple [A] time = 0.017, size = 99, normalized size = 1.3

$$\frac{x^4 \operatorname{arccosh}(ax)}{4} - \frac{x^3}{16a} \sqrt{ax-1}\sqrt{ax+1} - \frac{3x}{32a^3} \sqrt{ax-1}\sqrt{ax+1} - \frac{3}{32a^4} \sqrt{ax-1}\sqrt{ax+1} \ln\left(ax + \sqrt{a^2x^2-1}\right) \frac{1}{\sqrt{a^2x^2-1}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*arccosh(a*x), x)
```

```
[Out] 1/4*x^4*arccosh(a*x)-1/16*x^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)/a-3/32*x*(a*x-1)^(
1/2)*(a*x+1)^(1/2)/a^3-3/32/a^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)/(a^2*x^2-1)^(1
/2)*ln(a*x+(a^2*x^2-1)^(1/2))
```

Maxima [A] time = 1.14385, size = 116, normalized size = 1.51

$$\frac{1}{4}x^4 \operatorname{arccosh}(ax) - \frac{1}{32} \left(\frac{2\sqrt{a^2x^2-1}x^3}{a^2} + \frac{3\sqrt{a^2x^2-1}x}{a^4} + \frac{3 \log\left(2a^2x + 2\sqrt{a^2x^2-1}\sqrt{a^2}\right)}{\sqrt{a^2}a^4} \right) a$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x),x, algorithm="maxima")

[Out] $\frac{1}{4}x^4 \operatorname{arccosh}(ax) - \frac{1}{32}(2\sqrt{a^2x^2 - 1})x^3/a^2 + 3\sqrt{a^2x^2 - 1}x/a^4 + 3\log(2a^2x + 2\sqrt{a^2x^2 - 1})\sqrt{a^2x^2 - 1}/(\sqrt{a^2x^2 - 1}a^4)$
*a

Fricas [A] time = 2.27403, size = 131, normalized size = 1.7

$$\frac{(8a^4x^4 - 3)\log(ax + \sqrt{a^2x^2 - 1}) - (2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1}}{32a^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x),x, algorithm="fricas")

[Out] $\frac{1}{32}((8a^4x^4 - 3)\log(ax + \sqrt{a^2x^2 - 1}) - (2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1})/a^4$

Sympy [A] time = 1.34646, size = 68, normalized size = 0.88

$$\begin{cases} \frac{x^4 \operatorname{acosh}(ax)}{4} - \frac{x^3 \sqrt{a^2x^2 - 1}}{16a} - \frac{3x \sqrt{a^2x^2 - 1}}{32a^3} - \frac{3 \operatorname{acosh}(ax)}{32a^4} & \text{for } a \neq 0 \\ \frac{i\pi x^4}{8} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x),x)

[Out] Piecewise((x**4*acosh(a*x)/4 - x**3*sqrt(a**2*x**2 - 1)/(16*a) - 3*x*sqrt(a**2*x**2 - 1)/(32*a**3) - 3*acosh(a*x)/(32*a**4), Ne(a, 0)), (I*pi*x**4/8, True))

Giac [A] time = 1.35273, size = 109, normalized size = 1.42

$$\frac{1}{4}x^4 \log(ax + \sqrt{a^2x^2 - 1}) - \frac{1}{32} \left(\sqrt{a^2x^2 - 1}x \left(\frac{2x^2}{a^2} + \frac{3}{a^4} \right) - \frac{3 \log(|-x|a + \sqrt{a^2x^2 - 1})}{a^4|a|} \right) a$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x),x, algorithm="giac")

[Out] $\frac{1}{4}x^4 \log(ax + \sqrt{a^2x^2 - 1}) - \frac{1}{32}(\sqrt{a^2x^2 - 1})x(2x^2/a^2 + 3/a^4) - 3\log(\operatorname{abs}(-x\operatorname{abs}(a) + \sqrt{a^2x^2 - 1}))/(\sqrt{a^2x^2 - 1}a^4\operatorname{abs}(a))$ *a

3.3 $\int x^2 \cosh^{-1}(ax) dx$

Optimal. Leaf size=65

$$-\frac{2\sqrt{ax-1}\sqrt{ax+1}}{9a^3} - \frac{x^2\sqrt{ax-1}\sqrt{ax+1}}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)$$

[Out] $(-2\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(9*a^3) - (x^2*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(9*a) + (x^3*\text{ArcCosh}[a*x])/3$

Rubi [A] time = 0.0225147, antiderivative size = 65, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 100, 12, 74}

$$-\frac{2\sqrt{ax-1}\sqrt{ax+1}}{9a^3} - \frac{x^2\sqrt{ax-1}\sqrt{ax+1}}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] Int[x^2*ArcCosh[a*x], x]

[Out] $(-2\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(9*a^3) - (x^2*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(9*a) + (x^3*\text{ArcCosh}[a*x])/3$

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 100

```
Int[((a_.) + (b_.)*(x_.))^(m_.)*((c_.) + (d_.)*(x_.))^(n_.)*((e_.) + (f_.)*(x_
))^(p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m - 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/(d*f*(m + n + p + 1)), x] + Dist[1/(d*f*(m + n + p + 1)), Int[(a
+ b*x)^(m - 2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m + n + p + 1) - b*(b
*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*
(d*e*(m + n) + c*f*(m + p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p
}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 74

```
Int[((a_.) + (b_.)*(x_.))*((c_.) + (d_.)*(x_.))^(n_.)*((e_.) + (f_.)*(x_.))^(p
_.), x_Symbol] :> Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p
+ 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ
[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]
```

Rubi steps

$$\begin{aligned}
\int x^2 \cosh^{-1}(ax) dx &= \frac{1}{3}x^3 \cosh^{-1}(ax) - \frac{1}{3}a \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax) - \frac{\int \frac{2x}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{9a} \\
&= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax) - \frac{2 \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{9a} \\
&= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{9a^3} - \frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)
\end{aligned}$$

Mathematica [A] time = 0.0229695, size = 46, normalized size = 0.71

$$\frac{1}{3}x^3 \cosh^{-1}(ax) - \frac{\sqrt{ax-1}\sqrt{ax+1}(a^2x^2+2)}{9a^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2*ArcCosh[a*x],x]

[Out] -(Sqrt[-1+a*x]*Sqrt[1+a*x]*(2+a^2*x^2))/(9*a^3) + (x^3*ArcCosh[a*x])/3

Maple [A] time = 0.009, size = 43, normalized size = 0.7

$$\frac{1}{a^3} \left(\frac{a^3 x^3 \operatorname{arccosh}(ax)}{3} - \frac{a^2 x^2 + 2}{9} \sqrt{ax-1} \sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x),x)

[Out] 1/a^3*(1/3*a^3*x^3*arccosh(a*x)-1/9*(a*x-1)^(1/2)*(a*x+1)^(1/2)*(a^2*x^2+2))

Maxima [A] time = 1.11093, size = 65, normalized size = 1.

$$\frac{1}{3}x^3 \operatorname{arcosh}(ax) - \frac{1}{9}a \left(\frac{\sqrt{a^2x^2-1}x^2}{a^2} + \frac{2\sqrt{a^2x^2-1}}{a^4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x),x, algorithm="maxima")

[Out] 1/3*x^3*arccosh(a*x) - 1/9*a*(sqrt(a^2*x^2-1)*x^2/a^2 + 2*sqrt(a^2*x^2-1)/a^4)

Fricas [A] time = 2.40158, size = 113, normalized size = 1.74

$$\frac{3a^3x^3 \log\left(ax + \sqrt{a^2x^2-1}\right) - (a^2x^2+2)\sqrt{a^2x^2-1}}{9a^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x),x, algorithm="fricas")

[Out] 1/9*(3*a^3*x^3*log(a*x + sqrt(a^2*x^2 - 1)) - (a^2*x^2 + 2)*sqrt(a^2*x^2 - 1))/a^3

Sympy [A] time = 0.619472, size = 54, normalized size = 0.83

$$\begin{cases} \frac{x^3 \operatorname{acosh}(ax)}{3} - \frac{x^2 \sqrt{a^2 x^2 - 1}}{9a} - \frac{2\sqrt{a^2 x^2 - 1}}{9a^3} & \text{for } a \neq 0 \\ \frac{i\pi x^3}{6} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x),x)

[Out] Piecewise((x**3*acosh(a*x)/3 - x**2*sqrt(a**2*x**2 - 1)/(9*a) - 2*sqrt(a**2*x**2 - 1)/(9*a**3), Ne(a, 0)), (I*pi*x**3/6, True))

Giac [A] time = 1.24391, size = 70, normalized size = 1.08

$$\frac{1}{3} x^3 \log\left(ax + \sqrt{a^2 x^2 - 1}\right) - \frac{(a^2 x^2 - 1)^{\frac{3}{2}} + 3\sqrt{a^2 x^2 - 1}}{9a^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x),x, algorithm="giac")

[Out] 1/3*x^3*log(a*x + sqrt(a^2*x^2 - 1)) - 1/9*((a^2*x^2 - 1)^(3/2) + 3*sqrt(a^2*x^2 - 1))/a^3

3.4 $\int x \cosh^{-1}(ax) dx$

Optimal. Leaf size=49

$$-\frac{\cosh^{-1}(ax)}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax) - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{4a}$$

[Out] $-(x\sqrt{-1+ax}*\sqrt{1+ax})/(4*a) - \text{ArcCosh}[a*x]/(4*a^2) + (x^2*\text{ArcCosh}[a*x])/2$

Rubi [A] time = 0.0152043, antiderivative size = 49, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 90, 52}

$$-\frac{\cosh^{-1}(ax)}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax) - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{4a}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x], x]

[Out] $-(x\sqrt{-1+ax}*\sqrt{1+ax})/(4*a) - \text{ArcCosh}[a*x]/(4*a^2) + (x^2*\text{ArcCosh}[a*x])/2$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^n)/(d*(m+1)), x] - Dist[(b*c*n)/(d*(m+1)), Int[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^(n-1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 90

Int[((a_.) + (b_.)*(x_.))^2*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a+b*x)*(c+d*x)^(n+1)*(e+f*x)^(p+1))/(d*f*(n+p+3)), x] + Dist[1/(d*f*(n+p+3)), Int[(c+d*x)^n*(e+f*x)^(p+1)*Simp[a^2*d*f*(n+p+3) - b*(b*c*e + a*(d*e*(n+1) + c*f*(p+1))) + b*(a*d*f*(n+p+4) - b*(d*e*(n+2) + c*f*(p+2)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n+p+3, 0]

Rule 52

Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]), x_Symbol] :> Simp[ArcCosh[(b*x)/a]/b, x] /; FreeQ[{a, b, c, d}, x] && EqQ[a+c, 0] && EqQ[b-d, 0] && GtQ[a, 0]

Rubi steps

$$\begin{aligned} \int x \cosh^{-1}(ax) dx &= \frac{1}{2}x^2 \cosh^{-1}(ax) - \frac{1}{2}a \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{4a} + \frac{1}{2}x^2 \cosh^{-1}(ax) - \frac{\int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{4a} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{4a} - \frac{\cosh^{-1}(ax)}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax) \end{aligned}$$

Mathematica [A] time = 0.0246326, size = 61, normalized size = 1.24

$$\frac{-2a^2x^2 \cosh^{-1}(ax) + ax\sqrt{ax-1}\sqrt{ax+1} + 2 \tanh^{-1}\left(\sqrt{\frac{ax-1}{ax+1}}\right)}{4a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x*ArcCosh[a*x], x]

[Out] $-(a*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x] - 2*a^2*x^2*\text{ArcCosh}[a*x] + 2*\text{ArcTanh}[\text{Sqrt}[(-1 + a*x)/(1 + a*x)]])/(4*a^2)$

Maple [A] time = 0.011, size = 77, normalized size = 1.6

$$\frac{x^2 \operatorname{arccosh}(ax)}{2} - \frac{x}{4a} \sqrt{ax-1} \sqrt{ax+1} - \frac{1}{4a^2} \sqrt{ax-1} \sqrt{ax+1} \ln\left(ax + \sqrt{a^2x^2 - 1}\right) \frac{1}{\sqrt{a^2x^2 - 1}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x), x)

[Out] $1/2*x^2*\operatorname{arccosh}(a*x) - 1/4*x*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/a - 1/4/a^2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/(a^2*x^2-1)^{(1/2)}*\ln(a*x+(a^2*x^2-1)^{(1/2)})$

Maxima [A] time = 1.13153, size = 88, normalized size = 1.8

$$\frac{1}{2}x^2 \operatorname{arccosh}(ax) - \frac{1}{4}a \left(\frac{\sqrt{a^2x^2 - 1}x}{a^2} + \frac{\log\left(2a^2x + 2\sqrt{a^2x^2 - 1}\sqrt{a^2}\right)}{\sqrt{a^2}a^2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x), x, algorithm="maxima")

[Out] $1/2*x^2*\operatorname{arccosh}(a*x) - 1/4*a*(\text{sqrt}(a^2*x^2 - 1)*x/a^2 + \log(2*a^2*x + 2*\text{sqrt}(a^2*x^2 - 1)*\text{sqrt}(a^2)))/(\text{sqrt}(a^2)*a^2)$

Fricas [A] time = 2.34593, size = 109, normalized size = 2.22

$$\frac{\sqrt{a^2x^2 - 1}ax - (2a^2x^2 - 1) \log(ax + \sqrt{a^2x^2 - 1})}{4a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x), x, algorithm="fricas")

[Out] $-1/4*(\text{sqrt}(a^2*x^2 - 1)*a*x - (2*a^2*x^2 - 1)*\log(a*x + \text{sqrt}(a^2*x^2 - 1)))/a^2$

Sympy [A] time = 0.265342, size = 44, normalized size = 0.9

$$\begin{cases} \frac{x^2 \operatorname{acosh}(ax)}{2} - \frac{x\sqrt{a^2x^2-1}}{4a} - \frac{\operatorname{acosh}(ax)}{4a^2} & \text{for } a \neq 0 \\ \frac{i\pi x^2}{4} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x),x)

[Out] Piecewise((x**2*acosh(a*x)/2 - x*sqrt(a**2*x**2 - 1)/(4*a) - acosh(a*x)/(4*a**2), Ne(a, 0)), (I*pi*x**2/4, True))

Giac [A] time = 1.27737, size = 95, normalized size = 1.94

$$\frac{1}{2}x^2 \log(ax + \sqrt{a^2x^2 - 1}) - \frac{1}{4}a \left(\frac{\sqrt{a^2x^2 - 1}x}{a^2} - \frac{\log\left(|-x|a + \sqrt{a^2x^2 - 1}\right)}{a^2|a|} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x),x, algorithm="giac")

[Out] 1/2*x^2*log(a*x + sqrt(a^2*x^2 - 1)) - 1/4*a*(sqrt(a^2*x^2 - 1)*x/a^2 - log(abs(-x*abs(a) + sqrt(a^2*x^2 - 1)))/(a^2*abs(a)))

3.5 $\int \cosh^{-1}(ax) dx$

Optimal. Leaf size=30

$$x \cosh^{-1}(ax) - \frac{\sqrt{ax-1}\sqrt{ax+1}}{a}$$

[Out] -((Sqrt[-1 + a*x]*Sqrt[1 + a*x])/a) + x*ArcCosh[a*x]

Rubi [A] time = 0.006411, antiderivative size = 30, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5654, 74}

$$x \cosh^{-1}(ax) - \frac{\sqrt{ax-1}\sqrt{ax+1}}{a}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x], x]

[Out] -((Sqrt[-1 + a*x]*Sqrt[1 + a*x])/a) + x*ArcCosh[a*x]

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] :> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c^n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 74

Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]

Rubi steps

$$\begin{aligned} \int \cosh^{-1}(ax) dx &= x \cosh^{-1}(ax) - a \int \frac{x}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx \\ &= -\frac{\sqrt{-1 + ax}\sqrt{1 + ax}}{a} + x \cosh^{-1}(ax) \end{aligned}$$

Mathematica [A] time = 0.016369, size = 30, normalized size = 1.

$$x \cosh^{-1}(ax) - \frac{\sqrt{ax-1}\sqrt{ax+1}}{a}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x], x]

[Out] -((Sqrt[-1 + a*x]*Sqrt[1 + a*x])/a) + x*ArcCosh[a*x]

Maple [A] time = 0.001, size = 29, normalized size = 1.

$$\frac{1}{a} \left(ax \operatorname{arccosh}(ax) - \sqrt{ax-1} \sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x), x)

[Out] 1/a*(a*x*arccosh(a*x)-(a*x-1)^(1/2)*(a*x+1)^(1/2))

Maxima [A] time = 1.15911, size = 34, normalized size = 1.13

$$\frac{ax \operatorname{arcosh}(ax) - \sqrt{a^2x^2 - 1}}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x), x, algorithm="maxima")

[Out] (a*x*arccosh(a*x) - sqrt(a^2*x^2 - 1))/a

Fricas [A] time = 2.36269, size = 78, normalized size = 2.6

$$\frac{ax \log\left(ax + \sqrt{a^2x^2 - 1}\right) - \sqrt{a^2x^2 - 1}}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x), x, algorithm="fricas")

[Out] (a*x*log(a*x + sqrt(a^2*x^2 - 1)) - sqrt(a^2*x^2 - 1))/a

Sympy [A] time = 0.208176, size = 26, normalized size = 0.87

$$\begin{cases} x \operatorname{acosh}(ax) - \frac{\sqrt{a^2x^2-1}}{a} & \text{for } a \neq 0 \\ \frac{i\pi x}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x), x)

[Out] Piecewise((x*acosh(a*x) - sqrt(a**2*x**2 - 1)/a, Ne(a, 0)), (I*pi*x/2, True))

Giac [A] time = 1.37339, size = 47, normalized size = 1.57

$$x \log\left(ax + \sqrt{a^2x^2 - 1}\right) - \frac{\sqrt{a^2x^2 - 1}}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x),x, algorithm="giac")
```

```
[Out] x*log(a*x + sqrt(a^2*x^2 - 1)) - sqrt(a^2*x^2 - 1)/a
```

3.6 $\int \frac{\cosh^{-1}(ax)}{x} dx$

Optimal. Leaf size=43

$$\frac{1}{2} \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - \frac{1}{2} \cosh^{-1}(ax)^2 + \cosh^{-1}(ax) \log\left(e^{2 \cosh^{-1}(ax)} + 1\right)$$

[Out] $-\text{ArcCosh}[a*x]^2/2 + \text{ArcCosh}[a*x]*\text{Log}[1 + E^{(2*\text{ArcCosh}[a*x])}] + \text{PolyLog}[2, -E^{(2*\text{ArcCosh}[a*x])}]/2$

Rubi [A] time = 0.058621, antiderivative size = 43, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5660, 3718, 2190, 2279, 2391}

$$\frac{1}{2} \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - \frac{1}{2} \cosh^{-1}(ax)^2 + \cosh^{-1}(ax) \log\left(e^{2 \cosh^{-1}(ax)} + 1\right)$$

Antiderivative was successfully verified.

[In] $\text{Int}[\text{ArcCosh}[a*x]/x, x]$

[Out] $-\text{ArcCosh}[a*x]^2/2 + \text{ArcCosh}[a*x]*\text{Log}[1 + E^{(2*\text{ArcCosh}[a*x])}] + \text{PolyLog}[2, -E^{(2*\text{ArcCosh}[a*x])}]/2$

Rule 5660

$\text{Int}[\frac{(a + \text{ArcCosh}[c*x])^n}{x}, x, \text{ArcCosh}[c*x]] \text{ ; FreeQ}\{a, b, c, x\} \ \&\& \ \text{IGtQ}[n, 0]$

Rule 3718

$\text{Int}[\frac{(c + d*x)^m \tan[e + (f*x)]}{x}, x] \text{ ; FreeQ}\{c, d, e, f, fz\}, x \ \&\& \ \text{IGtQ}[m, 0]$

Rule 2190

$\text{Int}[\frac{(F + (g + (e + f*x))^n)^m}{(a + b*(F + (g + (e + f*x))^n))}, x] \text{ ; FreeQ}\{F, a, b, c, d, e, f, g, n\}, x \ \&\& \ \text{IGtQ}[m, 0]$

Rule 2279

$\text{Int}[\text{Log}[a + b*(F + (e + f*x))^n], x] \text{ ; FreeQ}\{F, a, b, c, d, e, n\}, x \ \&\& \ \text{GtQ}[a, 0]$

Rule 2391

$\text{Int}[\text{Log}[\frac{c + d*x^n}{x}], x] \text{ ; FreeQ}\{c, d, e, n\}, x \ \&\& \ \text{EqQ}[c*d, 1]$

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)}{x} dx &= \text{Subst} \left(\int x \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{2} \cosh^{-1}(ax)^2 + 2 \text{Subst} \left(\int \frac{e^{2x}}{1+e^{2x}} dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{2} \cosh^{-1}(ax)^2 + \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) - \text{Subst} \left(\int \log(1+e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{2} \cosh^{-1}(ax)^2 + \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) - \frac{1}{2} \text{Subst} \left(\int \frac{\log(1+x)}{x} dx, x, e^{2 \cosh^{-1}(ax)} \right) \\
&= -\frac{1}{2} \cosh^{-1}(ax)^2 + \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \frac{1}{2} \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right)
\end{aligned}$$

Mathematica [A] time = 0.0340923, size = 42, normalized size = 0.98

$$\frac{1}{2} \left(\cosh^{-1}(ax) \left(\cosh^{-1}(ax) + 2 \log \left(e^{-2 \cosh^{-1}(ax)} + 1 \right) \right) - \text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]/x,x]

[Out] (ArcCosh[a*x]*(ArcCosh[a*x] + 2*Log[1 + E^(-2*ArcCosh[a*x])]) - PolyLog[2, -E^(-2*ArcCosh[a*x])])/2

Maple [A] time = 0.034, size = 66, normalized size = 1.5

$$-\frac{(\text{arccosh}(ax))^2}{2} + \text{arccosh}(ax) \ln \left(1 + \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right) + \frac{1}{2} \text{polylog} \left(2, - \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)/x,x)

[Out] -1/2*arccosh(a*x)^2+arccosh(a*x)*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)+1/2*polylog(2,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{arcosh}(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)/x, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{\text{arcosh}(ax)}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x,x, algorithm="fricas")

[Out] integral(arccosh(a*x)/x, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)/x,x)

[Out] Integral(acosh(a*x)/x, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{arcosh}(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x,x, algorithm="giac")

[Out] integrate(arccosh(a*x)/x, x)

3.7 $\int \frac{\cosh^{-1}(ax)}{x^2} dx$

Optimal. Leaf size=32

$$a \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) - \frac{\cosh^{-1}(ax)}{x}$$

[Out] $-(\text{ArcCosh}[a*x]/x) + a*\text{ArcTan}[\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]]$

Rubi [A] time = 0.0168724, antiderivative size = 32, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {5662, 92, 205}

$$a \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) - \frac{\cosh^{-1}(ax)}{x}$$

Antiderivative was successfully verified.

[In] $\text{Int}[\text{ArcCosh}[a*x]/x^2, x]$

[Out] $-(\text{ArcCosh}[a*x]/x) + a*\text{ArcTan}[\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]]$

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 92

```
Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_
))), x_Symbol] :> Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x],
x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
2*b*d*e - f*(b*c + a*d), 0]
```

Rule 205

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] :> Simp[(Rt[a/b, 2]*ArcTan[x/Rt[a
/b, 2]])/a, x] /; FreeQ[{a, b}, x] && PosQ[a/b]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)}{x^2} dx &= -\frac{\cosh^{-1}(ax)}{x} + a \int \frac{1}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{\cosh^{-1}(ax)}{x} + a^2 \text{Subst}\left(\int \frac{1}{a+ax^2} dx, x, \sqrt{-1+ax}\sqrt{1+ax}\right) \\ &= -\frac{\cosh^{-1}(ax)}{x} + a \tan^{-1}\left(\sqrt{-1+ax}\sqrt{1+ax}\right) \end{aligned}$$

Mathematica [A] time = 0.0245135, size = 57, normalized size = 1.78

$$\frac{a\sqrt{a^2x^2-1}\tan^{-1}\left(\sqrt{a^2x^2-1}\right)}{\sqrt{ax-1}\sqrt{ax+1}} - \frac{\cosh^{-1}(ax)}{x}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]/x^2,x]

[Out] -(ArcCosh[a*x]/x) + (a*Sqrt[-1 + a^2*x^2]*ArcTan[Sqrt[-1 + a^2*x^2]])/(Sqrt[-1 + a*x]*Sqrt[1 + a*x])

Maple [A] time = 0.013, size = 51, normalized size = 1.6

$$-\frac{\operatorname{arccosh}(ax)}{x} - a\sqrt{ax-1}\sqrt{ax+1}\arctan\left(\frac{1}{\sqrt{a^2x^2-1}}\right)\frac{1}{\sqrt{a^2x^2-1}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)/x^2,x)

[Out] -arccosh(a*x)/x-a*(a*x-1)^(1/2)*(a*x+1)^(1/2)/(a^2*x^2-1)^(1/2)*arctan(1/(a^2*x^2-1)^(1/2))

Maxima [A] time = 1.78092, size = 32, normalized size = 1.

$$-a\arcsin\left(\frac{1}{\sqrt{a^2|x|}}\right) - \frac{\operatorname{arcosh}(ax)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^2,x, algorithm="maxima")

[Out] -a*arcsin(1/(sqrt(a^2)*abs(x))) - arccosh(a*x)/x

Fricas [B] time = 2.40256, size = 158, normalized size = 4.94

$$\frac{2ax\arctan\left(-ax + \sqrt{a^2x^2-1}\right) + (x-1)\log\left(ax + \sqrt{a^2x^2-1}\right) + x\log\left(-ax + \sqrt{a^2x^2-1}\right)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^2,x, algorithm="fricas")

[Out] (2*a*x*arctan(-a*x + sqrt(a^2*x^2 - 1)) + (x - 1)*log(a*x + sqrt(a^2*x^2 - 1)) + x*log(-a*x + sqrt(a^2*x^2 - 1)))/x

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}(ax)}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)/x**2,x)

[Out] Integral(acosh(a*x)/x**2, x)

Giac [A] time = 1.39625, size = 49, normalized size = 1.53

$$a \arctan\left(\sqrt{a^2x^2 - 1}\right) - \frac{\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^2,x, algorithm="giac")

[Out] a*arctan(sqrt(a^2*x^2 - 1)) - log(a*x + sqrt(a^2*x^2 - 1))/x

$$3.8 \quad \int \frac{\cosh^{-1}(ax)}{x^3} dx$$

Optimal. Leaf size=38

$$\frac{a\sqrt{ax-1}\sqrt{ax+1}}{2x} - \frac{\cosh^{-1}(ax)}{2x^2}$$

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*x) - ArcCosh[a*x]/(2*x^2)

Rubi [A] time = 0.0134166, antiderivative size = 38, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.25$, Rules used = {5662, 95}

$$\frac{a\sqrt{ax-1}\sqrt{ax+1}}{2x} - \frac{\cosh^{-1}(ax)}{2x^2}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]/x^3,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*x) - ArcCosh[a*x]/(2*x^2)

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 95

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] /; FreeQ[{a, b, c, d, e, f, m, n, p}, x] && EqQ[Simplify[m + n + p + 3], 0] && EqQ[a*d*f*(m + 1) + b*c*f*(n + 1) + b*d*e*(p + 1), 0] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)}{x^3} dx &= -\frac{\cosh^{-1}(ax)}{2x^2} + \frac{1}{2}a \int \frac{1}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{2x} - \frac{\cosh^{-1}(ax)}{2x^2} \end{aligned}$$

Mathematica [A] time = 0.007299, size = 35, normalized size = 0.92

$$\frac{ax\sqrt{ax-1}\sqrt{ax+1} - \cosh^{-1}(ax)}{2x^2}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]/x^3,x]

[Out] $(a*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x] - \text{ArcCosh}[a*x])/(2*x^2)$

Maple [A] time = 0.012, size = 40, normalized size = 1.1

$$a^2 \left(-\frac{\text{arccosh}(ax)}{2a^2x^2} + \frac{1}{2ax} \sqrt{ax-1} \sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(arccosh(a*x)/x^3,x)`

[Out] $a^2*(-1/2*\text{arccosh}(a*x)/a^2/x^2+1/2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/a/x)$

Maxima [A] time = 1.72844, size = 36, normalized size = 0.95

$$\frac{\sqrt{a^2x^2-1}a}{2x} - \frac{\text{arcosh}(ax)}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)/x^3,x, algorithm="maxima")`

[Out] $1/2*\text{sqrt}(a^2*x^2 - 1)*a/x - 1/2*\text{arccosh}(a*x)/x^2$

Fricas [A] time = 2.4195, size = 86, normalized size = 2.26

$$\frac{\sqrt{a^2x^2-1}ax - \log(ax + \sqrt{a^2x^2-1})}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)/x^3,x, algorithm="fricas")`

[Out] $1/2*(\text{sqrt}(a^2*x^2 - 1)*a*x - \log(a*x + \text{sqrt}(a^2*x^2 - 1)))/x^2$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}(ax)}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(acosh(a*x)/x**3,x)`

[Out] `Integral(acosh(a*x)/x**3, x)`

Giac [A] time = 1.20903, size = 68, normalized size = 1.79

$$\frac{a|a|}{\left(x|a| - \sqrt{a^2x^2 - 1}\right)^2 + 1} - \frac{\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^3,x, algorithm="giac")

[Out] a*abs(a)/((x*abs(a) - sqrt(a^2*x^2 - 1))^2 + 1) - 1/2*log(a*x + sqrt(a^2*x^2 - 1))/x^2

3.9 $\int \frac{\cosh^{-1}(ax)}{x^4} dx$

Optimal. Leaf size=65

$$\frac{1}{6}a^3 \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3}$$

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*x^2) - ArcCosh[a*x]/(3*x^3) + (a^3*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]])/6

Rubi [A] time = 0.027259, antiderivative size = 65, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5662, 103, 12, 92, 205}

$$\frac{1}{6}a^3 \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]/x^4,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*x^2) - ArcCosh[a*x]/(3*x^3) + (a^3*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]])/6

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 103

```
Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_
))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] + Dist[1/((m + 1)*(b*c - a
*d)*(b*e - a*f)), Int[(a + b*x)^(m + 1)*(c + d*x)^n*(e + f*x)^p*Simp[a*d*f*
(m + 1) - b*(d*e*(m + n + 2) + c*f*(m + p + 2)) - b*d*f*(m + n + p + 3)*x,
x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && LtQ[m, -1] && IntegerQ[
m] && (IntegerQ[n] || IntegersQ[2*n, 2*p])
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 92

```
Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_
))), x_Symbol] :> Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x],
x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
2*b*d*e - f*(b*c + a*d), 0]
```

Rule 205

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] :> Simp[(Rt[a/b, 2]*ArcTan[x/Rt[a/b, 2]])/a, x] /; FreeQ[{a, b}, x] && PosQ[a/b]

Rubi steps

$$\begin{aligned}
 \int \frac{\cosh^{-1}(ax)}{x^4} dx &= -\frac{\cosh^{-1}(ax)}{3x^3} + \frac{1}{3}a \int \frac{1}{x^3\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3} + \frac{1}{6}a \int \frac{a^2}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3} + \frac{1}{6}a^3 \int \frac{1}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3} + \frac{1}{6}a^4 \text{Subst}\left(\int \frac{1}{a+ax^2} dx, x, \sqrt{-1+ax}\sqrt{1+ax}\right) \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{6x^2} - \frac{\cosh^{-1}(ax)}{3x^3} + \frac{1}{6}a^3 \tan^{-1}\left(\sqrt{-1+ax}\sqrt{1+ax}\right)
 \end{aligned}$$

Mathematica [A] time = 0.0752107, size = 78, normalized size = 1.2

$$\frac{ax\left(a^2x^2+a^2x^2\sqrt{a^2x^2-1}\tan^{-1}\left(\sqrt{a^2x^2-1}\right)-1\right)}{\sqrt{ax-1}\sqrt{ax+1}} - 2\cosh^{-1}(ax)}{6x^3}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]/x^4,x]

[Out] (-2*ArcCosh[a*x] + (a*x*(-1 + a^2*x^2 + a^2*x^2*Sqrt[-1 + a^2*x^2])*ArcTan[Sqrt[-1 + a^2*x^2]]))/(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*x^3)

Maple [A] time = 0.013, size = 73, normalized size = 1.1

$$-\frac{\operatorname{arccosh}(ax)}{3x^3} - \frac{a^3}{6}\sqrt{ax-1}\sqrt{ax+1}\arctan\left(\frac{1}{\sqrt{a^2x^2-1}}\right)\frac{1}{\sqrt{a^2x^2-1}} + \frac{a}{6x^2}\sqrt{ax-1}\sqrt{ax+1}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)/x^4,x)

[Out] -1/3*arccosh(a*x)/x^3-1/6*a^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)/(a^2*x^2-1)^(1/2)*arctan(1/(a^2*x^2-1)^(1/2))+1/6*a*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x^2

Maxima [A] time = 1.82707, size = 61, normalized size = 0.94

$$-\frac{1}{6}\left(a^2\arcsin\left(\frac{1}{\sqrt{a^2|x|}}\right)-\frac{\sqrt{a^2x^2-1}}{x^2}\right)a-\frac{\operatorname{arcosh}(ax)}{3x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^4,x, algorithm="maxima")

[Out] $-1/6*(a^2*\arcsin(1/(\sqrt{a^2}*\text{abs}(x)))) - \sqrt{a^2*x^2 - 1}/x^2*a - 1/3*\text{arc}\text{cosh}(a*x)/x^3$

Fricas [A] time = 2.45052, size = 215, normalized size = 3.31

$$\frac{2a^3x^3 \arctan\left(-ax + \sqrt{a^2x^2 - 1}\right) + 2x^3 \log\left(-ax + \sqrt{a^2x^2 - 1}\right) + \sqrt{a^2x^2 - 1}ax + 2\left(x^3 - 1\right) \log\left(ax + \sqrt{a^2x^2 - 1}\right)}{6x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^4,x, algorithm="fricas")

[Out] $1/6*(2*a^3*x^3*\arctan(-a*x + \sqrt{a^2*x^2 - 1}) + 2*x^3*\log(-a*x + \sqrt{a^2*x^2 - 1}) + \sqrt{a^2*x^2 - 1}*a*x + 2*(x^3 - 1)*\log(a*x + \sqrt{a^2*x^2 - 1}))/x^3$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}(ax)}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)/x**4,x)

[Out] Integral(acosh(a*x)/x**4, x)

Giac [A] time = 1.33463, size = 78, normalized size = 1.2

$$\frac{1}{6}a^3\left(\frac{\sqrt{a^2x^2 - 1}}{a^2x^2} + \arctan\left(\sqrt{a^2x^2 - 1}\right)\right) - \frac{\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{3x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^4,x, algorithm="giac")

[Out] $1/6*a^3*(\sqrt{a^2*x^2 - 1}/(a^2*x^2) + \arctan(\sqrt{a^2*x^2 - 1})) - 1/3*\log(a*x + \sqrt{a^2*x^2 - 1})/x^3$

3.10 $\int \frac{\cosh^{-1}(ax)}{x^5} dx$

Optimal. Leaf size=66

$$\frac{a^3\sqrt{ax-1}\sqrt{ax+1}}{6x} + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{12x^3} - \frac{\cosh^{-1}(ax)}{4x^4}$$

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(12*x^3) + (a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*x) - ArcCosh[a*x]/(4*x^4)

Rubi [A] time = 0.0244926, antiderivative size = 66, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 103, 12, 95}

$$\frac{a^3\sqrt{ax-1}\sqrt{ax+1}}{6x} + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{12x^3} - \frac{\cosh^{-1}(ax)}{4x^4}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]/x^5,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(12*x^3) + (a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*x) - ArcCosh[a*x]/(4*x^4)

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 103

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] + Dist[1/((m + 1)*(b*c - a*d)*(b*e - a*f)), Int[(a + b*x)^(m + 1)*(c + d*x)^n*(e + f*x)^p*Simp[a*d*f*(m + 1) - b*(d*e*(m + n + 2) + c*f*(m + p + 2)) - b*d*f*(m + n + p + 3)*x, x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && LtQ[m, -1] && IntegerQ[m] && (IntegerQ[n] || IntegersQ[2*n, 2*p])

Rule 12

Int[(a_.)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_.)*(v_) /; FreeQ[b, x]]

Rule 95

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] /; FreeQ[{a, b, c, d, e, f, m, n, p}, x] && EqQ[Simplify[m + n + p + 3], 0] && EqQ[a*d*f*(m + 1) + b*c*f*(n + 1) + b*d*e*(p + 1), 0] && NeQ[m, -1]

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)}{x^5} dx &= -\frac{\cosh^{-1}(ax)}{4x^4} + \frac{1}{4}a \int \frac{1}{x^4\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{12x^3} - \frac{\cosh^{-1}(ax)}{4x^4} + \frac{1}{12}a \int \frac{2a^2}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{12x^3} - \frac{\cosh^{-1}(ax)}{4x^4} + \frac{1}{6}a^3 \int \frac{1}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{12x^3} + \frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{6x} - \frac{\cosh^{-1}(ax)}{4x^4}
\end{aligned}$$

Mathematica [A] time = 0.0229603, size = 45, normalized size = 0.68

$$\frac{ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2+1) - 3\cosh^{-1}(ax)}{12x^4}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]/x^5,x]

[Out] (a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(1 + 2*a^2*x^2) - 3*ArcCosh[a*x])/(12*x^4)

Maple [A] time = 0.012, size = 50, normalized size = 0.8

$$a^4 \left(-\frac{\operatorname{arccosh}(ax)}{4x^4a^4} + \frac{2a^2x^2+1}{12x^3a^3} \sqrt{ax-1}\sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)/x^5,x)

[Out] a^4*(-1/4*arccosh(a*x)/a^4/x^4+1/12*(a*x-1)^(1/2)*(a*x+1)^(1/2)*(2*a^2*x^2+1)/a^3/x^3)

Maxima [A] time = 1.77233, size = 65, normalized size = 0.98

$$\frac{1}{12} \left(\frac{2\sqrt{a^2x^2-1}a^2}{x} + \frac{\sqrt{a^2x^2-1}}{x^3} \right) a - \frac{\operatorname{arcosh}(ax)}{4x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^5,x, algorithm="maxima")

[Out] 1/12*(2*sqrt(a^2*x^2 - 1)*a^2/x + sqrt(a^2*x^2 - 1)/x^3)*a - 1/4*arccosh(a*x)/x^4

Fricas [A] time = 2.46552, size = 109, normalized size = 1.65

$$\frac{(2a^3x^3+ax)\sqrt{a^2x^2-1} - 3\log(ax+\sqrt{a^2x^2-1})}{12x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^5,x, algorithm="fricas")

[Out] 1/12*((2*a^3*x^3 + a*x)*sqrt(a^2*x^2 - 1) - 3*log(a*x + sqrt(a^2*x^2 - 1)))/x^4

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}(ax)}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)/x**5,x)

[Out] Integral(acosh(a*x)/x**5, x)

Giac [A] time = 1.34505, size = 104, normalized size = 1.58

$$\frac{\left(3\left(x|a| - \sqrt{a^2x^2 - 1}\right)^2 + 1\right)a^3|a| \log\left(ax + \sqrt{a^2x^2 - 1}\right)}{3\left(\left(x|a| - \sqrt{a^2x^2 - 1}\right)^2 + 1\right)^3} - \frac{\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{4x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^5,x, algorithm="giac")

[Out] 1/3*(3*(x*abs(a) - sqrt(a^2*x^2 - 1))^2 + 1)*a^3*abs(a)/((x*abs(a) - sqrt(a^2*x^2 - 1))^2 + 1)^3 - 1/4*log(a*x + sqrt(a^2*x^2 - 1))/x^4

3.11 $\int \frac{\cosh^{-1}(ax)}{x^6} dx$

Optimal. Leaf size=93

$$\frac{3a^3\sqrt{ax-1}\sqrt{ax+1}}{40x^2} + \frac{3}{40}a^5 \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{20x^4} - \frac{\cosh^{-1}(ax)}{5x^5}$$

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(20*x^4) + (3*a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(40*x^2) - ArcCosh[a*x]/(5*x^5) + (3*a^5*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]])/40

Rubi [A] time = 0.0407888, antiderivative size = 93, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5662, 103, 12, 92, 205}

$$\frac{3a^3\sqrt{ax-1}\sqrt{ax+1}}{40x^2} + \frac{3}{40}a^5 \tan^{-1}\left(\sqrt{ax-1}\sqrt{ax+1}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{20x^4} - \frac{\cosh^{-1}(ax)}{5x^5}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]/x^6,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(20*x^4) + (3*a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(40*x^2) - ArcCosh[a*x]/(5*x^5) + (3*a^5*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]])/40

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 103

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] + Dist[1/((m + 1)*(b*c - a*d)*(b*e - a*f)), Int[(a + b*x)^(m + 1)*(c + d*x)^n*(e + f*x)^p*Simp[a*d*f*(m + 1) - b*(d*e*(m + n + 2) + c*f*(m + p + 2)) - b*d*f*(m + n + p + 3)*x, x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && LtQ[m, -1] && IntegerQ[m] && (IntegerQ[n] || IntegersQ[2*n, 2*p])

Rule 12

Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 92

Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_.))), x_Symbol] :> Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x], x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[2*b*d*e - f*(b*c + a*d), 0]

Rule 205

$\text{Int}[(a_+ + (b_-)(x_-)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(\text{Rt}[a/b, 2] \cdot \text{ArcTan}[x/\text{Rt}[a/b, 2]])/a, x] /; \text{FreeQ}\{a, b, x\} \ \&\& \ \text{PosQ}[a/b]$

Rubi steps

$$\begin{aligned}
 \int \frac{\cosh^{-1}(ax)}{x^6} dx &= -\frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{5}a \int \frac{1}{x^5\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{20}a \int \frac{3a^2}{x^3\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{20}(3a^3) \int \frac{1}{x^3\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} + \frac{3a^3\sqrt{-1+ax}\sqrt{1+ax}}{40x^2} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{40}(3a^3) \int \frac{a^2}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} + \frac{3a^3\sqrt{-1+ax}\sqrt{1+ax}}{40x^2} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{40}(3a^5) \int \frac{1}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} + \frac{3a^3\sqrt{-1+ax}\sqrt{1+ax}}{40x^2} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{1}{40}(3a^6) \text{Subst}\left(\int \frac{1}{a+ax^2} dx, x, \sqrt{-1+ax}\sqrt{1+ax}\right) \\
 &= \frac{a\sqrt{-1+ax}\sqrt{1+ax}}{20x^4} + \frac{3a^3\sqrt{-1+ax}\sqrt{1+ax}}{40x^2} - \frac{\cosh^{-1}(ax)}{5x^5} + \frac{3}{40}a^5 \tan^{-1}\left(\sqrt{-1+ax}\sqrt{1+ax}\right)
 \end{aligned}$$

Mathematica [A] time = 0.0436838, size = 104, normalized size = 1.12

$$\frac{-3a^5x^5 + a^3x^3 - 3a^5x^5\sqrt{a^2x^2-1} \tan^{-1}\left(\sqrt{a^2x^2-1}\right) + 2ax + 8\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{40x^5\sqrt{ax-1}\sqrt{ax+1}}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]/x^6,x]

[Out] $-(2*a*x + a^3*x^3 - 3*a^5*x^5 + 8*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x] - 3*a^5*x^5*\text{Sqrt}[-1 + a^2*x^2]*\text{ArcTan}[\text{Sqrt}[-1 + a^2*x^2]])/(40*x^5*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])$

Maple [A] time = 0.016, size = 95, normalized size = 1.

$$-\frac{\text{arccosh}(ax)}{5x^5} - \frac{3a^5}{40}\sqrt{ax-1}\sqrt{ax+1} \arctan\left(\frac{1}{\sqrt{a^2x^2-1}}\right) \frac{1}{\sqrt{a^2x^2-1}} + \frac{3a^3}{40x^2}\sqrt{ax-1}\sqrt{ax+1} + \frac{a}{20x^4}\sqrt{ax-1}\sqrt{ax+1}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)/x^6,x)

[Out] $-1/5*\text{arccosh}(a*x)/x^5 - 3/40*a^5*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/(a^2*x^2-1)^{(1/2)}*\arctan(1/(a^2*x^2-1)^{(1/2)}) + 3/40*a^3*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/x^2 + 1/20*a*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/x^4$

Maxima [A] time = 1.76618, size = 88, normalized size = 0.95

$$-\frac{1}{40} \left(3a^4 \arcsin\left(\frac{1}{\sqrt{a^2|x|}}\right) - \frac{3\sqrt{a^2x^2-1}a^2}{x^2} - \frac{2\sqrt{a^2x^2-1}}{x^4} \right) a - \frac{\operatorname{arcosh}(ax)}{5x^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^6,x, algorithm="maxima")

[Out] -1/40*(3*a^4*arcsin(1/(sqrt(a^2)*abs(x)))) - 3*sqrt(a^2*x^2 - 1)*a^2/x^2 - 2*sqrt(a^2*x^2 - 1)/x^4)*a - 1/5*arccosh(a*x)/x^5

Fricas [A] time = 2.51877, size = 238, normalized size = 2.56

$$\frac{6a^5x^5 \arctan(-ax + \sqrt{a^2x^2-1}) + 8x^5 \log(-ax + \sqrt{a^2x^2-1}) + 8(x^5-1) \log(ax + \sqrt{a^2x^2-1}) + (3a^3x^3 + 2ax)\sqrt{a^2x^2-1}}{40x^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^6,x, algorithm="fricas")

[Out] 1/40*(6*a^5*x^5*arctan(-a*x + sqrt(a^2*x^2 - 1)) + 8*x^5*log(-a*x + sqrt(a^2*x^2 - 1)) + 8*(x^5 - 1)*log(a*x + sqrt(a^2*x^2 - 1)) + (3*a^3*x^3 + 2*a*x)*sqrt(a^2*x^2 - 1))/x^5

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}(ax)}{x^6} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)/x**6,x)

[Out] Integral(acosh(a*x)/x**6, x)

Giac [A] time = 1.3486, size = 103, normalized size = 1.11

$$\frac{1}{40} a^5 \left(\frac{3(a^2x^2-1)^{\frac{3}{2}} + 5\sqrt{a^2x^2-1}}{a^4x^4} + 3 \arctan(\sqrt{a^2x^2-1}) \right) - \frac{\log(ax + \sqrt{a^2x^2-1})}{5x^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)/x^6,x, algorithm="giac")

[Out] 1/40*a^5*((3*(a^2*x^2 - 1)^(3/2) + 5*sqrt(a^2*x^2 - 1))/(a^4*x^4) + 3*arctan(sqrt(a^2*x^2 - 1))) - 1/5*log(a*x + sqrt(a^2*x^2 - 1))/x^5

3.12 $\int x^4 \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=132

$$\frac{8x^3}{225a^2} - \frac{8x^2\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^3} + \frac{16x}{75a^4} - \frac{16\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^5} + \frac{1}{5}x^5\cosh^{-1}(ax)^2 - \frac{2x^4\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^5}$$

[Out] (16*x)/(75*a^4) + (8*x^3)/(225*a^2) + (2*x^5)/125 - (16*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(75*a^5) - (8*x^2*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(75*a^3) - (2*x^4*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(25*a) + (x^5*ArcCosh[a*x]^2)/5

Rubi [A] time = 0.489759, antiderivative size = 132, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5759, 5718, 8, 30}

$$\frac{8x^3}{225a^2} - \frac{8x^2\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^3} + \frac{16x}{75a^4} - \frac{16\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^5} + \frac{1}{5}x^5\cosh^{-1}(ax)^2 - \frac{2x^4\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{75a^5}$$

Antiderivative was successfully verified.

[In] Int[x^4*ArcCosh[a*x]^2,x]

[Out] (16*x)/(75*a^4) + (8*x^3)/(225*a^2) + (2*x^5)/125 - (16*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(75*a^5) - (8*x^2*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(75*a^3) - (2*x^4*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(25*a) + (x^5*ArcCosh[a*x]^2)/5

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(sqrt[-1 + c*x]*sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_.))^ (m_.))/(sqrt[(d1_.) + (e1_.)*(x_.)]*sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*sqrt[d1 + e1*x]*sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(sqrt[d1 + e1*x]*sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*sqrt[d1 + e1*x]*sqrt[d2 + e2*x])/(c*d1*d2*m*sqrt[1 + c*x]*sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_.)*((d1_.) + (e1_.)*(x_.))^ (p_.)*((d2_.) + (e2_.)*(x_.))^ (p_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b^n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ

[p, -1] && IntegerQ[p + 1/2]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 30

Int[(x_)^(m_), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int x^4 \cosh^{-1}(ax)^2 dx &= \frac{1}{5}x^5 \cosh^{-1}(ax)^2 - \frac{1}{5}(2a) \int \frac{x^5 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)^2 + \frac{2 \int x^4 dx}{25} - \frac{8 \int \frac{x^3 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{25a} \\ &= \frac{2x^5}{125} - \frac{8x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{75a^3} - \frac{2x^4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)^2 - \\ &= \frac{8x^3}{225a^2} + \frac{2x^5}{125} - \frac{16\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{75a^5} - \frac{8x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{75a^3} - \frac{2x^4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{25a} \\ &= \frac{16x}{75a^4} + \frac{8x^3}{225a^2} + \frac{2x^5}{125} - \frac{16\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{75a^5} - \frac{8x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{75a^3} - \frac{2x^4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{25a} \end{aligned}$$

Mathematica [A] time = 0.106839, size = 80, normalized size = 0.61

$$\frac{\frac{40x^3}{a^2} - \frac{30\sqrt{ax-1}\sqrt{ax+1}(3a^4x^4+4a^2x^2+8) \cosh^{-1}(ax)}{a^5} + \frac{240x}{a^4} + 225x^5 \cosh^{-1}(ax)^2 + 18x^5}{1125}$$

Antiderivative was successfully verified.

[In] Integrate[x^4*ArcCosh[a*x]^2,x]

[Out] ((240*x)/a^4 + (40*x^3)/a^2 + 18*x^5 - (30*sqrt[-1 + a*x]*sqrt[1 + a*x]*(8 + 4*a^2*x^2 + 3*a^4*x^4)*ArcCosh[a*x])/a^5 + 225*x^5*ArcCosh[a*x]^2)/1125

Maple [A] time = 0.04, size = 168, normalized size = 1.3

$$\frac{1}{a^5} \left(\frac{(\operatorname{arccosh}(ax))^2 a^3 x^3 (ax-1)(ax+1)}{5} + \frac{(\operatorname{arccosh}(ax))^2 (ax-1)(ax+1) ax}{5} + \frac{(\operatorname{arccosh}(ax))^2 ax}{5} - \frac{2 \operatorname{arccosh}(ax) a}{25} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^2,x)

[Out] 1/a^5*(1/5*arccosh(a*x)^2*a^3*x^3*(a*x-1)*(a*x+1)+1/5*arccosh(a*x)^2*(a*x-1)*(a*x+1)*a*x+1/5*arccosh(a*x)^2*a*x-2/25*arccosh(a*x)*a^4*x^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)-16/75*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)-8/75*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a^2*x^2+2/125*(a*x-1)*(a*x+1)*a^3*x^3+58/1125*(a*x-1)*(a*x+1)*a*x+298/1125*a*x)

Maxima [A] time = 1.28225, size = 134, normalized size = 1.02

$$\frac{1}{5} x^5 \operatorname{arcosh}(ax)^2 - \frac{2}{75} \left(\frac{3 \sqrt{a^2 x^2 - 1} x^4}{a^2} + \frac{4 \sqrt{a^2 x^2 - 1} x^2}{a^4} + \frac{8 \sqrt{a^2 x^2 - 1}}{a^6} \right) a \operatorname{arcosh}(ax) + \frac{2(9 a^4 x^5 + 20 a^2 x^3 + 120 x)}{1125 a^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^2,x, algorithm="maxima")

[Out] 1/5*x^5*arccosh(a*x)^2 - 2/75*(3*sqrt(a^2*x^2 - 1)*x^4/a^2 + 4*sqrt(a^2*x^2 - 1)*x^2/a^4 + 8*sqrt(a^2*x^2 - 1)/a^6)*a*arccosh(a*x) + 2/1125*(9*a^4*x^5 + 20*a^2*x^3 + 120*x)/a^4

Fricas [A] time = 2.53045, size = 234, normalized size = 1.77

$$\frac{225 a^5 x^5 \log\left(ax + \sqrt{a^2 x^2 - 1}\right)^2 + 18 a^5 x^5 + 40 a^3 x^3 - 30\left(3 a^4 x^4 + 4 a^2 x^2 + 8\right) \sqrt{a^2 x^2 - 1} \log\left(ax + \sqrt{a^2 x^2 - 1}\right) + 240 a x}{1125 a^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^2,x, algorithm="fricas")

[Out] 1/1125*(225*a^5*x^5*log(a*x + sqrt(a^2*x^2 - 1))^2 + 18*a^5*x^5 + 40*a^3*x^3 - 30*(3*a^4*x^4 + 4*a^2*x^2 + 8)*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1)) + 240*a*x)/a^5

Sympy [A] time = 4.91408, size = 122, normalized size = 0.92

$$\begin{cases} \frac{x^5 \operatorname{acosh}^2(ax)}{\pi^2 x^5} + \frac{2x^5}{125} - \frac{2x^4 \sqrt{a^2 x^2 - 1} \operatorname{acosh}(ax)}{25a} + \frac{8x^3}{225a^2} - \frac{8x^2 \sqrt{a^2 x^2 - 1} \operatorname{acosh}(ax)}{75a^3} + \frac{16x}{75a^4} - \frac{16 \sqrt{a^2 x^2 - 1} \operatorname{acosh}(ax)}{75a^5} & \text{for } a \neq 0 \\ -\frac{\pi^2 x^5}{20} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4*acosh(a*x)**2,x)

[Out] Piecewise((x**5*acosh(a*x)**2/5 + 2*x**5/125 - 2*x**4*sqrt(a**2*x**2 - 1)*acosh(a*x)/(25*a) + 8*x**3/(225*a**2) - 8*x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)/(75*a**3) + 16*x/(75*a**4) - 16*sqrt(a**2*x**2 - 1)*acosh(a*x)/(75*a**5), Ne(a, 0)), (-pi**2*x**5/20, True))

Giac [A] time = 1.33187, size = 153, normalized size = 1.16

$$\frac{1}{5} x^5 \log\left(ax + \sqrt{a^2 x^2 - 1}\right)^2 + \frac{2}{1125} a \left(\frac{9 a^4 x^5 + 20 a^2 x^3 + 120 x}{a^5} - \frac{15 \left(3 (a^2 x^2 - 1)^{\frac{5}{2}} + 10 (a^2 x^2 - 1)^{\frac{3}{2}} + 15 \sqrt{a^2 x^2 - 1} \right)}{a^6} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*arccosh(a*x)^2,x, algorithm="giac")
```

```
[Out] 1/5*x^5*log(a*x + sqrt(a^2*x^2 - 1))^2 + 2/1125*a*((9*a^4*x^5 + 20*a^2*x^3 + 120*x)/a^5 - 15*(3*(a^2*x^2 - 1)^(5/2) + 10*(a^2*x^2 - 1)^(3/2) + 15*sqrt(a^2*x^2 - 1))*log(a*x + sqrt(a^2*x^2 - 1))/a^6)
```

3.13 $\int x^3 \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=106

$$\frac{3x^2}{32a^2} - \frac{3x\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{16a^3} - \frac{3\cosh^{-1}(ax)^2}{32a^4} + \frac{1}{4}x^4\cosh^{-1}(ax)^2 - \frac{x^3\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{8a} + \frac{x^4}{32}$$

[Out] (3*x^2)/(32*a^2) + x^4/32 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(16*a^3) - (x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(8*a) - (3*ArcCosh[a*x]^2)/(32*a^4) + (x^4*ArcCosh[a*x]^2)/4

Rubi [A] time = 0.440192, antiderivative size = 106, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5662, 5759, 5676, 30}

$$\frac{3x^2}{32a^2} - \frac{3x\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{16a^3} - \frac{3\cosh^{-1}(ax)^2}{32a^4} + \frac{1}{4}x^4\cosh^{-1}(ax)^2 - \frac{x^3\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{8a} + \frac{x^4}{32}$$

Antiderivative was successfully verified.

[In] Int[x^3*ArcCosh[a*x]^2,x]

[Out] (3*x^2)/(32*a^2) + x^4/32 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(16*a^3) - (x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(8*a) - (3*ArcCosh[a*x]^2)/(32*a^4) + (x^4*ArcCosh[a*x]^2)/4

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int((((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int x^3 \cosh^{-1}(ax)^2 dx &= \frac{1}{4}x^4 \cosh^{-1}(ax)^2 - \frac{1}{2}a \int \frac{x^4 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{8a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^2 + \frac{\int x^3 dx}{8} - \frac{3 \int \frac{x^2 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{8a} \\ &= \frac{x^4}{32} - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{16a^3} - \frac{x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{8a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^2 - \frac{3}{32a^2} \\ &= \frac{3x^2}{32a^2} + \frac{x^4}{32} - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{16a^3} - \frac{x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{8a} - \frac{3 \cosh^{-1}(ax)}{32a^4} \end{aligned}$$

Mathematica [A] time = 0.0715097, size = 77, normalized size = 0.73

$$\frac{a^2 x^2 (a^2 x^2 + 3) - 2ax\sqrt{ax-1}\sqrt{ax+1} (2a^2 x^2 + 3) \cosh^{-1}(ax) + (8a^4 x^4 - 3) \cosh^{-1}(ax)^2}{32a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3*ArcCosh[a*x]^2,x]

[Out] (a^2*x^2*(3 + a^2*x^2) - 2*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(3 + 2*a^2*x^2) *ArcCosh[a*x] + (-3 + 8*a^4*x^4)*ArcCosh[a*x]^2)/(32*a^4)

Maple [A] time = 0.035, size = 126, normalized size = 1.2

$$\frac{1}{a^4} \left(\frac{(\operatorname{arccosh}(ax))^2 (ax-1)(ax+1) a^2 x^2}{4} + \frac{(\operatorname{arccosh}(ax))^2 a^2 x^2}{4} - \frac{a^3 x^3 \operatorname{arccosh}(ax)}{8} \sqrt{ax-1} \sqrt{ax+1} - \frac{3ax \operatorname{arccosh}(ax)}{16} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^2,x)

[Out] 1/a^4*(1/4*arccosh(a*x)^2*(a*x-1)*(a*x+1)*a^2*x^2+1/4*arccosh(a*x)^2*a^2*x^2-1/8*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a^3*x^3-3/16*arccosh(a*x)*a*x*(a*x-1)^(1/2)*(a*x+1)^(1/2)-3/32*arccosh(a*x)^2+1/32*(a*x-1)*(a*x+1)*a^2*x^2+1/8*a^2*x^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{4}x^4 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^2 - \int \frac{(a^3x^6 + \sqrt{ax+1}\sqrt{ax-1}a^2x^5 - ax^4) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)}{2(a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^2,x, algorithm="maxima")

[Out] $\frac{1}{4}x^4 \log(ax + \sqrt{ax + 1})\sqrt{ax - 1})^2 - \int \frac{1}{2}(a^3x^6 + \sqrt{ax + 1})\sqrt{ax - 1}a^2x^5 - ax^4) \log(ax + \sqrt{ax + 1})\sqrt{ax - 1}) / (a^3x^3 + (a^2x^2 - 1)\sqrt{ax + 1})\sqrt{ax - 1} - ax), x$

Fricas [A] time = 2.36711, size = 205, normalized size = 1.93

$$\frac{a^4x^4 + 3a^2x^2 + (8a^4x^4 - 3)\log(ax + \sqrt{a^2x^2 - 1})^2 - 2(2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1}\log(ax + \sqrt{a^2x^2 - 1})}{32a^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^2,x, algorithm="fricas")

[Out] $\frac{1}{32}(a^4x^4 + 3a^2x^2 + (8a^4x^4 - 3)\log(ax + \sqrt{a^2x^2 - 1})^2 - 2(2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1}\log(ax + \sqrt{a^2x^2 - 1}))/a^4$

Sympy [A] time = 2.87612, size = 99, normalized size = 0.93

$$\begin{cases} \frac{x^4 \operatorname{acosh}^2(ax)}{\pi^2 x^4} + \frac{x^4}{32} - \frac{x^3 \sqrt{a^2x^2 - 1} \operatorname{acosh}(ax)}{8a} + \frac{3x^2}{32a^2} - \frac{3x \sqrt{a^2x^2 - 1} \operatorname{acosh}(ax)}{16a^3} - \frac{3 \operatorname{acosh}^2(ax)}{32a^4} & \text{for } a \neq 0 \\ -\frac{\pi^2 x^4}{16} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x)**2,x)

[Out] Piecewise((x**4*acosh(a*x)**2/4 + x**4/32 - x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)/(8*a) + 3*x**2/(32*a**2) - 3*x*sqrt(a**2*x**2 - 1)*acosh(a*x)/(16*a**3) - 3*acosh(a*x)**2/(32*a**4), Ne(a, 0)), (-pi**2*x**4/16, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{arcosh}(ax)^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x^3*arccosh(a*x)^2, x)

3.14 $\int x^2 \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=90

$$\frac{4x}{9a^2} - \frac{4\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{9a^3} + \frac{1}{3}x^3 \cosh^{-1}(ax)^2 - \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{9a} + \frac{2x^3}{27}$$

[Out] (4*x)/(9*a^2) + (2*x^3)/27 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(9*a^3) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(9*a) + (x^3*ArcCosh[a*x]^2)/3

Rubi [A] time = 0.311197, antiderivative size = 90, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5759, 5718, 8, 30}

$$\frac{4x}{9a^2} - \frac{4\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{9a^3} + \frac{1}{3}x^3 \cosh^{-1}(ax)^2 - \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{9a} + \frac{2x^3}{27}$$

Antiderivative was successfully verified.

[In] Int[x^2*ArcCosh[a*x]^2,x]

[Out] (4*x)/(9*a^2) + (2*x^3)/27 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(9*a^3) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(9*a) + (x^3*ArcCosh[a*x]^2)/3

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((f_.)*(x_))^(m_))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p]))/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 30

Int[(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int x^2 \cosh^{-1}(ax)^2 dx &= \frac{1}{3}x^3 \cosh^{-1}(ax)^2 - \frac{1}{3}(2a) \int \frac{x^3 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^2 + \frac{2 \int x^2 dx}{9} - \frac{4 \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{9a} \\ &= \frac{2x^3}{27} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{9a^3} - \frac{2x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^2 \\ &= \frac{4x}{9a^2} + \frac{2x^3}{27} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{9a^3} - \frac{2x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^2 \end{aligned}$$

Mathematica [A] time = 0.0950779, size = 64, normalized size = 0.71

$$\frac{1}{27} \left(2x \left(\frac{6}{a^2} + x^2 \right) - \frac{6\sqrt{ax-1}\sqrt{ax+1} (a^2x^2 + 2) \cosh^{-1}(ax)}{a^3} + 9x^3 \cosh^{-1}(ax)^2 \right)$$

Antiderivative was successfully verified.

[In] Integrate[x^2*ArcCosh[a*x]^2,x]

[Out] (2*x*(6/a^2 + x^2) - (6*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(2 + a^2*x^2)*ArcCosh[a*x])/a^3 + 9*x^3*ArcCosh[a*x]^2)/27

Maple [A] time = 0.031, size = 100, normalized size = 1.1

$$\frac{1}{a^3} \left(\frac{(\operatorname{arccosh}(ax))^2 (ax-1)(ax+1)ax}{3} + \frac{(\operatorname{arccosh}(ax))^2 ax}{3} - \frac{2 \operatorname{arccosh}(ax) a^2 x^2 \sqrt{ax-1} \sqrt{ax+1}}{9} - \frac{4 \operatorname{arccosh}(ax)}{9} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^2,x)

[Out] 1/a^3*(1/3*arccosh(a*x)^2*(a*x-1)*(a*x+1)*a*x+1/3*arccosh(a*x)^2*a*x-2/9*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a^2*x^2-4/9*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+2/27*(a*x-1)*(a*x+1)*a*x+14/27*a*x)

Maxima [A] time = 1.1807, size = 95, normalized size = 1.06

$$\frac{1}{3} x^3 \operatorname{arccosh}(ax)^2 - \frac{2}{9} a \left(\frac{\sqrt{a^2 x^2 - 1} x^2}{a^2} + \frac{2 \sqrt{a^2 x^2 - 1}}{a^4} \right) \operatorname{arccosh}(ax) + \frac{2(a^2 x^3 + 6x)}{27 a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^2,x, algorithm="maxima")

[Out] $\frac{1}{3}x^3\operatorname{arccosh}(ax)^2 - \frac{2}{9}a(\sqrt{a^2x^2 - 1})x^2/a^2 + 2\sqrt{a^2x^2 - 1}/a^4\operatorname{arccosh}(ax) + \frac{2}{27}(a^2x^3 + 6x)/a^2$

Fricas [A] time = 2.25661, size = 188, normalized size = 2.09

$$\frac{9a^3x^3\log\left(ax + \sqrt{a^2x^2 - 1}\right)^2 + 2a^3x^3 - 6\left(a^2x^2 + 2\right)\sqrt{a^2x^2 - 1}\log\left(ax + \sqrt{a^2x^2 - 1}\right) + 12ax}{27a^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^2,x, algorithm="fricas")

[Out] $\frac{1}{27}(9a^3x^3\log(ax + \sqrt{a^2x^2 - 1})^2 + 2a^3x^3 - 6(a^2x^2 + 2)\sqrt{a^2x^2 - 1}\log(ax + \sqrt{a^2x^2 - 1}) + 12ax)/a^3$

Sympy [A] time = 1.2952, size = 85, normalized size = 0.94

$$\begin{cases} \frac{x^3\operatorname{acosh}^2(ax)}{\pi^2x^3} + \frac{2x^3}{27} - \frac{2x^2\sqrt{a^2x^2-1}\operatorname{acosh}(ax)}{9a} + \frac{4x}{9a^2} - \frac{4\sqrt{a^2x^2-1}\operatorname{acosh}(ax)}{9a^3} & \text{for } a \neq 0 \\ -\frac{\pi^2x^3}{12} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**2,x)

[Out] Piecewise((x**3*acosh(a*x)**2/3 + 2*x**3/27 - 2*x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)/(9*a) + 4*x/(9*a**2) - 4*sqrt(a**2*x**2 - 1)*acosh(a*x)/(9*a**3), Ne(a, 0)), (-pi**2*x**3/12, True))

Giac [A] time = 1.32305, size = 120, normalized size = 1.33

$$\frac{1}{3}x^3\log\left(ax + \sqrt{a^2x^2 - 1}\right)^2 + \frac{2}{27}a\left(\frac{a^2x^3 + 6x}{a^3} - \frac{3\left(\left(a^2x^2 - 1\right)^{\frac{3}{2}} + 3\sqrt{a^2x^2 - 1}\right)\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{a^4}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^2,x, algorithm="giac")

[Out] $\frac{1}{3}x^3\log(ax + \sqrt{a^2x^2 - 1})^2 + \frac{2}{27}a((a^2x^3 + 6x)/a^3 - 3((a^2x^2 - 1)^{(3/2)} + 3\sqrt{a^2x^2 - 1})\log(ax + \sqrt{a^2x^2 - 1})/a^4)$

3.15 $\int x \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=64

$$-\frac{\cosh^{-1}(ax)^2}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{2a} + \frac{x^2}{4}$$

[Out] $x^2/4 - (x\sqrt{-1 + ax}*\sqrt{1 + ax}*\text{ArcCosh}[a*x])/(2*a) - \text{ArcCosh}[a*x]^2/(4*a^2) + (x^2*\text{ArcCosh}[a*x]^2)/2$

Rubi [A] time = 0.250665, antiderivative size = 64, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5759, 5676, 30}

$$-\frac{\cosh^{-1}(ax)^2}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{2a} + \frac{x^2}{4}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x]^2,x]

[Out] $x^2/4 - (x\sqrt{-1 + ax}*\sqrt{1 + ax}*\text{ArcCosh}[a*x])/(2*a) - \text{ArcCosh}[a*x]^2/(4*a^2) + (x^2*\text{ArcCosh}[a*x]^2)/2$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int((((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((f_.)*(x_))^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

Int((((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int x \cosh^{-1}(ax)^2 dx &= \frac{1}{2}x^2 \cosh^{-1}(ax)^2 - a \int \frac{x^2 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{2a} + \frac{1}{2}x^2 \cosh^{-1}(ax)^2 + \frac{\int x dx}{2} - \frac{\int \frac{\cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{2a} \\ &= \frac{x^2}{4} - \frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{2a} - \frac{\cosh^{-1}(ax)^2}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^2 \end{aligned}$$

Mathematica [A] time = 0.0498287, size = 58, normalized size = 0.91

$$\frac{a^2x^2 + (2a^2x^2 - 1) \cosh^{-1}(ax)^2 - 2ax\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{4a^2}$$

Antiderivative was successfully verified.

[In] Integrate[x*ArcCosh[a*x]^2,x]

[Out] (a^2*x^2 - 2*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x] + (-1 + 2*a^2*x^2)*ArcCosh[a*x]^2)/(4*a^2)

Maple [A] time = 0.029, size = 58, normalized size = 0.9

$$\frac{1}{a^2} \left(\frac{(\operatorname{arccosh}(ax))^2 a^2 x^2}{2} - \frac{ax \operatorname{arccosh}(ax)}{2} \sqrt{ax-1} \sqrt{ax+1} - \frac{(\operatorname{arccosh}(ax))^2}{4} + \frac{a^2 x^2}{4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x)^2,x)

[Out] 1/a^2*(1/2*arccosh(a*x)^2*a^2*x^2-1/2*arccosh(a*x)*a*x*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/4*arccosh(a*x)^2+1/4*a^2*x^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{2}x^2 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^2 - \int \frac{(a^3x^4 + \sqrt{ax+1}\sqrt{ax-1}a^2x^3 - ax^2) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)}{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^2,x, algorithm="maxima")

[Out] 1/2*x^2*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 - integrate((a^3*x^4 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x^3 - a*x^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))/(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x), x)

Fricas [A] time = 2.19339, size = 166, normalized size = 2.59

$$\frac{a^2x^2 - 2\sqrt{a^2x^2 - 1}ax \log(ax + \sqrt{a^2x^2 - 1}) + (2a^2x^2 - 1) \log(ax + \sqrt{a^2x^2 - 1})^2}{4a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^2,x, algorithm="fricas")

[Out] 1/4*(a^2*x^2 - 2*sqrt(a^2*x^2 - 1)*a*x*log(a*x + sqrt(a^2*x^2 - 1)) + (2*a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^2)/a^2

Sympy [A] time = 0.639111, size = 60, normalized size = 0.94

$$\begin{cases} \frac{x^2 \operatorname{acosh}^2(ax)}{\pi^2 x^2} + \frac{x^2}{4} - \frac{x\sqrt{a^2x^2-1} \operatorname{acosh}(ax)}{2a} - \frac{\operatorname{acosh}^2(ax)}{4a^2} & \text{for } a \neq 0 \\ -\frac{\pi^2 x^2}{8} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**2,x)

[Out] Piecewise((x**2*acosh(a*x)**2/2 + x**2/4 - x*sqrt(a**2*x**2 - 1)*acosh(a*x)/(2*a) - acosh(a*x)**2/(4*a**2), Ne(a, 0)), (-pi**2*x**2/8, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{arcosh}(ax)^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x*arccosh(a*x)^2, x)

3.16 $\int \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=39

$$x \cosh^{-1}(ax)^2 - \frac{2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 2x$$

[Out] 2*x - (2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/a + x*ArcCosh[a*x]^2

Rubi [A] time = 0.127432, antiderivative size = 39, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5654, 5718, 8}

$$x \cosh^{-1}(ax)^2 - \frac{2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 2x$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^2,x]

[Out] 2*x - (2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/a + x*ArcCosh[a*x]^2

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.), x_Symbol] :> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)*((d1_.) + (e1_.)*(x_.))^ (p_.)*((d2_.) + (e2_.)*(x_.))^ (p_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 8

Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]

Rubi steps

$$\begin{aligned} \int \cosh^{-1}(ax)^2 dx &= x \cosh^{-1}(ax)^2 - (2a) \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx \\ &= -\frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{a} + x \cosh^{-1}(ax)^2 + 2 \int 1 dx \\ &= 2x - \frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{a} + x \cosh^{-1}(ax)^2 \end{aligned}$$

Mathematica [A] time = 0.0198588, size = 39, normalized size = 1.

$$x \cosh^{-1}(ax)^2 - \frac{2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 2x$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^2,x]

[Out] 2*x - (2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/a + x*ArcCosh[a*x]^2

Maple [A] time = 0.026, size = 39, normalized size = 1.

$$\frac{1}{a} \left((\operatorname{arccosh}(ax))^2 ax - 2 \operatorname{arccosh}(ax) \sqrt{ax-1} \sqrt{ax+1} + 2ax \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^2,x)

[Out] 1/a*(arccosh(a*x)^2*a*x-2*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+2*a*x)

Maxima [A] time = 1.13679, size = 43, normalized size = 1.1

$$x \operatorname{arcosh}(ax)^2 + 2x - \frac{2\sqrt{a^2x^2-1} \operatorname{arcosh}(ax)}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2,x, algorithm="maxima")

[Out] x*arccosh(a*x)^2 + 2*x - 2*sqrt(a^2*x^2 - 1)*arccosh(a*x)/a

Fricas [A] time = 2.32478, size = 134, normalized size = 3.44

$$\frac{ax \log\left(ax + \sqrt{a^2x^2-1}\right)^2 + 2ax - 2\sqrt{a^2x^2-1} \log\left(ax + \sqrt{a^2x^2-1}\right)}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2,x, algorithm="fricas")

[Out] (a*x*log(a*x + sqrt(a^2*x^2 - 1))^2 + 2*a*x - 2*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1)))/a

Sympy [A] time = 0.24437, size = 39, normalized size = 1.

$$\begin{cases} x \operatorname{acosh}^2(ax) + 2x - \frac{2\sqrt{a^2x^2-1} \operatorname{acosh}(ax)}{a} & \text{for } a \neq 0 \\ -\frac{\pi^2 x}{4} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2,x)

[Out] Piecewise((x*acosh(a*x)**2 + 2*x - 2*sqrt(a**2*x**2 - 1)*acosh(a*x)/a, Ne(a, 0)), (-pi**2*x/4, True))

Giac [A] time = 1.35347, size = 84, normalized size = 2.15

$$x \log \left(ax + \sqrt{a^2 x^2 - 1} \right)^2 + 2a \left(\frac{x}{a} - \frac{\sqrt{a^2 x^2 - 1} \log \left(ax + \sqrt{a^2 x^2 - 1} \right)}{a^2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2,x, algorithm="giac")

[Out] x*log(a*x + sqrt(a^2*x^2 - 1))^2 + 2*a*(x/a - sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))/a^2)

$$3.17 \quad \int \frac{\cosh^{-1}(ax)^2}{x} dx$$

Optimal. Leaf size=62

$$\cosh^{-1}(ax)\text{PolyLog}\left(2, -e^{2\cosh^{-1}(ax)}\right) - \frac{1}{2}\text{PolyLog}\left(3, -e^{2\cosh^{-1}(ax)}\right) - \frac{1}{3}\cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log\left(e^{2\cosh^{-1}(ax)}\right)$$

[Out] -ArcCosh[a*x]^3/3 + ArcCosh[a*x]^2*Log[1 + E^(2*ArcCosh[a*x])] + ArcCosh[a*x]*PolyLog[2, -E^(2*ArcCosh[a*x])] - PolyLog[3, -E^(2*ArcCosh[a*x])]/2

Rubi [A] time = 0.092509, antiderivative size = 62, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5660, 3718, 2190, 2531, 2282, 6589}

$$\cosh^{-1}(ax)\text{PolyLog}\left(2, -e^{2\cosh^{-1}(ax)}\right) - \frac{1}{2}\text{PolyLog}\left(3, -e^{2\cosh^{-1}(ax)}\right) - \frac{1}{3}\cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log\left(e^{2\cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^2/x, x]

[Out] -ArcCosh[a*x]^3/3 + ArcCosh[a*x]^2*Log[1 + E^(2*ArcCosh[a*x])] + ArcCosh[a*x]*PolyLog[2, -E^(2*ArcCosh[a*x])] - PolyLog[3, -E^(2*ArcCosh[a*x])]/2

Rule 5660

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_/(x_), x_Symbol] := Subst[Int[(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n, 0]

Rule 3718

Int[((c_.) + (d_.)*(x_.))^m_)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)], x_Symbol] := -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c + d*x)^m*E^(2*(-I*e) + f*fz*x))/(1 + E^(2*(-I*e) + f*fz*x)), x], x] /; FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]

Rule 2190

Int[(((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^n_)*((c_.) + (d_.)*(x_.))^m_)/((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^n_), x_Symbol] := Simp[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a]/(b*f*g*n*Log[F]), x] - Dist[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]

Rule 2531

Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_.))))^n_]*((f_.) + (g_.)*(x_.))^m_, x_Symbol] := -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x))))^n]/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m - 1)*PolyLog[2, -(e*(F^(c*(a + b*x))))^n], x], x] /; FreeQ[{F, a, b, c, e, f, g, n}, x] && GtQ[m, 0]

Rule 2282

Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x], Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; Functi

```

onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)^v_ /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]

```

Rule 6589

```

Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]

```

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)^2}{x} dx &= \text{Subst} \left(\int x^2 \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{3} \cosh^{-1}(ax)^3 + 2 \text{Subst} \left(\int \frac{e^{2x} x^2}{1 + e^{2x}} dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{3} \cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) - 2 \text{Subst} \left(\int x \log(1 + e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{3} \cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \cosh^{-1}(ax) \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \text{Subst} \left(\int \text{Li}_2(-e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{3} \cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \cosh^{-1}(ax) \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \frac{1}{2} \text{Subst} \left(\int \text{Li}_2(-e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\
&= -\frac{1}{3} \cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \cosh^{-1}(ax) \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \frac{1}{2} \text{Li}_3 \left(-e^{2 \cosh^{-1}(ax)} \right)
\end{aligned}$$

Mathematica [A] time = 0.0280018, size = 63, normalized size = 1.02

$$-\cosh^{-1}(ax) \text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) - \frac{1}{2} \text{PolyLog} \left(3, -e^{-2 \cosh^{-1}(ax)} \right) + \frac{1}{3} \cosh^{-1}(ax)^3 + \cosh^{-1}(ax)^2 \log \left(e^{-2 \cosh^{-1}(ax)} \right)$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[ArcCosh[a*x]^2/x, x]
```

```
[Out] ArcCosh[a*x]^3/3 + ArcCosh[a*x]^2*Log[1 + E^(-2*ArcCosh[a*x])] - ArcCosh[a*x]*PolyLog[2, -E^(-2*ArcCosh[a*x])] - PolyLog[3, -E^(-2*ArcCosh[a*x])]/2
```

Maple [A] time = 0.029, size = 98, normalized size = 1.6

$$-\frac{(\text{arccosh}(ax))^3}{3} + (\text{arccosh}(ax))^2 \ln \left(1 + \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right) + \text{arccosh}(ax) \text{polylog} \left(2, - \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(arccosh(a*x)^2/x, x)
```

```
[Out] -1/3*arccosh(a*x)^3+arccosh(a*x)^2*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)+arccosh(a*x)*polylog(2,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)-1/2*polylog(3,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)
```


Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^2}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^2/x, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^2}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^2/x, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^2(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2/x,x)

[Out] Integral(acosh(a*x)**2/x, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^2}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^2/x, x)

3.18 $\int \frac{\cosh^{-1}(ax)^2}{x^2} dx$

Optimal. Leaf size=60

$$-2ia \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 2ia \operatorname{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) - \frac{\cosh^{-1}(ax)^2}{x} + 4a \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right)$$

[Out] $-(\operatorname{ArcCosh}[a*x]^2/x) + 4*a*\operatorname{ArcCosh}[a*x]*\operatorname{ArcTan}[E^{\operatorname{ArcCosh}[a*x]}] - (2*I)*a*\operatorname{PolyLog}[2, (-I)*E^{\operatorname{ArcCosh}[a*x]}] + (2*I)*a*\operatorname{PolyLog}[2, I*E^{\operatorname{ArcCosh}[a*x]}]$

Rubi [A] time = 0.208523, antiderivative size = 60, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5761, 4180, 2279, 2391}

$$-2ia \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 2ia \operatorname{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) - \frac{\cosh^{-1}(ax)^2}{x} + 4a \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[\operatorname{ArcCosh}[a*x]^2/x^2, x]$

[Out] $-(\operatorname{ArcCosh}[a*x]^2/x) + 4*a*\operatorname{ArcCosh}[a*x]*\operatorname{ArcTan}[E^{\operatorname{ArcCosh}[a*x]}] - (2*I)*a*\operatorname{PolyLog}[2, (-I)*E^{\operatorname{ArcCosh}[a*x]}] + (2*I)*a*\operatorname{PolyLog}[2, I*E^{\operatorname{ArcCosh}[a*x]}]$

Rule 5662

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[c_.*(x_)]*(b_.)]^{(n_.)}*((d_.)*(x_))^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(d*x)^{(m+1)}*(a + b*\operatorname{ArcCosh}[c*x])^n / (d*(m+1)), x] - \operatorname{Dist}[(b*c*n) / (d*(m+1)), \operatorname{Int}[(d*x)^{(m+1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n-1)} / (\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /; \operatorname{FreeQ}\{a, b, c, d, m\}, x] \&\& \operatorname{IGtQ}[n, 0] \&\& \operatorname{NeQ}[m, -1]$

Rule 5761

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[c_.*(x_)]*(b_.)]^{(n_.)}*(x_)^{(m_.)} / (\operatorname{Sqrt}[d1_.] + (e1_.)*(x_)]*\operatorname{Sqrt}[d2_.] + (e2_.)*(x_)], x_Symbol] \rightarrow \operatorname{Dist}[1/(c^{(m+1)}*\operatorname{Sqrt}[-(d1*d2)]), \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m, x], x, \operatorname{ArcCosh}[c*x]], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2\}, x] \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{IGtQ}[n, 0] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0] \&\& \operatorname{IntegerQ}[m]$

Rule 4180

$\operatorname{Int}[\operatorname{csc}[(e_.) + \operatorname{Pi}*(k_.) + (\operatorname{Complex}[0, fz_])*(f_.)*(x_)]*((c_.) + (d_.)*(x_))]^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(-2*(c + d*x)^m*\operatorname{ArcTanh}[E^{-(I*e) + f*fz*x}/E^{(I*k*Pi)}]) / (f*fz*I), x] + (-\operatorname{Dist}[(d*m) / (f*fz*I), \operatorname{Int}[(c + d*x)^{(m-1)}*\operatorname{Log}[1 - E^{-(I*e) + f*fz*x}/E^{(I*k*Pi)}], x], x] + \operatorname{Dist}[(d*m) / (f*fz*I), \operatorname{Int}[(c + d*x)^{(m-1)}*\operatorname{Log}[1 + E^{-(I*e) + f*fz*x}/E^{(I*k*Pi)}], x], x]) /; \operatorname{FreeQ}\{c, d, e, f, fz\}, x] \&\& \operatorname{IntegerQ}[2*k] \&\& \operatorname{IGtQ}[m, 0]$

Rule 2279

$\operatorname{Int}[\operatorname{Log}[(a_.) + (b_.)*((F_.)^{((e_.)*((c_.) + (d_.)*(x_)))})]^{(n_.)}], x_Symbol] \rightarrow \operatorname{Dist}[1/(d*e*n*\operatorname{Log}[F]), \operatorname{Subst}[\operatorname{Int}[\operatorname{Log}[a + b*x]/x, x], x, (F^{(e*(c + d*x))})^n], x] /; \operatorname{FreeQ}\{F, a, b, c, d, e, n\}, x] \&\& \operatorname{GtQ}[a, 0]$

Rule 2391

Int[Log[(c_.)*(d_) + (e_.)*(x_)^(n_.)]/(x_), x_Symbol] := -Simp[PolyLog[2, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^2}{x^2} dx &= -\frac{\cosh^{-1}(ax)^2}{x} + (2a) \int \frac{\cosh^{-1}(ax)}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{\cosh^{-1}(ax)^2}{x} + (2a) \text{Subst}\left(\int x \operatorname{sech}(x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^2}{x} + 4a \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - (2ia) \text{Subst}\left(\int \log(1-ie^x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^2}{x} + 4a \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - (2ia) \text{Subst}\left(\int \frac{\log(1-ix)}{x} dx, x, e^{\cosh^{-1}(ax)}\right) \\ &= -\frac{\cosh^{-1}(ax)^2}{x} + 4a \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 2ia \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 2ia \operatorname{Li}_2\left(ie^{\cosh^{-1}(ax)}\right) \end{aligned}$$

Mathematica [A] time = 0.250518, size = 92, normalized size = 1.53

$$-ia \left(2 \operatorname{PolyLog}\left(2, -ie^{-\cosh^{-1}(ax)}\right) - 2 \operatorname{PolyLog}\left(2, ie^{-\cosh^{-1}(ax)}\right) + \cosh^{-1}(ax) \left(-\frac{i \cosh^{-1}(ax)}{ax} + 2 \log\left(1 - ie^{-\cosh^{-1}(ax)}\right) \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^2/x^2,x]

[Out] (-I)*a*(ArcCosh[a*x]*(((-I)*ArcCosh[a*x])/(a*x) + 2*Log[1 - I/E^ArcCosh[a*x]] - 2*Log[1 + I/E^ArcCosh[a*x]]) + 2*PolyLog[2, (-I)/E^ArcCosh[a*x]] - 2*PolyLog[2, I/E^ArcCosh[a*x]])

Maple [A] time = 0.061, size = 137, normalized size = 2.3

$$-\frac{(\operatorname{arccosh}(ax))^2}{x} - 2ia \operatorname{arccosh}(ax) \ln\left(1 + i\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)\right) + 2ia \operatorname{arccosh}(ax) \ln\left(1 - i\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^2/x^2,x)

[Out] -arccosh(a*x)^2/x - 2*I*a*arccosh(a*x)*ln(1+I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))) + 2*I*a*arccosh(a*x)*ln(1-I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))) - 2*I*a*dilog(1+I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))) + 2*I*a*dilog(1-I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^2}{x} + \int \frac{2\left(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a\right) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)}{a^3x^4 - ax^2 + (a^2x^3 - x)\sqrt{ax+1}\sqrt{ax-1}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^2,x, algorithm="maxima")

[Out] $-\log(ax + \sqrt{ax + 1})\sqrt{ax - 1})^2/x + \int (2(a^3x^2 + \sqrt{ax + 1})\sqrt{ax - 1}a^2x - a)\log(ax + \sqrt{ax + 1})\sqrt{ax - 1})/(a^3x^4 - ax^2 + (a^2x^3 - x)\sqrt{ax + 1})\sqrt{ax - 1}) dx$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arccosh}(ax)^2}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^2,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^2/x^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^2(ax)}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2/x**2,x)

[Out] Integral(acosh(a*x)**2/x**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arccosh}(ax)^2}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^2,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^2/x^2, x)

$$3.19 \quad \int \frac{\cosh^{-1}(ax)^2}{x^3} dx$$

Optimal. Leaf size=48

$$a^2(-\log(x)) - \frac{\cosh^{-1}(ax)^2}{2x^2} + \frac{a\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{x}$$

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/x - ArcCosh[a*x]^2/(2*x^2) - a^2*Log[x]

Rubi [A] time = 0.192071, antiderivative size = 48, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5662, 5724, 29}

$$a^2(-\log(x)) - \frac{\cosh^{-1}(ax)^2}{2x^2} + \frac{a\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{x}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^2/x^3,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/x - ArcCosh[a*x]^2/(2*x^2) - a^2*Log[x]

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5724

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_.))^ (m_.)*((d1_.) + (e1_.)*(x_.))^ (p_.)*((d2_.) + (e2_.)*(x_.))^ (q_.), x_Symbol] :> Simp[((f*x)^(m + 1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && EqQ[m + 2*p + 3, 0] && NeQ[m, -1] && IntegerQ[p + 1/2]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^2}{x^3} dx &= -\frac{\cosh^{-1}(ax)^2}{2x^2} + a \int \frac{\cosh^{-1}(ax)}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{x} - \frac{\cosh^{-1}(ax)^2}{2x^2} - a^2 \int \frac{1}{x} dx \\ &= \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{x} - \frac{\cosh^{-1}(ax)^2}{2x^2} - a^2 \log(x) \end{aligned}$$

Mathematica [A] time = 0.0191179, size = 48, normalized size = 1.

$$a^2(-\log(x)) - \frac{\cosh^{-1}(ax)^2}{2x^2} + \frac{a\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{x}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^2/x^3,x]

[Out] (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/x - ArcCosh[a*x]^2/(2*x^2) - a^2*Log[x]

Maple [A] time = 0.063, size = 73, normalized size = 1.5

$$a^2 \operatorname{arccosh}(ax) + \frac{a \operatorname{arccosh}(ax)}{x} \sqrt{ax-1} \sqrt{ax+1} - \frac{(\operatorname{arccosh}(ax))^2}{2x^2} - a^2 \ln\left(1 + \left(ax + \sqrt{ax-1} \sqrt{ax+1}\right)^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^2/x^3,x)

[Out] a^2*arccosh(a*x)+a*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x-1/2*arccosh(a*x)^2/x^2-a^2*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)

Maxima [A] time = 1.73286, size = 53, normalized size = 1.1

$$-a^2 \log(x) + \frac{\sqrt{a^2x^2-1} a \operatorname{arccosh}(ax)}{x} - \frac{\operatorname{arccosh}(ax)^2}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^3,x, algorithm="maxima")

[Out] -a^2*log(x) + sqrt(a^2*x^2 - 1)*a*arccosh(a*x)/x - 1/2*arccosh(a*x)^2/x^2

Fricas [A] time = 2.51547, size = 158, normalized size = 3.29

$$-\frac{2a^2x^2 \log(x) - 2\sqrt{a^2x^2-1}ax \log(ax + \sqrt{a^2x^2-1}) + \log(ax + \sqrt{a^2x^2-1})^2}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^3,x, algorithm="fricas")

[Out] $-1/2*(2*a^2*x^2*\log(x) - 2*\sqrt{a^2*x^2 - 1}*a*x*\log(a*x + \sqrt{a^2*x^2 - 1})) + \log(a*x + \sqrt{a^2*x^2 - 1})^2/x^2$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^2(ax)}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2/x**3,x)

[Out] Integral(acosh(a*x)**2/x**3, x)

Giac [B] time = 1.42507, size = 149, normalized size = 3.1

$$\left(a \left(\frac{\log\left(|-x|a| + \sqrt{a^2x^2 - 1}\right)}{|a|} - \frac{|a|\log(|x|)}{a^2} \right) |a| + \frac{2|a|\log\left(ax + \sqrt{a^2x^2 - 1}\right)}{\left(x|a| - \sqrt{a^2x^2 - 1}\right)^2 + 1} \right) a - \frac{\log\left(ax + \sqrt{a^2x^2 - 1}\right)^2}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^3,x, algorithm="giac")

[Out] $(a*(\log(\operatorname{abs}(-x*\operatorname{abs}(a) + \sqrt{a^2*x^2 - 1}))/\operatorname{abs}(a) - \operatorname{abs}(a)*\log(\operatorname{abs}(x))/a^2)*\operatorname{abs}(a) + 2*\operatorname{abs}(a)*\log(a*x + \sqrt{a^2*x^2 - 1})/((x*\operatorname{abs}(a) - \sqrt{a^2*x^2 - 1})^2 + 1))*a - 1/2*\log(a*x + \sqrt{a^2*x^2 - 1})^2/x^2$

3.20 $\int \frac{\cosh^{-1}(ax)^2}{x^4} dx$

Optimal. Leaf size=114

$$-\frac{1}{3}ia^3\text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + \frac{1}{3}ia^3\text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + \frac{a^2}{3x} + \frac{2}{3}a^3 \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{3}$$

[Out] a^2/(3*x) + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(3*x^2) - ArcCosh[a*x]^2/(3*x^3) + (2*a^3*ArcCosh[a*x]*ArcTan[E^ArcCosh[a*x]])/3 - (I/3)*a^3*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (I/3)*a^3*PolyLog[2, I*E^ArcCosh[a*x]]

Rubi [A] time = 0.392414, antiderivative size = 114, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5748, 5761, 4180, 2279, 2391, 30}

$$-\frac{1}{3}ia^3\text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + \frac{1}{3}ia^3\text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + \frac{a^2}{3x} + \frac{2}{3}a^3 \cosh^{-1}(ax) \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) + \frac{a\sqrt{ax-1}\sqrt{ax+1}}{3}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^2/x^4, x]

[Out] a^2/(3*x) + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(3*x^2) - ArcCosh[a*x]^2/(3*x^3) + (2*a^3*ArcCosh[a*x]*ArcTan[E^ArcCosh[a*x]])/3 - (I/3)*a^3*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (I/3)*a^3*PolyLog[2, I*E^ArcCosh[a*x]]

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5748

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + (Dist[(c^2*(m + 2*p + 3))/(f^2*(m + 1)), Int[(f*x)^(m + 2)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n, x], x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && LtQ[m, -1] && IntegerQ[m] && IntegerQ[p + 1/2]

Rule 5761

Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Dist[1/(c^(m + 1)*Sqrt[-(d1*d2)]), Subst[Int[(a + b*x)^n*Cosh[x]^m, x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c, d1, e1, d2, e2}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IGtQ[n, 0] && GtQ[d1, 0] && LtQ[d2, 0] && IntegerQ[m]

Rule 4180


```
Int[csc[(e_.) + Pi*(k_.) + (Complex[0, fz_])*(f_.)*(x_)]*((c_.) + (d_.)*(x_
))^m_], x_Symbol] := Simp[(-2*(c + d*x)^m*ArcTanh[E^(-(I*e) + f*fz*x)/E^(
I*k*Pi)])/(f*fz*I), x] + (-Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1
- E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x] + Dist[(d*m)/(f*fz*I), Int[(c +
d*x)^(m - 1)*Log[1 + E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x]) /; FreeQ[{c,
d, e, f, fz}, x] && IntegerQ[2*k] && IGtQ[m, 0]
```

Rule 2279

```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:= Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x))
)^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]
```

Rule 2391

```
Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] := -Simp[PolyLog[2
, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]
```

Rule 30

```
Int[(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && N
eQ[m, -1]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^2}{x^4} dx &= -\frac{\cosh^{-1}(ax)^2}{3x^3} + \frac{1}{3}(2a) \int \frac{\cosh^{-1}(ax)}{x^3\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x^2} - \frac{\cosh^{-1}(ax)^2}{3x^3} - \frac{1}{3}a^2 \int \frac{1}{x^2} dx + \frac{1}{3}a^3 \int \frac{\cosh^{-1}(ax)}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a^2}{3x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x^2} - \frac{\cosh^{-1}(ax)^2}{3x^3} + \frac{1}{3}a^3 \text{Subst} \left(\int x \text{sech}(x) dx, x, \cosh^{-1}(ax) \right) \\ &= \frac{a^2}{3x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x^2} - \frac{\cosh^{-1}(ax)^2}{3x^3} + \frac{2}{3}a^3 \cosh^{-1}(ax) \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right) - \frac{1}{3} (i a^3) \\ &= \frac{a^2}{3x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x^2} - \frac{\cosh^{-1}(ax)^2}{3x^3} + \frac{2}{3}a^3 \cosh^{-1}(ax) \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right) - \frac{1}{3} (i a^3) \\ &= \frac{a^2}{3x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x^2} - \frac{\cosh^{-1}(ax)^2}{3x^3} + \frac{2}{3}a^3 \cosh^{-1}(ax) \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right) - \frac{1}{3} i a^3 \end{aligned}$$

Mathematica [A] time = 0.242953, size = 144, normalized size = 1.26

$$\frac{1}{3}a^3 \left(-i \text{PolyLog} \left(2, -ie^{-\cosh^{-1}(ax)} \right) + i \text{PolyLog} \left(2, ie^{-\cosh^{-1}(ax)} \right) - \frac{\cosh^{-1}(ax)^2}{a^3x^3} + \frac{\sqrt{\frac{ax-1}{ax+1}}(ax+1) \cosh^{-1}(ax)}{a^2x^2} + \frac{1}{ax} \right)$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[ArcCosh[a*x]^2/x^4,x]
```

```
[Out] (a^3*(1/(a*x) + (Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*ArcCosh[a*x])/(a^2*x^
2) - ArcCosh[a*x]^2/(a^3*x^3) - I*ArcCosh[a*x]*Log[1 - I/E^ArcCosh[a*x]] +
I*ArcCosh[a*x]*Log[1 + I/E^ArcCosh[a*x]] - I*PolyLog[2, (-I)/E^ArcCosh[a*x]
] + I*PolyLog[2, I/E^ArcCosh[a*x]]))/3
```

Maple [A] time = 0.106, size = 177, normalized size = 1.6

$$\frac{a \operatorname{arccosh}(ax) \sqrt{ax-1} \sqrt{ax+1}}{3x^2} + \frac{a^2}{3x} - \frac{(\operatorname{arccosh}(ax))^2}{3x^3} - \frac{i}{3} a^3 \operatorname{arccosh}(ax) \ln\left(1 + i\left(ax + \sqrt{ax-1} \sqrt{ax+1}\right)\right) + \frac{i}{3} a^3 \operatorname{arccosh}(ax) \ln\left(1 - i\left(ax + \sqrt{ax-1} \sqrt{ax+1}\right)\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^2/x^4,x)

[Out] 1/3*a*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x^2+1/3*a^2/x-1/3*arccosh(a*x)^2/x^3-1/3*I*a^3*arccosh(a*x)*ln(1+I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2)))+1/3*I*a^3*arccosh(a*x)*ln(1-I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2)))-1/3*I*a^3*dilog(1+I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2)))+1/3*I*a^3*dilog(1-I*(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^2}{3x^3} + \int \frac{2(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a) \log(ax + \sqrt{ax+1}\sqrt{ax-1})}{3(a^3x^6 - ax^4 + (a^2x^5 - x^3)\sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^4,x, algorithm="maxima")

[Out] -1/3*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2/x^3 + integrate(2/3*(a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))/(a^3*x^6 - a*x^4 + (a^2*x^5 - x^3)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^2}{x^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^4,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^2/x^4, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^2(ax)}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2/x**4,x)

[Out] Integral(acosh(a*x)**2/x**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arccosh}(ax)^2}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^4,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^2/x^4, x)

3.21 $\int \frac{\cosh^{-1}(ax)^2}{x^5} dx$

Optimal. Leaf size=95

$$\frac{a^2}{12x^2} - \frac{1}{3}a^4 \log(x) + \frac{a^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{3x} + \frac{a \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{6x^3} - \frac{\cosh^{-1}(ax)^2}{4x^4}$$

[Out] a^2/(12*x^2) + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(6*x^3) + (a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(3*x) - ArcCosh[a*x]^2/(4*x^4) - (a^4*Log[x])/3

Rubi [A] time = 0.364883, antiderivative size = 95, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5748, 5724, 29, 30}

$$\frac{a^2}{12x^2} - \frac{1}{3}a^4 \log(x) + \frac{a^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{3x} + \frac{a \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{6x^3} - \frac{\cosh^{-1}(ax)^2}{4x^4}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^2/x^5, x]

[Out] a^2/(12*x^2) + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(6*x^3) + (a^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(3*x) - ArcCosh[a*x]^2/(4*x^4) - (a^4*Log[x])/3

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5748

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1))*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + (Dist[(c^2*(m + 2*p + 3))/(f^2*(m + 1)), Int[(f*x)^(m + 2)*(d1 + e1*x)^p*(d2 + e2*x)^q*(a + b*ArcCosh[c*x])^n, x], x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && LtQ[m, -1] && IntegerQ[m] && IntegerQ[p + 1/2]

Rule 5724

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1))*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m, p}, x] && EqQ[e1 - c*

d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && EqQ[m + 2*p + 3, 0] && NeQ[m, -1] && IntegerQ[p + 1/2]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^2}{x^5} dx &= -\frac{\cosh^{-1}(ax)^2}{4x^4} + \frac{1}{2}a \int \frac{\cosh^{-1}(ax)}{x^4\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{6x^3} - \frac{\cosh^{-1}(ax)^2}{4x^4} - \frac{1}{6}a^2 \int \frac{1}{x^3} dx + \frac{1}{3}a^3 \int \frac{\cosh^{-1}(ax)}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{a^2}{12x^2} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{6x^3} + \frac{a^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x} - \frac{\cosh^{-1}(ax)^2}{4x^4} - \frac{1}{3}a^4 \\ &= \frac{a^2}{12x^2} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{6x^3} + \frac{a^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{3x} - \frac{\cosh^{-1}(ax)^2}{4x^4} - \frac{1}{3}a^4 \end{aligned}$$

Mathematica [A] time = 0.0776289, size = 69, normalized size = 0.73

$$\frac{a^2x^2 - 4a^4x^4 \log(x) + 2ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2 + 1) \cosh^{-1}(ax) - 3 \cosh^{-1}(ax)^2}{12x^4}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^2/x^5,x]

[Out] (a^2*x^2 + 2*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(1 + 2*a^2*x^2)*ArcCosh[a*x] - 3*ArcCosh[a*x]^2 - 4*a^4*x^4*Log[x])/(12*x^4)

Maple [A] time = 0.107, size = 109, normalized size = 1.2

$$\frac{a^4 \operatorname{arccosh}(ax)}{3} + \frac{a^3 \operatorname{arccosh}(ax)}{3x} \sqrt{ax-1} \sqrt{ax+1} + \frac{a \operatorname{arccosh}(ax)}{6x^3} \sqrt{ax-1} \sqrt{ax+1} + \frac{a^2}{12x^2} - \frac{(\operatorname{arccosh}(ax))^2}{4x^4} - \frac{a^4}{3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^2/x^5,x)

[Out] 1/3*a^4*arccosh(a*x)+1/3*a^3*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x+1/6*a*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x^3+1/12*a^2/x^2-1/4*arccosh(a*x)^2/x^4-1/3*a^4*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)

Maxima [A] time = 1.55523, size = 97, normalized size = 1.02

$$-\frac{1}{12} \left(4a^2 \log(x) - \frac{1}{x^2} \right) a^2 + \frac{1}{6} \left(\frac{2\sqrt{a^2x^2-1}a^2}{x} + \frac{\sqrt{a^2x^2-1}}{x^3} \right) a \operatorname{arccosh}(ax) - \frac{\operatorname{arccosh}(ax)^2}{4x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^5,x, algorithm="maxima")

[Out] $-1/12*(4*a^2*\log(x) - 1/x^2)*a^2 + 1/6*(2*\sqrt{a^2*x^2 - 1})*a^2/x + \sqrt{a^2*x^2 - 1}/x^3*a*\operatorname{arccosh}(a*x) - 1/4*\operatorname{arccosh}(a*x)^2/x^4$

Fricas [A] time = 2.54507, size = 194, normalized size = 2.04

$$\frac{4a^4x^4\log(x) - a^2x^2 - 2(2a^3x^3 + ax)\sqrt{a^2x^2 - 1}\log(ax + \sqrt{a^2x^2 - 1}) + 3\log(ax + \sqrt{a^2x^2 - 1})^2}{12x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^5,x, algorithm="fricas")

[Out] $-1/12*(4*a^4*x^4*\log(x) - a^2*x^2 - 2*(2*a^3*x^3 + a*x)*\sqrt{a^2*x^2 - 1}*\log(a*x + \sqrt{a^2*x^2 - 1}) + 3*\log(a*x + \sqrt{a^2*x^2 - 1})^2)/x^4$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^2(ax)}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**2/x**5,x)

[Out] Integral(acosh(a*x)**2/x**5, x)

Giac [A] time = 1.62617, size = 198, normalized size = 2.08

$$-\frac{1}{12} \left(2a^3 \log(x^2) - 4a^3 \log\left(\left| -x|a| + \sqrt{a^2x^2 - 1} \right| \right) - \frac{8 \left(3 \left(x|a| - \sqrt{a^2x^2 - 1} \right)^2 + 1 \right) a^2 |a| \log(ax + \sqrt{a^2x^2 - 1})}{\left(\left(x|a| - \sqrt{a^2x^2 - 1} \right)^2 + 1 \right)^3} - \frac{2a^3x^2 + a}{x^2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^2/x^5,x, algorithm="giac")

[Out] $-1/12*(2*a^3*\log(x^2) - 4*a^3*\log(\operatorname{abs}(-x*\operatorname{abs}(a) + \sqrt{a^2*x^2 - 1}))) - 8*(3*(x*\operatorname{abs}(a) - \sqrt{a^2*x^2 - 1})^2 + 1)*a^2*\operatorname{abs}(a)*\log(a*x + \sqrt{a^2*x^2 - 1})/((x*\operatorname{abs}(a) - \sqrt{a^2*x^2 - 1})^2 + 1)^3 - (2*a^3*x^2 + a)/x^2*a - 1/4*\log(a*x + \sqrt{a^2*x^2 - 1})^2/x^4$

3.22 $\int x^4 \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=231

$$\frac{272x^2\sqrt{ax-1}\sqrt{ax+1}}{5625a^3} + \frac{8x^3 \cosh^{-1}(ax)}{75a^2} - \frac{4x^2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{25a^3} - \frac{4144\sqrt{ax-1}\sqrt{ax+1}}{5625a^5} + \frac{16x \cosh^{-1}(ax)}{25a^4}$$

[Out] $(-4144*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(5625*a^5) - (272*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(5625*a^3) - (6*x^4*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(625*a) + (16*x*\text{ArcCosh}[a*x])/(25*a^4) + (8*x^3*\text{ArcCosh}[a*x])/(75*a^2) + (6*x^5*\text{ArcCosh}[a*x])/125 - (8*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a^5) - (4*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a^3) - (3*x^4*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a) + (x^5*\text{ArcCosh}[a*x]^3)/5$

Rubi [A] time = 0.771434, antiderivative size = 231, normalized size of antiderivative = 1., number of steps used = 16, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5759, 5718, 5654, 74, 100, 12}

$$\frac{272x^2\sqrt{ax-1}\sqrt{ax+1}}{5625a^3} + \frac{8x^3 \cosh^{-1}(ax)}{75a^2} - \frac{4x^2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{25a^3} - \frac{4144\sqrt{ax-1}\sqrt{ax+1}}{5625a^5} + \frac{16x \cosh^{-1}(ax)}{25a^4}$$

Antiderivative was successfully verified.

[In] Int[x^4*ArcCosh[a*x]^3,x]

[Out] $(-4144*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(5625*a^5) - (272*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(5625*a^3) - (6*x^4*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(625*a) + (16*x*\text{ArcCosh}[a*x])/(25*a^4) + (8*x^3*\text{ArcCosh}[a*x])/(75*a^2) + (6*x^5*\text{ArcCosh}[a*x])/125 - (8*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a^5) - (4*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a^3) - (3*x^4*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(25*a) + (x^5*\text{ArcCosh}[a*x]^3)/5$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int((((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_.))^ (m_.))/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_.)*((d1_.) + (e1_.)*(x_.))^ (p_.)*((d2_.) + (e2_.)*(x_.))^ (p_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*

$(-(d1*d2))^{\text{IntPart}[p]}*(d1 + e1*x)^{\text{FracPart}[p]}*(d2 + e2*x)^{\text{FracPart}[p]})/(2*c*(p + 1)*(1 + c*x)^{\text{FracPart}[p]}*(-1 + c*x)^{\text{FracPart}[p]})$, $\text{Int}[(-1 + c^2*x^2)^{(p + 1/2)}*(a + b*\text{ArcCosh}[c*x])^{(n - 1)}, x], x] /;$ $\text{FreeQ}[\{a, b, c, d1, e1, d2, e2, p\}, x] \ \&\& \ \text{EqQ}[e1 - c*d1, 0] \ \&\& \ \text{EqQ}[e2 + c*d2, 0] \ \&\& \ \text{GtQ}[n, 0] \ \&\& \ \text{NeQ}[p, -1] \ \&\& \ \text{IntegerQ}[p + 1/2]$

Rule 5654

$\text{Int}[(a + \text{ArcCosh}[c*x])*(b + \text{ArcCosh}[c*x])^{(n)}, x_Symbol] \rightarrow \text{Simp}[x*(a + b*\text{ArcCosh}[c*x])^{(n)}, x] - \text{Dist}[b*c*n, \text{Int}[(x*(a + b*\text{ArcCosh}[c*x])^{(n - 1)})/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /;$ $\text{FreeQ}[\{a, b, c\}, x] \ \&\& \ \text{GtQ}[n, 0]$

Rule 74

$\text{Int}[(a + b*x)*(c + d*x)^{(n)}*(e + f*x)^{(p)}, x_Symbol] \rightarrow \text{Simp}[(b*(c + d*x)^{(n + 1)}*(e + f*x)^{(p + 1)})/(d*f*(n + p + 2)), x] /;$ $\text{FreeQ}[\{a, b, c, d, e, f, n, p\}, x] \ \&\& \ \text{NeQ}[n + p + 2, 0] \ \&\& \ \text{EqQ}[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]$

Rule 100

$\text{Int}[(a + b*x)^{(m)}*(c + d*x)^{(n)}*(e + f*x)^{(p)}, x_Symbol] \rightarrow \text{Simp}[(b*(a + b*x)^{(m - 1)}*(c + d*x)^{(n + 1)}*(e + f*x)^{(p + 1)})/(d*f*(m + n + p + 1)), x] + \text{Dist}[1/(d*f*(m + n + p + 1)), \text{Int}[(a + b*x)^{(m - 2)}*(c + d*x)^n*(e + f*x)^p*\text{Simp}[a^2*d*f*(m + n + p + 1) - b*(b*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*(d*e*(m + n) + c*f*(m + p)))*x, x], x] /;$ $\text{FreeQ}[\{a, b, c, d, e, f, n, p\}, x] \ \&\& \ \text{GtQ}[m, 1] \ \&\& \ \text{NeQ}[m + n + p + 1, 0] \ \&\& \ \text{IntegerQ}[m]$

Rule 12

$\text{Int}[(a + b*x)*\text{Int}[u, x], x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /;$ $\text{FreeQ}[a, x] \ \&\& \ \text{!MatchQ}[u, (b + v)*x] /;$ $\text{FreeQ}[b, x]$

Rubi steps

$$\begin{aligned} \int x^4 \cosh^{-1}(ax)^3 dx &= \frac{1}{5}x^5 \cosh^{-1}(ax)^3 - \frac{1}{5}(3a) \int \frac{x^5 \cosh^{-1}(ax)^2}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx \\ &= -\frac{3x^4\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax)^3 + \frac{6}{25} \int x^4 \cosh^{-1}(ax) dx - \frac{12 \int \frac{x^3 \cosh^{-1}(ax)}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx}{25a} \\ &= \frac{6}{125}x^5 \cosh^{-1}(ax) - \frac{4x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{25a^3} - \frac{3x^4\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{25a} + \frac{1}{5}x^5 \cosh^{-1}(ax) \\ &= -\frac{6x^4\sqrt{-1 + ax}\sqrt{1 + ax}}{625a} + \frac{8x^3 \cosh^{-1}(ax)}{75a^2} + \frac{6}{125}x^5 \cosh^{-1}(ax) - \frac{8\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{25a^5} \\ &= -\frac{8x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{225a^3} - \frac{6x^4\sqrt{-1 + ax}\sqrt{1 + ax}}{625a} + \frac{16x \cosh^{-1}(ax)}{25a^4} + \frac{8x^3 \cosh^{-1}(ax)}{75a^2} + \frac{6}{125}x^5 \cosh^{-1}(ax) \\ &= -\frac{16\sqrt{-1 + ax}\sqrt{1 + ax}}{25a^5} - \frac{272x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{5625a^3} - \frac{6x^4\sqrt{-1 + ax}\sqrt{1 + ax}}{625a} + \frac{16x \cosh^{-1}(ax)}{25a^4} + \frac{8}{125}x^5 \cosh^{-1}(ax) \\ &= -\frac{32\sqrt{-1 + ax}\sqrt{1 + ax}}{45a^5} - \frac{272x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{5625a^3} - \frac{6x^4\sqrt{-1 + ax}\sqrt{1 + ax}}{625a} + \frac{16x \cosh^{-1}(ax)}{25a^4} + \frac{8}{125}x^5 \cosh^{-1}(ax) \\ &= -\frac{4144\sqrt{-1 + ax}\sqrt{1 + ax}}{5625a^5} - \frac{272x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{5625a^3} - \frac{6x^4\sqrt{-1 + ax}\sqrt{1 + ax}}{625a} + \frac{16x \cosh^{-1}(ax)}{25a^4} + \frac{8}{125}x^5 \cosh^{-1}(ax) \end{aligned}$$

Mathematica [A] time = 0.116565, size = 130, normalized size = 0.56

$$\frac{-2\sqrt{ax-1}\sqrt{ax+1}(27a^4x^4+136a^2x^2+2072)+1125a^5x^5\cosh^{-1}(ax)^3+30ax(9a^4x^4+20a^2x^2+120)\cosh^{-1}(ax)-5625a^5}{5625a^5}$$

Antiderivative was successfully verified.

[In] Integrate[x^4*ArcCosh[a*x]^3,x]

[Out] (-2*Sqrt[-1+a*x]*Sqrt[1+a*x]*(2072+136*a^2*x^2+27*a^4*x^4)+30*a*x*(120+20*a^2*x^2+9*a^4*x^4)*ArcCosh[a*x]-225*Sqrt[-1+a*x]*Sqrt[1+a*x]*(8+4*a^2*x^2+3*a^4*x^4)*ArcCosh[a*x]^2+1125*a^5*x^5*ArcCosh[a*x]^3)/(5625*a^5)

Maple [A] time = 0.048, size = 246, normalized size = 1.1

$$\frac{1}{a^5} \left(\frac{(\operatorname{arccosh}(ax))^3 a^3 x^3 (ax-1)(ax+1)}{5} + \frac{(\operatorname{arccosh}(ax))^3 (ax-1)(ax+1) ax}{5} + \frac{(\operatorname{arccosh}(ax))^3 ax}{5} - \frac{3 a^4 (\operatorname{arccosh}(ax))^3}{25} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^3,x)

[Out] 1/a^5*(1/5*arccosh(a*x)^3*a^3*x^3*(a*x-1)*(a*x+1)+1/5*arccosh(a*x)^3*(a*x-1)*(a*x+1)*a*x+1/5*arccosh(a*x)^3*a*x-3/25*arccosh(a*x)^2*a^4*x^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)-8/25*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)-4/25*arccosh(a*x)^2*a^2*x^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)+6/125*arccosh(a*x)*(a*x-1)*(a*x+1)*a^3*x^3+58/375*arccosh(a*x)*(a*x-1)*(a*x+1)*a*x+298/375*a*x*arccosh(a*x)-6/625*a^4*x^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)-4144/5625*(a*x-1)^(1/2)*(a*x+1)^(1/2)-272/5625*a^2*x^2*(a*x-1)^(1/2)*(a*x+1)^(1/2))

Maxima [A] time = 1.19804, size = 223, normalized size = 0.97

$$\frac{1}{5} x^5 \operatorname{arccosh}(ax)^3 - \frac{1}{25} \left(\frac{3\sqrt{a^2x^2-1}x^4}{a^2} + \frac{4\sqrt{a^2x^2-1}x^2}{a^4} + \frac{8\sqrt{a^2x^2-1}}{a^6} \right) a \operatorname{arccosh}(ax)^2 - \frac{2}{5625} a \left(\frac{27\sqrt{a^2x^2-1}a^2x^4 + \dots}{5625} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^3,x, algorithm="maxima")

[Out] 1/5*x^5*arccosh(a*x)^3 - 1/25*(3*sqrt(a^2*x^2-1)*x^4/a^2 + 4*sqrt(a^2*x^2-1)*x^2/a^4 + 8*sqrt(a^2*x^2-1)/a^6)*a*arccosh(a*x)^2 - 2/5625*a*((27*sqrt(a^2*x^2-1)*a^2*x^4 + 136*sqrt(a^2*x^2-1)*x^2 + 2072*sqrt(a^2*x^2-1)/a^2)/a^4 - 15*(9*a^4*x^5 + 20*a^2*x^3 + 120*x)*arccosh(a*x)/a^5)

Fricas [A] time = 2.41865, size = 359, normalized size = 1.55

$$\frac{1125 a^5 x^5 \log(ax + \sqrt{a^2 x^2 - 1})^3 - 225 (3 a^4 x^4 + 4 a^2 x^2 + 8) \sqrt{a^2 x^2 - 1} \log(ax + \sqrt{a^2 x^2 - 1})^2 + 30 (9 a^5 x^5 + 20 a^3 x^3 + \dots)}{5625 a^5}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^3,x, algorithm="fricas")

[Out] 1/5625*(1125*a^5*x^5*log(a*x + sqrt(a^2*x^2 - 1))^3 - 225*(3*a^4*x^4 + 4*a^2*x^2 + 8)*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^2 + 30*(9*a^5*x^5 + 20*a^3*x^3 + 120*a*x)*log(a*x + sqrt(a^2*x^2 - 1)) - 2*(27*a^4*x^4 + 136*a^2*x^2 + 2072)*sqrt(a^2*x^2 - 1))/a^5

Sympy [A] time = 8.78706, size = 206, normalized size = 0.89

$$\left\{ \begin{array}{l} \frac{x^5 \operatorname{acosh}^3(ax)}{40} + \frac{6x^5 \operatorname{acosh}(ax)}{125} - \frac{3x^4 \sqrt{a^2x^2-1} \operatorname{acosh}^2(ax)}{25a} - \frac{6x^4 \sqrt{a^2x^2-1}}{625a} + \frac{8x^3 \operatorname{acosh}(ax)}{75a^2} - \frac{4x^2 \sqrt{a^2x^2-1} \operatorname{acosh}^2(ax)}{25a^3} - \frac{272x^2 \sqrt{a^2x^2-1}}{5625a^3} + \frac{16x \operatorname{acosh}(ax)}{25a^4} - \frac{8 \sqrt{a^2x^2-1} \operatorname{acosh}(ax)}{25a^5} - \frac{4144 \sqrt{a^2x^2-1}}{5625a^5} \end{array} \right.$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4*acosh(a*x)**3,x)

[Out] Piecewise((x**5*acosh(a*x)**3/5 + 6*x**5*acosh(a*x)/125 - 3*x**4*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(25*a) - 6*x**4*sqrt(a**2*x**2 - 1)/(625*a) + 8*x**3*acosh(a*x)/(75*a**2) - 4*x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(25*a**3) - 272*x**2*sqrt(a**2*x**2 - 1)/(5625*a**3) + 16*x*acosh(a*x)/(25*a**4) - 8*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(25*a**5) - 4144*sqrt(a**2*x**2 - 1)/(5625*a**5), Ne(a, 0)), (-I*pi**3*x**5/40, True))

Giac [A] time = 1.60727, size = 243, normalized size = 1.05

$$\frac{1}{5} x^5 \log(ax + \sqrt{a^2x^2 - 1})^3 - \frac{1}{5625} a \left(\frac{225 \left(3(a^2x^2 - 1)^{\frac{5}{2}} + 10(a^2x^2 - 1)^{\frac{3}{2}} + 15\sqrt{a^2x^2 - 1} \right) \log(ax + \sqrt{a^2x^2 - 1})^2}{a^6} - 2 \left(15 \sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})^2 + 10(a^2x^2 - 1)^{\frac{3}{2}} \log(ax + \sqrt{a^2x^2 - 1}) + 3(a^2x^2 - 1)^{\frac{5}{2}} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^3,x, algorithm="giac")

[Out] 1/5*x^5*log(a*x + sqrt(a^2*x^2 - 1))^3 - 1/5625*a*(225*(3*(a^2*x^2 - 1)^(5/2) + 10*(a^2*x^2 - 1)^(3/2) + 15*sqrt(a^2*x^2 - 1))*log(a*x + sqrt(a^2*x^2 - 1))^2/a^6 - 2*(15*(9*a^4*x^5 + 20*a^2*x^3 + 120*x)*log(a*x + sqrt(a^2*x^2 - 1)) - (27*(a^2*x^2 - 1)^(5/2) + 190*(a^2*x^2 - 1)^(3/2) + 2235*sqrt(a^2*x^2 - 1))/a)/a^5)

3.23 $\int x^3 \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=183

$$\frac{9x^2 \cosh^{-1}(ax)}{32a^2} - \frac{45x\sqrt{ax-1}\sqrt{ax+1}}{256a^3} - \frac{9x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{32a^3} - \frac{3 \cosh^{-1}(ax)^3}{32a^4} - \frac{45 \cosh^{-1}(ax)}{256a^4} - \frac{3x^3\sqrt{ax-1}\sqrt{ax+1}}{32a^3}$$

```
[Out] (-45*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(256*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(128*a) - (45*ArcCosh[a*x])/(256*a^4) + (9*x^2*ArcCosh[a*x])/(32*a^2) + (3*x^4*ArcCosh[a*x])/32 - (9*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(32*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(16*a) - (3*ArcCosh[a*x]^3)/(32*a^4) + (x^4*ArcCosh[a*x]^3)/4
```

Rubi [A] time = 0.666215, antiderivative size = 183, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5759, 5676, 90, 52, 100, 12}

$$\frac{9x^2 \cosh^{-1}(ax)}{32a^2} - \frac{45x\sqrt{ax-1}\sqrt{ax+1}}{256a^3} - \frac{9x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{32a^3} - \frac{3 \cosh^{-1}(ax)^3}{32a^4} - \frac{45 \cosh^{-1}(ax)}{256a^4} - \frac{3x^3\sqrt{ax-1}\sqrt{ax+1}}{32a^3}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*ArcCosh[a*x]^3,x]
```

```
[Out] (-45*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(256*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(128*a) - (45*ArcCosh[a*x])/(256*a^4) + (9*x^2*ArcCosh[a*x])/(32*a^2) + (3*x^4*ArcCosh[a*x])/32 - (9*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(32*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(16*a) - (3*ArcCosh[a*x]^3)/(32*a^4) + (x^4*ArcCosh[a*x]^3)/4
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*((f_.)*(x_))^(m_.))/(Sqrt[(d1_ + (e1_.)*(x_)]*Sqrt[(d2_ + (e2_.)*(x_))], x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)/(Sqrt[(d1_ + (e1_.)*(x_)]*Sqrt[(d2_ + (e2_.)*(x_))], x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
```

]

Rule 90

```
Int[((a_.) + (b_.)*(x_))^(2*((c_.) + (d_.)*(x_))^(n_.))*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] := Simp[(b*(a + b*x)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 3)), x] + Dist[1/(d*f*(n + p + 3)), Int[(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(n + p + 3) - b*(b*c*e + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(n + p + 4) - b*(d*e*(n + 2) + c*f*(p + 2)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 3, 0]
```

Rule 52

```
Int[1/(Sqrt[(a_) + (b_.)*(x_)]*Sqrt[(c_) + (d_.)*(x_)]), x_Symbol] := Simp[ArcCosh[(b*x)/a]/b, x] /; FreeQ[{a, b, c, d}, x] && EqQ[a + c, 0] && EqQ[b - d, 0] && GtQ[a, 0]
```

Rule 100

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] := Simp[(b*(a + b*x)^(m - 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(m + n + p + 1)), x] + Dist[1/(d*f*(m + n + p + 1)), Int[(a + b*x)^(m - 2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m + n + p + 1) - b*(b*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*(d*e*(m + n) + c*f*(m + p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rubi steps

$$\begin{aligned}
\int x^3 \cosh^{-1}(ax)^3 dx &= \frac{1}{4}x^4 \cosh^{-1}(ax)^3 - \frac{1}{4}(3a) \int \frac{x^4 \cosh^{-1}(ax)^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{16a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^3 + \frac{3}{8} \int x^3 \cosh^{-1}(ax) dx - \frac{9 \int \frac{x^2 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}}}{16a} \\
&= \frac{3}{32}x^4 \cosh^{-1}(ax) - \frac{9x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{32a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{16a} + \frac{1}{4}x^4 \\
&= -\frac{3x^3\sqrt{-1+ax}\sqrt{1+ax}}{128a} + \frac{9x^2 \cosh^{-1}(ax)}{32a^2} + \frac{3}{32}x^4 \cosh^{-1}(ax) - \frac{9x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{32a^3} \\
&= -\frac{9x\sqrt{-1+ax}\sqrt{1+ax}}{64a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax}}{128a} + \frac{9x^2 \cosh^{-1}(ax)}{32a^2} + \frac{3}{32}x^4 \cosh^{-1}(ax) - \frac{9x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{32a^3} \\
&= -\frac{45x\sqrt{-1+ax}\sqrt{1+ax}}{256a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax}}{128a} - \frac{9 \cosh^{-1}(ax)}{64a^4} + \frac{9x^2 \cosh^{-1}(ax)}{32a^2} + \frac{3}{32}x^4 \cosh^{-1}(ax) \\
&= -\frac{45x\sqrt{-1+ax}\sqrt{1+ax}}{256a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax}}{128a} - \frac{45 \cosh^{-1}(ax)}{256a^4} + \frac{9x^2 \cosh^{-1}(ax)}{32a^2} + \frac{3}{32}x^4 \cosh^{-1}(ax)
\end{aligned}$$

Mathematica [A] time = 0.131483, size = 143, normalized size = 0.78

$$\frac{-3ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2+15)+8(8a^4x^4-3)\cosh^{-1}(ax)^3-24ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2+3)\cosh^{-1}(ax)^2+24a^2x}{256a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3*ArcCosh[a*x]^3,x]

[Out] $(-3*a*x*\sqrt{-1+a*x}*\sqrt{1+a*x}*(15+2*a^2*x^2)+24*a^2*x^2*(3+a^2*x^2)*\text{ArcCosh}[a*x]-24*a*x*\sqrt{-1+a*x}*\sqrt{1+a*x}*(3+2*a^2*x^2)*\text{ArcCosh}[a*x]^2+8*(-3+8*a^4*x^4)*\text{ArcCosh}[a*x]^3-45*\text{Log}[a*x+\sqrt{-1+a*x}]*\sqrt{1+a*x}]/(256*a^4)$

Maple [A] time = 0.042, size = 184, normalized size = 1.

$$\frac{1}{a^4} \left(\frac{(\operatorname{arccosh}(ax))^3 (ax-1)(ax+1)a^2x^2}{4} + \frac{(\operatorname{arccosh}(ax))^3 a^2x^2}{4} - \frac{3(\operatorname{arccosh}(ax))^2 a^3x^3}{16} \sqrt{ax-1}\sqrt{ax+1} - \frac{9(\operatorname{arccosh}(ax))^3}{16} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^3,x)

[Out] $1/a^4*(1/4*\operatorname{arccosh}(a*x)^3*(a*x-1)*(a*x+1)*a^2*x^2+1/4*\operatorname{arccosh}(a*x)^3*a^2*x^2-3/16*\operatorname{arccosh}(a*x)^2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}*a^3*x^3-9/32*\operatorname{arccosh}(a*x)^2*a*x*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}-3/32*\operatorname{arccosh}(a*x)^3+3/32*\operatorname{arccosh}(a*x)*(a*x-1)*(a*x+1)*a^2*x^2-3/128*a^3*x^3*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}-45/256*(a*x+1)^{(1/2)}*(a*x-1)^{(1/2)}*a*x-45/256*\operatorname{arccosh}(a*x)+3/8*a^2*x^2*\operatorname{arccosh}(a*x))$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{4}x^4 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^3 - \int \frac{3\left(a^3x^6 + \sqrt{ax+1}\sqrt{ax-1}a^2x^5 - ax^4\right) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^2}{4\left(a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax\right)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^3,x, algorithm="maxima")

[Out] $1/4*x^4*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})^3 - \text{integrate}(3/4*(a^3*x^6 + \sqrt{a*x + 1}*\sqrt{a*x - 1}*a^2*x^5 - a*x^4)*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})^2/(a^3*x^3 + (a^2*x^2 - 1)*\sqrt{a*x + 1}*\sqrt{a*x - 1} - a*x), x)$

Fricas [A] time = 2.52813, size = 327, normalized size = 1.79

$$\frac{8(8a^4x^4 - 3)\log\left(ax + \sqrt{a^2x^2 - 1}\right)^3 - 24(2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1}\log\left(ax + \sqrt{a^2x^2 - 1}\right)^2 + 3(8a^4x^4 + 24a^2x^2 - 15)}{256a^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^3,x, algorithm="fricas")

[Out] $1/256*(8*(8*a^4*x^4 - 3)*\log(a*x + \sqrt{a^2*x^2 - 1})^3 - 24*(2*a^3*x^3 + 3*a*x)*\sqrt{a^2*x^2 - 1}*\log(a*x + \sqrt{a^2*x^2 - 1})^2 + 3*(8*a^4*x^4 + 24*a^2*x^2 - 15)*\log(a*x + \sqrt{a^2*x^2 - 1}) - 3*(2*a^3*x^3 + 15*a*x)*\sqrt{a^2*x^2 - 1})/256$

$$2x^2 - 1)/a^4$$

Sympy [A] time = 5.03371, size = 170, normalized size = 0.93

$$\left\{ \begin{array}{l} \frac{x^4 \operatorname{acosh}^3(ax)}{32} + \frac{3x^4 \operatorname{acosh}(ax)}{32} - \frac{3x^3 \sqrt{a^2 x^2 - 1} \operatorname{acosh}^2(ax)}{16a} - \frac{3x^3 \sqrt{a^2 x^2 - 1}}{128a} + \frac{9x^2 \operatorname{acosh}(ax)}{32a^2} - \frac{9x \sqrt{a^2 x^2 - 1} \operatorname{acosh}^2(ax)}{32a^3} - \frac{45x \sqrt{a^2 x^2 - 1}}{256a^3} - \frac{3 \operatorname{acosh}^3(ax)}{32a^4} \\ - \frac{i\pi^3 x^4}{32} \end{array} \right.$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x)**3,x)

[Out] Piecewise((x**4*acosh(a*x)**3/4 + 3*x**4*acosh(a*x)/32 - 3*x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(16*a) - 3*x**3*sqrt(a**2*x**2 - 1)/(128*a) + 9*x**2*acosh(a*x)/(32*a**2) - 9*x*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(32*a**3) - 45*x*sqrt(a**2*x**2 - 1)/(256*a**3) - 3*acosh(a*x)**3/(32*a**4) - 45*acosh(a*x)/(256*a**4), Ne(a, 0)), (-I*pi**3*x**4/32, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{arcosh}(ax)^3 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^3,x, algorithm="giac")

[Out] integrate(x^3*arccosh(a*x)^3, x)

3.24 $\int x^2 \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=155

$$-\frac{40\sqrt{ax-1}\sqrt{ax+1}}{27a^3} + \frac{4x \cosh^{-1}(ax)}{3a^2} - \frac{2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{3a^3} - \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}}{27a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^3 + \frac{2}{9}$$

[Out] $(-40*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(27*a^3) - (2*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(27*a) + (4*x*\text{ArcCosh}[a*x])/(3*a^2) + (2*x^3*\text{ArcCosh}[a*x])/9 - (2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(3*a^3) - (x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(3*a) + (x^3*\text{ArcCosh}[a*x]^3)/3$

Rubi [A] time = 0.4742, antiderivative size = 155, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5759, 5718, 5654, 74, 100, 12}

$$-\frac{40\sqrt{ax-1}\sqrt{ax+1}}{27a^3} + \frac{4x \cosh^{-1}(ax)}{3a^2} - \frac{2\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{3a^3} - \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}}{27a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^3 + \frac{2}{9}$$

Antiderivative was successfully verified.

[In] $\text{Int}[x^2*\text{ArcCosh}[a*x]^3, x]$

[Out] $(-40*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(27*a^3) - (2*x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(27*a) + (4*x*\text{ArcCosh}[a*x])/(3*a^2) + (2*x^3*\text{ArcCosh}[a*x])/9 - (2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(3*a^3) - (x^2*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(3*a) + (x^3*\text{ArcCosh}[a*x]^3)/3$

Rule 5662

$\text{Int}(((a_.) + \text{ArcCosh}[(c_.)*(x_)]*(b_))^n*((d_.)*(x_))^m, x_Symbol]$
 $:= \text{Simp}(((d*x)^(m+1)*(a + b*\text{ArcCosh}[c*x])^n)/(d*(m+1)), x) - \text{Dist}[(b*c^n)/(d*(m+1)), \text{Int}(((d*x)^(m+1)*(a + b*\text{ArcCosh}[c*x])^(n-1))/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x), x] /;$ FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

$\text{Int}(((a_.) + \text{ArcCosh}[(c_.)*(x_)]*(b_))^n*((f_.)*(x_))^m)/(\text{Sqrt}[(d1_.) + (e1_.)*(x_)]*\text{Sqrt}[(d2_.) + (e2_.)*(x_)]), x_Symbol]$ $:= \text{Simp}[(f*(f*x)^(m-1)*\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x]*(a + b*\text{ArcCosh}[c*x])^n)/(e1*e2*m), x] + (\text{Dist}[(f^2*(m-1))/(c^2*m), \text{Int}(((f*x)^(m-2)*(a + b*\text{ArcCosh}[c*x])^n)/(\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x]), x), x] + \text{Dist}[(b*f^n*\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x])/(c*d1*d2*m*\text{Sqrt}[1 + c*x]*\text{Sqrt}[-1 + c*x]), \text{Int}[(f*x)^(m-1)*(a + b*\text{ArcCosh}[c*x])^(n-1), x], x]) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

$\text{Int}(((a_.) + \text{ArcCosh}[(c_.)*(x_)]*(b_))^n*(x_)*((d1_.) + (e1_.)*(x_))^p*((d2_.) + (e2_.)*(x_))^q, x_Symbol]$ $:= \text{Simp}(((d1 + e1*x)^(p+1)*(d2 + e2*x)^(q+1)*(a + b*\text{ArcCosh}[c*x])^n)/(2*e1*e2*(p+1)), x) - \text{Dist}[(b^n*(-(d1*d2))^\text{IntPart}[p]*(d1 + e1*x)^\text{FracPart}[p]*(d2 + e2*x)^\text{FracPart}[p])/(2*c*(p+1)*(1 + c*x)^\text{FracPart}[p]*(-1 + c*x)^\text{FracPart}[p]), \text{Int}((-1 + c^2*x^2)^(p+1/2)*(a + b*\text{ArcCosh}[c*x])^(n-1), x), x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ

[p, -1] && IntegerQ[p + 1/2]

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n, x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 74

Int[((a_.) + (b_.)*(x_.))*((c_.) + (d_.)*(x_.))^n*((e_.) + (f_.)*(x_.))^p, x_Symbol] := Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]

Rule 100

Int[((a_.) + (b_.)*(x_.))^m*((c_.) + (d_.)*(x_.))^n*((e_.) + (f_.)*(x_.))^p, x_Symbol] := Simp[(b*(a + b*x)^(m - 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(m + n + p + 1)), x] + Dist[1/(d*f*(m + n + p + 1)), Int[(a + b*x)^(m - 2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m + n + p + 1) - b*(b*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*(d*e*(m + n) + c*f*(m + p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]

Rubi steps

$$\begin{aligned}
 \int x^2 \cosh^{-1}(ax)^3 dx &= \frac{1}{3}x^3 \cosh^{-1}(ax)^3 - a \int \frac{x^3 \cosh^{-1}(ax)^2}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx \\
 &= -\frac{x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^3 + \frac{2}{3} \int x^2 \cosh^{-1}(ax) dx - \frac{2 \int \frac{x \cosh^{-1}(ax)^2}{\sqrt{-1 + ax}\sqrt{1 + ax}}}{3a} \\
 &= \frac{2}{9}x^3 \cosh^{-1}(ax) - \frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a^3} - \frac{x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a} + \frac{1}{3}x^3 \cosh^{-1}(ax) \\
 &= -\frac{2x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{27a} + \frac{4x \cosh^{-1}(ax)}{3a^2} + \frac{2}{9}x^3 \cosh^{-1}(ax) - \frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a^3} \\
 &= -\frac{4\sqrt{-1 + ax}\sqrt{1 + ax}}{3a^3} - \frac{2x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{27a} + \frac{4x \cosh^{-1}(ax)}{3a^2} + \frac{2}{9}x^3 \cosh^{-1}(ax) - \frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a^3} \\
 &= -\frac{40\sqrt{-1 + ax}\sqrt{1 + ax}}{27a^3} - \frac{2x^2\sqrt{-1 + ax}\sqrt{1 + ax}}{27a} + \frac{4x \cosh^{-1}(ax)}{3a^2} + \frac{2}{9}x^3 \cosh^{-1}(ax) - \frac{2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^2}{3a^3}
 \end{aligned}$$

Mathematica [A] time = 0.0925802, size = 103, normalized size = 0.66

$$\frac{-2\sqrt{ax - 1}\sqrt{ax + 1}(a^2x^2 + 20) + 9a^3x^3 \cosh^{-1}(ax)^3 - 9\sqrt{ax - 1}\sqrt{ax + 1}(a^2x^2 + 2) \cosh^{-1}(ax)^2 + 6ax(a^2x^2 + 6) \cosh^{-1}(ax)}{27a^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2*ArcCosh[a*x]^3, x]

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax}(20+a^2x^2)+6ax(6+a^2x^2)\operatorname{ArcCosh}[ax]-9\sqrt{-1+ax}\sqrt{1+ax}(2+a^2x^2)\operatorname{ArcCosh}[ax]^2+9a^3x^3\operatorname{ArcCosh}[ax]^3)/(27a^3)$

Maple [A] time = 0.037, size = 150, normalized size = 1.

$$\frac{1}{a^3} \left(\frac{(\operatorname{arccosh}(ax))^3(ax-1)(ax+1)ax}{3} + \frac{(\operatorname{arccosh}(ax))^3ax}{3} - \frac{(\operatorname{arccosh}(ax))^2a^2x^2}{3} \sqrt{ax-1}\sqrt{ax+1} - \frac{2(\operatorname{arccosh}(ax))^2a^2x^2}{3} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^2*arccosh(a*x)^3,x)`

[Out] $1/a^3*(1/3*\operatorname{arccosh}(a*x)^3*(a*x-1)*(a*x+1)*a*x+1/3*\operatorname{arccosh}(a*x)^3*a*x-1/3*\operatorname{arccosh}(a*x)^2*a^2*x^2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}-2/3*\operatorname{arccosh}(a*x)^2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}+2/9*\operatorname{arccosh}(a*x)*(a*x-1)*(a*x+1)*a*x+14/9*a*x*\operatorname{arccosh}(a*x)-2/27*a^2*x^2*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}-40/27*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)})$

Maxima [A] time = 1.252, size = 157, normalized size = 1.01

$$\frac{1}{3}x^3\operatorname{arccosh}(ax)^3 - \frac{1}{3}a\left(\frac{\sqrt{a^2x^2-1}x^2}{a^2} + \frac{2\sqrt{a^2x^2-1}}{a^4}\right)\operatorname{arccosh}(ax)^2 - \frac{2}{27}a\left(\frac{\sqrt{a^2x^2-1}x^2 + \frac{20\sqrt{a^2x^2-1}}{a^2}}{a^2} - \frac{3(a^2x^3+6x)}{a^3}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2*arccosh(a*x)^3,x, algorithm="maxima")`

[Out] $1/3*x^3*\operatorname{arccosh}(a*x)^3 - 1/3*a*(\sqrt{a^2*x^2-1})*x^2/a^2 + 2*\sqrt{a^2*x^2-1}/a^4*\operatorname{arccosh}(a*x)^2 - 2/27*a*((\sqrt{a^2*x^2-1})*x^2 + 20*\sqrt{a^2*x^2-1})/a^2/a^2 - 3*(a^2*x^3 + 6*x)*\operatorname{arccosh}(a*x)/a^3$

Fricas [A] time = 2.50902, size = 281, normalized size = 1.81

$$\frac{9a^3x^3\log(ax+\sqrt{a^2x^2-1})^3 - 9(a^2x^2+2)\sqrt{a^2x^2-1}\log(ax+\sqrt{a^2x^2-1})^2 + 6(a^3x^3+6ax)\log(ax+\sqrt{a^2x^2-1})}{27a^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2*arccosh(a*x)^3,x, algorithm="fricas")`

[Out] $1/27*(9*a^3*x^3*\log(a*x + \sqrt{a^2*x^2-1})^3 - 9*(a^2*x^2 + 2)*\sqrt{a^2*x^2-1}*\log(a*x + \sqrt{a^2*x^2-1})^2 + 6*(a^3*x^3 + 6*a*x)*\log(a*x + \sqrt{a^2*x^2-1}) - 2*(a^2*x^2 + 20)*\sqrt{a^2*x^2-1})/a^3$

Sympy [A] time = 2.59883, size = 138, normalized size = 0.89

$$\left\{ \begin{array}{l} \frac{x^3\operatorname{acosh}^3(ax)}{24} + \frac{2x^3\operatorname{acosh}(ax)}{9} - \frac{x^2\sqrt{a^2x^2-1}\operatorname{acosh}^2(ax)}{3a} - \frac{2x^2\sqrt{a^2x^2-1}}{27a} + \frac{4x\operatorname{acosh}(ax)}{3a^2} - \frac{2\sqrt{a^2x^2-1}\operatorname{acosh}^2(ax)}{3a^3} - \frac{40\sqrt{a^2x^2-1}}{27a^3} \end{array} \right. \text{for } a \neq 0$$

otherwise

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**3,x)

[Out] Piecewise((x**3*acosh(a*x)**3/3 + 2*x**3*acosh(a*x)/9 - x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(3*a) - 2*x**2*sqrt(a**2*x**2 - 1)/(27*a) + 4*x*acosh(a*x)/(3*a**2) - 2*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(3*a**3) - 40*sqrt(a**2*x**2 - 1)/(27*a**3), Ne(a, 0)), (-I*pi**3*x**3/24, True))

Giac [A] time = 1.58303, size = 190, normalized size = 1.23

$$\frac{1}{3}x^3 \log(ax + \sqrt{a^2x^2 - 1})^3 - \frac{1}{27}a \left(\frac{9 \left((a^2x^2 - 1)^{\frac{3}{2}} + 3\sqrt{a^2x^2 - 1} \right) \log(ax + \sqrt{a^2x^2 - 1})^2}{a^4} - \frac{2 \left(3(a^2x^3 + 6x) \log(ax + \sqrt{a^2x^2 - 1}) \right)}{a^4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^3,x, algorithm="giac")

[Out] 1/3*x^3*log(a*x + sqrt(a^2*x^2 - 1))^3 - 1/27*a*(9*((a^2*x^2 - 1)^(3/2) + 3*sqrt(a^2*x^2 - 1))*log(a*x + sqrt(a^2*x^2 - 1))^2/a^4 - 2*(3*(a^2*x^3 + 6*x)*log(a*x + sqrt(a^2*x^2 - 1)) - ((a^2*x^2 - 1)^(3/2) + 21*sqrt(a^2*x^2 - 1))/a)/a^3)

3.25 $\int x \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=107

$$-\frac{\cosh^{-1}(ax)^3}{4a^2} - \frac{3 \cosh^{-1}(ax)}{8a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^3 + \frac{3}{4}x^2 \cosh^{-1}(ax) - \frac{3x\sqrt{ax-1}\sqrt{ax+1}}{8a} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{4a}$$

[Out] $(-3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(8*a) - (3*\text{ArcCosh}[a*x])/(8*a^2) + (3*x^2*\text{ArcCosh}[a*x])/4 - (3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(4*a) - \text{ArcCosh}[a*x]^3/(4*a^2) + (x^2*\text{ArcCosh}[a*x]^3)/2$

Rubi [A] time = 0.380996, antiderivative size = 107, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5662, 5759, 5676, 90, 52}

$$-\frac{\cosh^{-1}(ax)^3}{4a^2} - \frac{3 \cosh^{-1}(ax)}{8a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^3 + \frac{3}{4}x^2 \cosh^{-1}(ax) - \frac{3x\sqrt{ax-1}\sqrt{ax+1}}{8a} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{4a}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x]^3,x]

[Out] $(-3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/(8*a) - (3*\text{ArcCosh}[a*x])/(8*a^2) + (3*x^2*\text{ArcCosh}[a*x])/4 - (3*x*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/(4*a) - \text{ArcCosh}[a*x]^3/(4*a^2) + (x^2*\text{ArcCosh}[a*x]^3)/2$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int((((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rule 90

```
Int[((a_.) + (b_.)*(x_))^(2*((c_.) + (d_.)*(x_))^(n_.))*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] := Simp[(b*(a + b*x)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 3)), x] + Dist[1/(d*f*(n + p + 3)), Int[(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(n + p + 3) - b*(b*c*e + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(n + p + 4) - b*(d*e*(n + 2) + c*f*(p + 2)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 3, 0]
```

Rule 52

```
Int[1/(Sqrt[(a_) + (b_.)*(x_)]*Sqrt[(c_) + (d_.)*(x_)]), x_Symbol] := Simp[ArcCosh[(b*x)/a]/b, x] /; FreeQ[{a, b, c, d}, x] && EqQ[a + c, 0] && EqQ[b - d, 0] && GtQ[a, 0]
```

Rubi steps

$$\begin{aligned} \int x \cosh^{-1}(ax)^3 dx &= \frac{1}{2}x^2 \cosh^{-1}(ax)^3 - \frac{1}{2}(3a) \int \frac{x^2 \cosh^{-1}(ax)^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{4a} + \frac{1}{2}x^2 \cosh^{-1}(ax)^3 + \frac{3}{2} \int x \cosh^{-1}(ax) dx - \frac{3 \int \frac{\cosh^{-1}(ax)^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{4a} \\ &= \frac{3}{4}x^2 \cosh^{-1}(ax) - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{4a} - \frac{\cosh^{-1}(ax)^3}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^3 - \frac{1}{4}(3a) \int \frac{\cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}}{8a} + \frac{3}{4}x^2 \cosh^{-1}(ax) - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{4a} - \frac{\cosh^{-1}(ax)^3}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^3 \\ &= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}}{8a} - \frac{3 \cosh^{-1}(ax)}{8a^2} + \frac{3}{4}x^2 \cosh^{-1}(ax) - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{4a} - \frac{\cosh^{-1}(ax)^3}{4a^2} \end{aligned}$$

Mathematica [A] time = 0.0816682, size = 113, normalized size = 1.06

$$\frac{(4a^2x^2 - 2) \cosh^{-1}(ax)^3 + 6a^2x^2 \cosh^{-1}(ax) - 3(ax\sqrt{ax-1}\sqrt{ax+1} + \log(ax + \sqrt{ax-1}\sqrt{ax+1})) - 6ax\sqrt{ax-1}\sqrt{ax+1}}{8a^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*ArcCosh[a*x]^3, x]
```

```
[Out] (6*a^2*x^2*ArcCosh[a*x] - 6*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2 + (-2 + 4*a^2*x^2)*ArcCosh[a*x]^3 - 3*(a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x] + Log[a*x + Sqrt[-1 + a*x]*Sqrt[1 + a*x]]))/(8*a^2)
```

Maple [A] time = 0.03, size = 88, normalized size = 0.8

$$\frac{1}{a^2} \left(\frac{(\operatorname{arccosh}(ax))^3 a^2 x^2}{2} - \frac{3 (\operatorname{arccosh}(ax))^2 ax \sqrt{ax-1} \sqrt{ax+1}}{4} - \frac{(\operatorname{arccosh}(ax))^3}{4} + \frac{3 a^2 x^2 \operatorname{arccosh}(ax)}{4} - \frac{3 ax \sqrt{ax-1}}{8} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*arccosh(a*x)^3, x)
```

```
[Out] 1/a^2*(1/2*arccosh(a*x)^3*a^2*x^2-3/4*arccosh(a*x)^2*a*x*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/4*arccosh(a*x)^3+3/4*a^2*x^2*arccosh(a*x)-3/8*(a*x+1)^(1/2)*(a*x-1)^(1/2))
```

$$x-1)^{(1/2)}*a*x-3/8*\operatorname{arccosh}(a*x))$$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{2}x^2 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^3 - \int \frac{3\left(a^3x^4 + \sqrt{ax+1}\sqrt{ax-1}a^2x^3 - ax^2\right) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^2}{2\left(a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax\right)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^3,x, algorithm="maxima")

[Out] 1/2*x^2*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3 - integrate(3/2*(a^3*x^4 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x^3 - a*x^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2/(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x), x)

Fricas [A] time = 2.45023, size = 261, normalized size = 2.44

$$\frac{6\sqrt{a^2x^2-1}ax \log\left(ax + \sqrt{a^2x^2-1}\right)^2 - 2\left(2a^2x^2-1\right) \log\left(ax + \sqrt{a^2x^2-1}\right)^3 + 3\sqrt{a^2x^2-1}ax - 3\left(2a^2x^2-1\right) \log\left(ax + \sqrt{a^2x^2-1}\right)}{8a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^3,x, algorithm="fricas")

[Out] -1/8*(6*sqrt(a^2*x^2 - 1)*a*x*log(a*x + sqrt(a^2*x^2 - 1))^2 - 2*(2*a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^3 + 3*sqrt(a^2*x^2 - 1)*a*x - 3*(2*a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1)))/a^2

Sympy [A] time = 1.25823, size = 102, normalized size = 0.95

$$\begin{cases} \frac{x^2 \operatorname{acosh}^3(ax)}{16} + \frac{3x^2 \operatorname{acosh}(ax)}{4} - \frac{3x\sqrt{a^2x^2-1} \operatorname{acosh}^2(ax)}{4a} - \frac{3x\sqrt{a^2x^2-1}}{8a} - \frac{\operatorname{acosh}^3(ax)}{4a^2} - \frac{3 \operatorname{acosh}(ax)}{8a^2} & \text{for } a \neq 0 \\ -\frac{i\pi^3 x^2}{16} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**3,x)

[Out] Piecewise((x**2*acosh(a*x)**3/2 + 3*x**2*acosh(a*x)/4 - 3*x*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/(4*a) - 3*x*sqrt(a**2*x**2 - 1)/(8*a) - acosh(a*x)**3/(4*a**2) - 3*acosh(a*x)/(8*a**2), Ne(a, 0)), (-I*pi**3*x**2/16, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{arcosh}(ax)^3 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x*arccosh(a*x)^3, x)
```

3.26 $\int \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=68

$$-\frac{6\sqrt{ax-1}\sqrt{ax+1}}{a} + x \cosh^{-1}(ax)^3 - \frac{3\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{a} + 6x \cosh^{-1}(ax)$$

[Out] $(-6*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/a + 6*x*\text{ArcCosh}[a*x] - (3*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/a + x*\text{ArcCosh}[a*x]^3$

Rubi [A] time = 0.183306, antiderivative size = 68, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5654, 5718, 74}

$$-\frac{6\sqrt{ax-1}\sqrt{ax+1}}{a} + x \cosh^{-1}(ax)^3 - \frac{3\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{a} + 6x \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^3, x]

[Out] $(-6*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x])/a + 6*x*\text{ArcCosh}[a*x] - (3*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*\text{ArcCosh}[a*x]^2)/a + x*\text{ArcCosh}[a*x]^3$

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] :> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 74

Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]

Rubi steps

$$\begin{aligned}
\int \cosh^{-1}(ax)^3 dx &= x \cosh^{-1}(ax)^3 - (3a) \int \frac{x \cosh^{-1}(ax)^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{a} + x \cosh^{-1}(ax)^3 + 6 \int \cosh^{-1}(ax) dx \\
&= 6x \cosh^{-1}(ax) - \frac{3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{a} + x \cosh^{-1}(ax)^3 - (6a) \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{6\sqrt{-1+ax}\sqrt{1+ax}}{a} + 6x \cosh^{-1}(ax) - \frac{3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{a} + x \cosh^{-1}(ax)^3
\end{aligned}$$

Mathematica [A] time = 0.0254505, size = 68, normalized size = 1.

$$-\frac{6\sqrt{ax-1}\sqrt{ax+1}}{a} + x \cosh^{-1}(ax)^3 - \frac{3\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^2}{a} + 6x \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^3,x]

[Out] (-6*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/a + 6*x*ArcCosh[a*x] - (3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/a + x*ArcCosh[a*x]^3

Maple [A] time = 0.031, size = 61, normalized size = 0.9

$$\frac{1}{a} \left((\operatorname{arccosh}(ax))^3 ax - 3 (\operatorname{arccosh}(ax))^2 \sqrt{ax-1}\sqrt{ax+1} + 6 ax \operatorname{arccosh}(ax) - 6 \sqrt{ax-1}\sqrt{ax+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3,x)

[Out] 1/a*(arccosh(a*x)^3*a*x-3*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)+6*a*x*arccosh(a*x)-6*(a*x-1)^(1/2)*(a*x+1)^(1/2))

Maxima [A] time = 1.20984, size = 77, normalized size = 1.13

$$x \operatorname{arccosh}(ax)^3 - \frac{3\sqrt{a^2x^2-1} \operatorname{arccosh}(ax)^2}{a} + \frac{6(ax \operatorname{arccosh}(ax) - \sqrt{a^2x^2-1})}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3,x, algorithm="maxima")

[Out] x*arccosh(a*x)^3 - 3*sqrt(a^2*x^2 - 1)*arccosh(a*x)^2/a + 6*(a*x*arccosh(a*x) - sqrt(a^2*x^2 - 1))/a

Fricas [A] time = 2.47585, size = 205, normalized size = 3.01

$$\frac{ax \log(ax + \sqrt{a^2x^2-1})^3 + 6ax \log(ax + \sqrt{a^2x^2-1}) - 3\sqrt{a^2x^2-1} \log(ax + \sqrt{a^2x^2-1})^2 - 6\sqrt{a^2x^2-1}}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3,x, algorithm="fricas")

[Out] (a*x*log(a*x + sqrt(a^2*x^2 - 1))^3 + 6*a*x*log(a*x + sqrt(a^2*x^2 - 1)) - 3*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^2 - 6*sqrt(a^2*x^2 - 1))/a

Sympy [A] time = 0.570065, size = 63, normalized size = 0.93

$$\begin{cases} x \operatorname{acosh}^3(ax) + 6x \operatorname{acosh}(ax) - \frac{3\sqrt{a^2x^2-1} \operatorname{acosh}^2(ax)}{a} - \frac{6\sqrt{a^2x^2-1}}{a} & \text{for } a \neq 0 \\ -\frac{i\pi^3x}{8} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3,x)

[Out] Piecewise((x*acosh(a*x)**3 + 6*x*acosh(a*x) - 3*sqrt(a**2*x**2 - 1)*acosh(a*x)**2/a - 6*sqrt(a**2*x**2 - 1)/a, Ne(a, 0)), (-I*pi**3*x/8, True))

Giac [A] time = 1.36205, size = 132, normalized size = 1.94

$$x \log(ax + \sqrt{a^2x^2 - 1})^3 - 3a \left(\frac{\sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})^2}{a^2} - \frac{2 \left(x \log(ax + \sqrt{a^2x^2 - 1}) - \frac{\sqrt{a^2x^2 - 1}}{a} \right)}{a} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3,x, algorithm="giac")

[Out] x*log(a*x + sqrt(a^2*x^2 - 1))^3 - 3*a*(sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^2/a^2 - 2*(x*log(a*x + sqrt(a^2*x^2 - 1)) - sqrt(a^2*x^2 - 1)/a)/a)

$$3.27 \quad \int \frac{\cosh^{-1}(ax)^3}{x} dx$$

Optimal. Leaf size=87

$$\frac{3}{2} \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - \frac{3}{2} \cosh^{-1}(ax) \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + \frac{3}{4} \text{PolyLog}\left(4, -e^{2 \cosh^{-1}(ax)}\right) - \frac{1}{4} \cosh^{-1}(ax)$$

[Out] -ArcCosh[a*x]^4/4 + ArcCosh[a*x]^3*Log[1 + E^(2*ArcCosh[a*x])] + (3*ArcCosh[a*x]^2*PolyLog[2, -E^(2*ArcCosh[a*x])])/2 - (3*ArcCosh[a*x]*PolyLog[3, -E^(2*ArcCosh[a*x])])/2 + (3*PolyLog[4, -E^(2*ArcCosh[a*x])])/4

Rubi [A] time = 0.105491, antiderivative size = 87, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5660, 3718, 2190, 2531, 6609, 2282, 6589}

$$\frac{3}{2} \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - \frac{3}{2} \cosh^{-1}(ax) \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + \frac{3}{4} \text{PolyLog}\left(4, -e^{2 \cosh^{-1}(ax)}\right) - \frac{1}{4} \cosh^{-1}(ax)$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^3/x,x]

[Out] -ArcCosh[a*x]^4/4 + ArcCosh[a*x]^3*Log[1 + E^(2*ArcCosh[a*x])] + (3*ArcCosh[a*x]^2*PolyLog[2, -E^(2*ArcCosh[a*x])])/2 - (3*ArcCosh[a*x]*PolyLog[3, -E^(2*ArcCosh[a*x])])/2 + (3*PolyLog[4, -E^(2*ArcCosh[a*x])])/4

Rule 5660

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_/(x_), x_Symbol] :> Subst[Int[(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n, 0]

Rule 3718

Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_)], x_Symbol] :> -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c + d*x)^m*E^(2*(-(I*e) + f*fz*x)))/(1 + E^(2*(-(I*e) + f*fz*x))), x], x] /; FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]

Rule 2190

Int[(((F_)^(g_.)*((e_.) + (f_.)*(x_)))^n_)*((c_.) + (d_.)*(x_))^(m_.)/((a_.) + (b_.)*((F_)^(g_.)*((e_.) + (f_.)*(x_)))^n_), x_Symbol] :> Simp[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a])/(b*f*g*n*Log[F]), x] - Dist[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]

Rule 2531

Int[Log[1 + (e_.)*((F_)^(c_.)*((a_.) + (b_.)*(x_)))^n_]*((f_.) + (g_.)*(x_))^(m_.), x_Symbol] :> -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x)))^n)])/b*c*n*Log[F], x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m - 1)*PolyLog[2, -(e*(F^(c*(a + b*x)))^n)], x], x] /; FreeQ[{F, a, b, c, e, f, g, n}, x] && GtQ[m, 0]

Rule 6609

```
Int[((e_.) + (f_.)*(x_.))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*(a_.) + (b_.
)*(x_.)))^(p_.)], x_Symbol] := Simp[((e + f*x)^m*PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p]/(b*c*p*Log[F]), x] - Dist[(f*m)/(b*c*p*Log[F]), Int[(e + f*x)^
(m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c,
d, e, f, n, p}, x] && GtQ[m, 0]
```

Rule 2282

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x],
Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_.)*((a_.)*(v_)^(n_.))^(m_.) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*(a_.) + (b_.)*x))*
(F_)^v_ /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rule 6589

```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_.))^(p_.)]/((d_.) + (e_.)*(x_.)), x_S
ymbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^3}{x} dx &= \text{Subst} \left(\int x^3 \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + 2 \text{Subst} \left(\int \frac{e^{2x} x^3}{1 + e^{2x}} dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + \cosh^{-1}(ax)^3 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) - 3 \text{Subst} \left(\int x^2 \log(1 + e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + \cosh^{-1}(ax)^3 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \frac{3}{2} \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 3 \text{Subst} \left(\int x \log(1 + e^{2x}) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + \cosh^{-1}(ax)^3 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \frac{3}{2} \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \frac{3}{2} \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + \cosh^{-1}(ax)^3 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \frac{3}{2} \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \frac{3}{2} \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\ &= -\frac{1}{4} \cosh^{-1}(ax)^4 + \cosh^{-1}(ax)^3 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + \frac{3}{2} \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - \frac{3}{2} \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \end{aligned}$$

Mathematica [A] time = 0.0496696, size = 82, normalized size = 0.94

$$\frac{1}{4} \left(-6 \cosh^{-1}(ax)^2 \text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) - 6 \cosh^{-1}(ax) \text{PolyLog} \left(3, -e^{-2 \cosh^{-1}(ax)} \right) - 3 \text{PolyLog} \left(4, -e^{-2 \cosh^{-1}(ax)} \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^3/x, x]

[Out] (ArcCosh[a*x]^4 + 4*ArcCosh[a*x]^3*Log[1 + E^(-2*ArcCosh[a*x])] - 6*ArcCosh[a*x]^2*PolyLog[2, -E^(-2*ArcCosh[a*x])] - 6*ArcCosh[a*x]*PolyLog[3, -E^(-2*ArcCosh[a*x])] - 3*PolyLog[4, -E^(-2*ArcCosh[a*x])])/4

Maple [A] time = 0.037, size = 132, normalized size = 1.5

$$-\frac{(\operatorname{arccosh}(ax))^4}{4} + (\operatorname{arccosh}(ax))^3 \ln \left(1 + \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right) + \frac{3 (\operatorname{arccosh}(ax))^2}{2} \operatorname{polylog} \left(2, - \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3/x,x)

[Out] $-1/4*\operatorname{arccosh}(a*x)^4+\operatorname{arccosh}(a*x)^3*\ln(1+(a*x+(a*x-1)^{(1/2)}*(a*x+1)^{(1/2}))^2)+3/2*\operatorname{arccosh}(a*x)^2*\operatorname{polylog}(2,-(a*x+(a*x-1)^{(1/2)}*(a*x+1)^{(1/2}))^2)-3/2*\operatorname{arccosh}(a*x)*\operatorname{polylog}(3,-(a*x+(a*x-1)^{(1/2)}*(a*x+1)^{(1/2}))^2)+3/4*\operatorname{polylog}(4,-(a*x+(a*x-1)^{(1/2)}*(a*x+1)^{(1/2}))^2)$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^3}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^3/x, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^3}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^3/x, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^3(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3/x,x)

[Out] Integral(acosh(a*x)**3/x, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^3}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^3/x,x, algorithm="giac")
```

```
[Out] integrate(arccosh(a*x)^3/x, x)
```

3.28 $\int \frac{\cosh^{-1}(ax)^3}{x^2} dx$

Optimal. Leaf size=104

$$-6ia \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 6ia \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 6ia \text{PolyLog}\left(3, -ie^{\cosh^{-1}(ax)}\right) - 6ia \text{PolyLog}\left(3, ie^{\cosh^{-1}(ax)}\right)$$

```
[Out] -(ArcCosh[a*x]^3/x) + 6*a*ArcCosh[a*x]^2*ArcTan[E^ArcCosh[a*x]] - (6*I)*a*ArcCosh[a*x]*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (6*I)*a*ArcCosh[a*x]*PolyLog[2, I*E^ArcCosh[a*x]] + (6*I)*a*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (6*I)*a*PolyLog[3, I*E^ArcCosh[a*x]]
```

Rubi [A] time = 0.310209, antiderivative size = 104, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5662, 5761, 4180, 2531, 2282, 6589}

$$-6ia \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 6ia \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 6ia \text{PolyLog}\left(3, -ie^{\cosh^{-1}(ax)}\right) - 6ia \text{PolyLog}\left(3, ie^{\cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^3/x^2,x]
```

```
[Out] -(ArcCosh[a*x]^3/x) + 6*a*ArcCosh[a*x]^2*ArcTan[E^ArcCosh[a*x]] - (6*I)*a*ArcCosh[a*x]*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (6*I)*a*ArcCosh[a*x]*PolyLog[2, I*E^ArcCosh[a*x]] + (6*I)*a*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (6*I)*a*PolyLog[3, I*E^ArcCosh[a*x]]
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5761

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_))/(Sqrt[(d1_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol]
:> Dist[1/(c^(m + 1)*Sqrt[-(d1*d2)]), Subst[Int[(a + b*x)^n*Cosh[x]^m, x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IGtQ[n, 0] && GtQ[d1, 0] && LtQ[d2, 0] && IntegerQ[m]
```

Rule 4180

```
Int[csc[(e_.) + Pi*(k_.) + (Complex[0, fz_])*(f_.)*(x_.)]*((c_.) + (d_.)*(x_.))^ (m_.), x_Symbol]
:> Simp[(-2*(c + d*x)^m*ArcTanh[E^(-(I*e) + f*fz*x)/E^(I*k*Pi)])/(f*fz*I), x] + (-Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 - E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x] + Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 + E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x]) /; FreeQ[{c, d, e, f, fz}, x] && IntegerQ[2*k] && IGtQ[m, 0]
```

Rule 2531

```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_)))^ (n_.)]*((f_.) + (g_.)*(x_.))^ (m_.), x_Symbol]
:> -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x
```

)))^n]]/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m - 1)*PolyLog[2, -(e*(F^(c*(a + b*x)))^n)], x], x] /; FreeQ[{F, a, b, c, e, f, g, n}, x] && GtQ[m, 0]

Rule 2282

Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x], Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; FunctionOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]

Rule 6589

Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_Symbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d, e, n, p}, x] && EqQ[b*d, a*e]

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^3}{x^2} dx &= -\frac{\cosh^{-1}(ax)^3}{x} + (3a) \int \frac{\cosh^{-1}(ax)^2}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{\cosh^{-1}(ax)^3}{x} + (3a) \operatorname{Subst}\left(\int x^2 \operatorname{sech}(x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^3}{x} + 6a \cosh^{-1}(ax)^2 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - (6ia) \operatorname{Subst}\left(\int x \log(1 - ie^x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^3}{x} + 6a \cosh^{-1}(ax)^2 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 6ia \cosh^{-1}(ax) \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 6ia \cosh^{-1}(ax) \operatorname{Li}_2\left(-ie^{-\cosh^{-1}(ax)}\right) \\ &= -\frac{\cosh^{-1}(ax)^3}{x} + 6a \cosh^{-1}(ax)^2 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 6ia \cosh^{-1}(ax) \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 6ia \cosh^{-1}(ax) \operatorname{Li}_2\left(-ie^{-\cosh^{-1}(ax)}\right) \end{aligned}$$

Mathematica [A] time = 0.167938, size = 128, normalized size = 1.23

$$-\frac{\cosh^{-1}(ax)^3}{x} + 3ia \left(-2 \cosh^{-1}(ax) \left(\operatorname{PolyLog}\left(2, -ie^{-\cosh^{-1}(ax)}\right) - \operatorname{PolyLog}\left(2, ie^{-\cosh^{-1}(ax)}\right) \right) - 2 \operatorname{PolyLog}\left(3, -ie^{-\cosh^{-1}(ax)}\right) + 2 \operatorname{PolyLog}\left(3, ie^{-\cosh^{-1}(ax)}\right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^3/x^2, x]

[Out] -(ArcCosh[a*x]^3/x) + (3*I)*a*(-(ArcCosh[a*x]^2*(Log[1 - I/E^ArcCosh[a*x]] - Log[1 + I/E^ArcCosh[a*x]])) - 2*ArcCosh[a*x]*(PolyLog[2, (-I)/E^ArcCosh[a*x]] - PolyLog[2, I/E^ArcCosh[a*x]]) - 2*PolyLog[3, (-I)/E^ArcCosh[a*x]] + 2*PolyLog[3, I/E^ArcCosh[a*x]])

Maple [F] time = 0.099, size = 0, normalized size = 0.

$$\int \frac{(\operatorname{arccosh}(ax))^3}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3/x^2,x)

[Out] int(arccosh(a*x)^3/x^2,x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{x} + \int \frac{3(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})^2}{a^3x^4 - ax^2 + (a^2x^3 - x)\sqrt{ax+1}\sqrt{ax-1}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^2,x, algorithm="maxima")

[Out] -log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/x + integrate(3*(a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2/(a^3*x^4 - a*x^2 + (a^2*x^3 - x)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{\text{arcosh}(ax)^3}{x^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^2,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^3/x^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}^3(ax)}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3/x**2,x)

[Out] Integral(acosh(a*x)**3/x**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{arcosh}(ax)^3}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^2,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^3/x^2, x)

3.29 $\int \frac{\cosh^{-1}(ax)^3}{x^3} dx$

Optimal. Leaf size=98

$$-\frac{3}{2}a^2 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + \frac{3}{2}a^2 \cosh^{-1}(ax)^2 - 3a^2 \cosh^{-1}(ax) \log\left(e^{2 \cosh^{-1}(ax)} + 1\right) - \frac{\cosh^{-1}(ax)^3}{2x^2} + \frac{3a\sqrt{ax - 1}}{2x^2}$$

[Out] (3*a^2*ArcCosh[a*x]^2)/2 + (3*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(2*x) - ArcCosh[a*x]^3/(2*x^2) - 3*a^2*ArcCosh[a*x]*Log[1 + E^(2*ArcCosh[a*x])] - (3*a^2*PolyLog[2, -E^(2*ArcCosh[a*x])])/2

Rubi [A] time = 0.31681, antiderivative size = 98, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5724, 5660, 3718, 2190, 2279, 2391}

$$-\frac{3}{2}a^2 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + \frac{3}{2}a^2 \cosh^{-1}(ax)^2 - 3a^2 \cosh^{-1}(ax) \log\left(e^{2 \cosh^{-1}(ax)} + 1\right) - \frac{\cosh^{-1}(ax)^3}{2x^2} + \frac{3a\sqrt{ax - 1}}{2x^2}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^3/x^3, x]

[Out] (3*a^2*ArcCosh[a*x]^2)/2 + (3*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(2*x) - ArcCosh[a*x]^3/(2*x^2) - 3*a^2*ArcCosh[a*x]*Log[1 + E^(2*ArcCosh[a*x])] - (3*a^2*PolyLog[2, -E^(2*ArcCosh[a*x])])/2

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5724

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p])*(d1 + e1*x)^(FracPart[p])*(d2 + e2*x)^(FracPart[p]))/(f*(m + 1)*(1 + c*x)^(FracPart[p])*(-1 + c*x)^(FracPart[p])), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && EqQ[m + 2*p + 3, 0] && NeQ[m, -1] && IntegerQ[p + 1/2]

Rule 5660

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(x_), x_Symbol] :> Subst[Int[(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n, 0]

Rule 3718

Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_)], x_Symbol] :> -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c

```
+ d*x)^m*E^(2*(-(I*e) + f*fz*x))/(1 + E^(2*(-(I*e) + f*fz*x))), x], x] /;
FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]
```

Rule 2190

```
Int[(((F_)^((g_)*((e_) + (f_)*(x_)))^(n_))*((c_) + (d_)*(x_))^(m_))/
((a_) + (b_)*((F_)^((g_)*((e_) + (f_)*(x_))))^(n_)), x_Symbol] :> Simp
[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a]]/(b*f*g*n*Log[F]), x] - Di
st[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)
))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2279

```
Int[Log[(a_) + (b_)*((F_)^((e_)*((c_) + (d_)*(x_))))^(n_)], x_Symbol]
:> Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x))
)^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]
```

Rule 2391

```
Int[Log[(c_)*((d_) + (e_)*(x_)^(n_))]/(x_), x_Symbol] :> -Simp[PolyLog[2
, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^3}{x^3} dx &= -\frac{\cosh^{-1}(ax)^3}{2x^2} + \frac{1}{2}(3a) \int \frac{\cosh^{-1}(ax)^2}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - (3a^2) \int \frac{\cosh^{-1}(ax)}{x} dx \\ &= \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - (3a^2) \text{Subst} \left(\int x \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\ &= \frac{3}{2}a^2 \cosh^{-1}(ax)^2 + \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - (6a^2) \text{Subst} \left(\int \frac{e^{2x}x}{1+e^{2x}} dx, x, \cosh^{-1}(ax) \right) \\ &= \frac{3}{2}a^2 \cosh^{-1}(ax)^2 + \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - 3a^2 \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\ &= \frac{3}{2}a^2 \cosh^{-1}(ax)^2 + \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - 3a^2 \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\ &= \frac{3}{2}a^2 \cosh^{-1}(ax)^2 + \frac{3a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{2x^2} - 3a^2 \cosh^{-1}(ax) \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \end{aligned}$$

Mathematica [A] time = 0.793931, size = 92, normalized size = 0.94

$$\frac{3}{2}a^2 \left(\text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) + \cosh^{-1}(ax) \left(\frac{\sqrt{\frac{ax-1}{ax+1}}(ax+1) \cosh^{-1}(ax)}{ax} - \cosh^{-1}(ax) - 2 \log \left(e^{-2 \cosh^{-1}(ax)} + 1 \right) \right) \right) - \frac{3}{2}a^2 \cosh^{-1}(ax)^3$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[ArcCosh[a*x]^3/x^3,x]
```

```
[Out] -ArcCosh[a*x]^3/(2*x^2) + (3*a^2*(ArcCosh[a*x]*(-ArcCosh[a*x] + (Sqrt[(-1 +
a*x)/(1 + a*x)]*(1 + a*x)*ArcCosh[a*x]))/(a*x) - 2*Log[1 + E^(-2*ArcCosh[a*
x])]) + PolyLog[2, -E^(-2*ArcCosh[a*x])])/2
```

Maple [A] time = 0.082, size = 113, normalized size = 1.2

$$\frac{3a^2(\operatorname{arccosh}(ax))^2}{2} - \frac{(\operatorname{arccosh}(ax))^3}{2x^2} - 3a^2\operatorname{arccosh}(ax)\ln\left(1 + \left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right) - \frac{3a^2}{2}\operatorname{polylog}\left(2, -\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3/x^3,x)

[Out] 3/2*a^2*arccosh(a*x)^2-1/2*arccosh(a*x)^3/x^2-3*a^2*arccosh(a*x)*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)-3/2*a^2*polylog(2,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)+3/2*a*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{2x^2} + \int \frac{3(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})^2}{2(a^3x^5 - ax^3 + (a^2x^4 - x^2)\sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^3,x, algorithm="maxima")

[Out] -1/2*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/x^2 + integrate(3/2*(a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2/(a^3*x^5 - a*x^3 + (a^2*x^4 - x^2)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^3}{x^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^3,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^3/x^3, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^3(ax)}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3/x**3,x)

[Out] Integral(acosh(a*x)**3/x**3, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^3}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^3/x^3,x, algorithm="giac")
```

```
[Out] integrate(arccosh(a*x)^3/x^3, x)
```

3.30 $\int \frac{\cosh^{-1}(ax)^3}{x^4} dx$

Optimal. Leaf size=183

$$-ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + ia^3 \text{PolyLog}\left(3, -ie^{\cosh^{-1}(ax)}\right) -$$

```
[Out] (a^2*ArcCosh[a*x])/x + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(2*x^2) - ArcCosh[a*x]^3/(3*x^3) + a^3*ArcCosh[a*x]^2*ArcTan[E^ArcCosh[a*x]] - a^3*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]] - I*a^3*ArcCosh[a*x]*PolyLog[2, (-I)*E^ArcCosh[a*x]] + I*a^3*ArcCosh[a*x]*PolyLog[2, I*E^ArcCosh[a*x]] + I*a^3*PolyLog[3, (-I)*E^ArcCosh[a*x]] - I*a^3*PolyLog[3, I*E^ArcCosh[a*x]]
```

Rubi [A] time = 0.5773, antiderivative size = 183, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 9, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.9$, Rules used = {5662, 5748, 5761, 4180, 2531, 2282, 6589, 92, 205}

$$-ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + ia^3 \text{PolyLog}\left(3, -ie^{\cosh^{-1}(ax)}\right) -$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^3/x^4, x]
```

```
[Out] (a^2*ArcCosh[a*x])/x + (a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^2)/(2*x^2) - ArcCosh[a*x]^3/(3*x^3) + a^3*ArcCosh[a*x]^2*ArcTan[E^ArcCosh[a*x]] - a^3*ArcTan[Sqrt[-1 + a*x]*Sqrt[1 + a*x]] - I*a^3*ArcCosh[a*x]*PolyLog[2, (-I)*E^ArcCosh[a*x]] + I*a^3*ArcCosh[a*x]*PolyLog[2, I*E^ArcCosh[a*x]] + I*a^3*PolyLog[3, (-I)*E^ArcCosh[a*x]] - I*a^3*PolyLog[3, I*E^ArcCosh[a*x]]
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((d_.)*(x_))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5748

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((f_.)*(x_))^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol]
:> Simp[((f*x)^(m + 1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + (Dist[(c^2*(m + 2*p + 3))/(f^2*(m + 1)), Int[(f*x)^(m + 2)*(d1 + e1*x)^p*(d2 + e2*x)^q*(a + b*ArcCosh[c*x])^n, x], x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && LtQ[m, -1] && IntegerQ[m] && IntegerQ[p + 1/2]
```

Rule 5761

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol]
:> Dist[1/(c^(m + 1)*Sqrt[-(d1*d2)]), Subst[Int[(a + b*x)^n*Cosh[x]^m, x], x, ArcCosh[c*x]], x] /; Fre
```

$\text{eQ}[\{a, b, c, d1, e1, d2, e2\}, x] \ \&\& \ \text{EqQ}[e1 - c*d1, 0] \ \&\& \ \text{EqQ}[e2 + c*d2, 0]$
 $\&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{GtQ}[d1, 0] \ \&\& \ \text{LtQ}[d2, 0] \ \&\& \ \text{IntegerQ}[m]$

Rule 4180

$\text{Int}[\text{csc}[(e_.) + \text{Pi}*(k_.) + (\text{Complex}[0, \text{fz}_])*(f_.)*(x_.)]*((c_.) + (d_.)*(x_.))^m], x_Symbol] \ :> \ \text{Simp}[(-2*(c + d*x)^m*\text{ArcTanh}[E^{-(I*e) + f*fz*x}/E^{I*k*Pi}])/(f*fz*I), x] + (-\text{Dist}[(d*m)/(f*fz*I), \text{Int}[(c + d*x)^{m-1}*\text{Log}[1 - E^{-(I*e) + f*fz*x}/E^{I*k*Pi}], x], x] + \text{Dist}[(d*m)/(f*fz*I), \text{Int}[(c + d*x)^{m-1}*\text{Log}[1 + E^{-(I*e) + f*fz*x}/E^{I*k*Pi}], x], x]) /; \text{FreeQ}[\{c, d, e, f, \text{fz}\}, x] \ \&\& \ \text{IntegerQ}[2*k] \ \&\& \ \text{IGtQ}[m, 0]$

Rule 2531

$\text{Int}[\text{Log}[1 + (e_.)*((F_)^{((c_.)*(a_.) + (b_.)*(x_.)))^n}]]*((f_.) + (g_.)*(x_.))^m], x_Symbol] \ :> \ -\text{Simp}[(f + g*x)^m*\text{PolyLog}[2, -(e*(F^{c*(a + b*x)})^n)]/(b*c*n*\text{Log}[F]), x] + \text{Dist}[(g*m)/(b*c*n*\text{Log}[F]), \text{Int}[(f + g*x)^{m-1}*\text{PolyLog}[2, -(e*(F^{c*(a + b*x)})^n)], x], x] /; \text{FreeQ}[\{F, a, b, c, e, f, g, n\}, x] \ \&\& \ \text{GtQ}[m, 0]$

Rule 2282

$\text{Int}[u_, x_Symbol] \ :> \ \text{With}[\{v = \text{FunctionOfExponential}[u, x]\}, \text{Dist}[v/D[v, x], \text{Subst}[\text{Int}[\text{FunctionOfExponentialFunction}[u, x]/x, x], x, v], x]] /; \text{FunctionOfExponentialQ}[u, x] \ \&\& \ !\text{MatchQ}[u, (w_)*((a_.)*(v_)^n)]^m /; \text{FreeQ}[\{a, m, n\}, x] \ \&\& \ \text{IntegerQ}[m*n] \ \&\& \ !\text{MatchQ}[u, E^{((c_.)*(a_.) + (b_.)*x)}*(F_)[v_]] /; \text{FreeQ}[\{a, b, c\}, x] \ \&\& \ \text{InverseFunctionQ}[F[x]]]$

Rule 6589

$\text{Int}[\text{PolyLog}[n, (c_.)*((a_.) + (b_.)*(x_.))^p]/((d_.) + (e_.)*(x_.)), x_Symbol] \ :> \ \text{Simp}[\text{PolyLog}[n + 1, c*(a + b*x)^p]/(e*p), x] /; \text{FreeQ}[\{a, b, c, d, e, n, p\}, x] \ \&\& \ \text{EqQ}[b*d, a*e]$

Rule 92

$\text{Int}[1/(\text{Sqrt}[(a_.) + (b_.)*(x_.)]*\text{Sqrt}[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_.))), x_Symbol] \ :> \ \text{Dist}[b*f, \text{Subst}[\text{Int}[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x], x, \text{Sqrt}[a + b*x]*\text{Sqrt}[c + d*x]], x] /; \text{FreeQ}[\{a, b, c, d, e, f\}, x] \ \&\& \ \text{EqQ}[2*b*d*e - f*(b*c + a*d), 0]$

Rule 205

$\text{Int}[(a_.) + (b_.)*(x_.)^2]^{-1}, x_Symbol] \ :> \ \text{Simp}[(\text{Rt}[a/b, 2]*\text{ArcTan}[x/\text{Rt}[a/b, 2]])/a, x] /; \text{FreeQ}[\{a, b\}, x] \ \&\& \ \text{PosQ}[a/b]$

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)^3}{x^4} dx &= -\frac{\cosh^{-1}(ax)^3}{3x^3} + a \int \frac{\cosh^{-1}(ax)^2}{x^3 \sqrt{-1+ax} \sqrt{1+ax}} dx \\
&= \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} - a^2 \int \frac{\cosh^{-1}(ax)}{x^2} dx + \frac{1}{2}a^3 \int \frac{\cosh^{-1}(ax)^2}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a^2 \cosh^{-1}(ax)}{x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} + \frac{1}{2}a^3 \text{Subst} \left(\int x^2 \text{sech}(x) dx, \right. \\
&= \frac{a^2 \cosh^{-1}(ax)}{x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} + a^3 \cosh^{-1}(ax)^2 \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right. \\
&= \frac{a^2 \cosh^{-1}(ax)}{x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} + a^3 \cosh^{-1}(ax)^2 \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right. \\
&= \frac{a^2 \cosh^{-1}(ax)}{x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} + a^3 \cosh^{-1}(ax)^2 \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right. \\
&= \frac{a^2 \cosh^{-1}(ax)}{x} + \frac{a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2}{2x^2} - \frac{\cosh^{-1}(ax)^3}{3x^3} + a^3 \cosh^{-1}(ax)^2 \tan^{-1} \left(e^{\cosh^{-1}(ax)} \right.
\end{aligned}$$

Mathematica [A] time = 0.545972, size = 201, normalized size = 1.1

$$\frac{1}{6} \left(-3ia^3 \left(2 \cosh^{-1}(ax) \text{PolyLog} \left(2, -ie^{-\cosh^{-1}(ax)} \right) - 2 \cosh^{-1}(ax) \text{PolyLog} \left(2, ie^{-\cosh^{-1}(ax)} \right) + 2 \text{PolyLog} \left(3, -ie^{-\cosh^{-1}(ax)} \right) \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^3/x^4,x]

[Out] ((6*a^2*ArcCosh[a*x])/x + (3*a*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*ArcCosh[a*x]^2)/x^2 - (2*ArcCosh[a*x]^3)/x^3 - (3*I)*a^3*((-4*I)*ArcTan[Tanh[ArcCosh[a*x]/2]] + ArcCosh[a*x]^2*Log[1 - I/E^ArcCosh[a*x]] - ArcCosh[a*x]^2*Log[1 + I/E^ArcCosh[a*x]] + 2*ArcCosh[a*x]*PolyLog[2, (-I)/E^ArcCosh[a*x]] - 2*ArcCosh[a*x]*PolyLog[2, I/E^ArcCosh[a*x]] + 2*PolyLog[3, (-I)/E^ArcCosh[a*x]] - 2*PolyLog[3, I/E^ArcCosh[a*x]]))/6

Maple [F] time = 0.169, size = 0, normalized size = 0.

$$\int \frac{(\text{arccosh}(ax))^3}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3/x^4,x)

[Out] int(arccosh(a*x)^3/x^4,x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{3x^3} + \int \frac{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a) \log(ax + \sqrt{ax+1}\sqrt{ax-1})^2}{a^3x^6 - ax^4 + (a^2x^5 - x^3)\sqrt{ax+1}\sqrt{ax-1}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^4,x, algorithm="maxima")

[Out] $-1/3 \log(ax + \sqrt{ax + 1}) \sqrt{ax - 1}^3 / x^3 + \int ((a^3 x^2 + \sqrt{ax + 1}) \sqrt{ax - 1} a^2 x - a) \log(ax + \sqrt{ax + 1}) \sqrt{ax - 1}^2 / (a^3 x^6 - a x^4 + (a^2 x^5 - x^3) \sqrt{ax + 1}) \sqrt{ax - 1}, x$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arccosh}(ax)^3}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^4,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^3/x^4, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^3(ax)}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3/x**4,x)

[Out] Integral(acosh(a*x)**3/x**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^3}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^4,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^3/x^4, x)

3.31 $\int \frac{\cosh^{-1}(ax)^3}{x^5} dx$

Optimal. Leaf size=174

$$-\frac{1}{2}a^4 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + \frac{a^2 \cosh^{-1}(ax)}{4x^2} - \frac{a^3 \sqrt{ax-1} \sqrt{ax+1}}{4x} + \frac{1}{2}a^4 \cosh^{-1}(ax)^2 + \frac{a^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{2x}$$

[Out] $-(a^3 \sqrt{-1 + a*x} \sqrt{1 + a*x})/(4*x) + (a^2 \text{ArcCosh}[a*x])/(4*x^2) + (a^4 \text{ArcCosh}[a*x]^2)/2 + (a \sqrt{-1 + a*x} \sqrt{1 + a*x} \text{ArcCosh}[a*x]^2)/(4*x^3) + (a^3 \sqrt{-1 + a*x} \sqrt{1 + a*x} \text{ArcCosh}[a*x]^2)/(2*x) - \text{ArcCosh}[a*x]^3/(4*x^4) - a^4 \text{ArcCosh}[a*x] \text{Log}[1 + E^{(2*\text{ArcCosh}[a*x])}] - (a^4 \text{PolyLog}[2, -E^{(2*\text{ArcCosh}[a*x])}])/2$

Rubi [A] time = 0.577703, antiderivative size = 174, normalized size of antiderivative = 1., number of steps used = 10, number of rules used = 9, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.9$, Rules used = {5662, 5748, 5724, 5660, 3718, 2190, 2279, 2391, 95}

$$-\frac{1}{2}a^4 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + \frac{a^2 \cosh^{-1}(ax)}{4x^2} - \frac{a^3 \sqrt{ax-1} \sqrt{ax+1}}{4x} + \frac{1}{2}a^4 \cosh^{-1}(ax)^2 + \frac{a^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{2x}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^3/x^5, x]

[Out] $-(a^3 \sqrt{-1 + a*x} \sqrt{1 + a*x})/(4*x) + (a^2 \text{ArcCosh}[a*x])/(4*x^2) + (a^4 \text{ArcCosh}[a*x]^2)/2 + (a \sqrt{-1 + a*x} \sqrt{1 + a*x} \text{ArcCosh}[a*x]^2)/(4*x^3) + (a^3 \sqrt{-1 + a*x} \sqrt{1 + a*x} \text{ArcCosh}[a*x]^2)/(2*x) - \text{ArcCosh}[a*x]^3/(4*x^4) - a^4 \text{ArcCosh}[a*x] \text{Log}[1 + E^{(2*\text{ArcCosh}[a*x])}] - (a^4 \text{PolyLog}[2, -E^{(2*\text{ArcCosh}[a*x])}])/2$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5748

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((f_.)*(x_.))^(m_.)*((d1_) + (e1_.)*(x_.))^(p_.)*((d2_) + (e2_.)*(x_.))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1))*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + (Dist[(c^2*(m + 2*p + 3))/(f^2*(m + 1)), Int[(f*x)^(m + 2)*(d1 + e1*x)^p*(d2 + e2*x)^q*(a + b*ArcCosh[c*x])^n, x], x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && LtQ[m, -1] && IntegerQ[m] && IntegerQ[p + 1/2]

Rule 5724

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((f_.)*(x_.))^(m_.)*((d1_) + (e1_.)*(x_.))^(p_.)*((d2_) + (e2_.)*(x_.))^(q_.), x_Symbol] :> Simp[((f*x)^(m + 1))*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*

```
f*(m + 1)), x] + Dist[(b*c*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*
(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart
rt[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n
- 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m, p}, x] && EqQ[e1 - c*
d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && EqQ[m + 2*p + 3, 0] && NeQ[m, -
1] && IntegerQ[p + 1/2]
```

Rule 5660

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(x_), x_Symbol] := Subst[Int[
(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n,
0]
```

Rule 3718

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)], x
_Symbol] := -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c
+ d*x)^m*E^(2*(-(I*e) + f*fz*x)))/(1 + E^(2*(-(I*e) + f*fz*x))), x], x] /;
FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]
```

Rule 2190

```
Int[(((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^(n_.)*((c_.) + (d_.)*(x_.))^(m_.))/
((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^(n_.)), x_Symbol] := Simp
[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a])/(b*f*g*n*Log[F]), x] - Di
st[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)
))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2279

```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_.))))^(n_.)], x_Symbol]
:= Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x))
)^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]
```

Rule 2391

```
Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] := -Simp[PolyLog[2
, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]
```

Rule 95

```
Int[((a_.) + (b_.)*(x_.))^(m_.)*((c_.) + (d_.)*(x_.))^(n_.)*((e_.) + (f_.)*(x_
))^p, x_Symbol] := Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] /; FreeQ[{a, b, c, d, e, f
, m, n, p}, x] && EqQ[Simplify[m + n + p + 3], 0] && EqQ[a*d*f*(m + 1) + b*
c*f*(n + 1) + b*d*e*(p + 1), 0] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)^3}{x^5} dx &= -\frac{\cosh^{-1}(ax)^3}{4x^4} + \frac{1}{4}(3a) \int \frac{\cosh^{-1}(ax)^2}{x^4\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} - \frac{\cosh^{-1}(ax)^3}{4x^4} - \frac{1}{2}a^2 \int \frac{\cosh^{-1}(ax)}{x^3} dx + \frac{1}{2}a^3 \int \frac{\cosh^{-1}(ax)}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} + \frac{a^3\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{2x} - \frac{\cosh^{-1}(ax)^3}{4x^4} \\
&= -\frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{4x} + \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} + \frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{2x} \\
&= -\frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{4x} + \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{1}{2}a^4\cosh^{-1}(ax)^2 + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} + \\
&= -\frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{4x} + \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{1}{2}a^4\cosh^{-1}(ax)^2 + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} + \\
&= -\frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{4x} + \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{1}{2}a^4\cosh^{-1}(ax)^2 + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} + \\
&= -\frac{a^3\sqrt{-1+ax}\sqrt{1+ax}}{4x} + \frac{a^2\cosh^{-1}(ax)}{4x^2} + \frac{1}{2}a^4\cosh^{-1}(ax)^2 + \frac{a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2}{4x^3} +
\end{aligned}$$

Mathematica [A] time = 0.598095, size = 220, normalized size = 1.26

$$\frac{2a^4x^4\sqrt{\frac{ax-1}{ax+1}}(ax+1)\text{PolyLog}\left(2,-e^{-2\cosh^{-1}(ax)}\right)-a^5x^5+a^3x^3-ax(ax+1)\left(2a^3x^3\left(\sqrt{\frac{ax-1}{ax+1}}-1\right)+2a^2x^2-ax+1\right)\cosh^{-1}(ax)}{4x^4\sqrt{ax-1}\sqrt{ax+1}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^3/x^5,x]

[Out] (a^3*x^3 - a^5*x^5 - a*x*(1 + a*x)*(1 - a*x + 2*a^2*x^2 + 2*a^3*x^3*(-1 + Sqrt[(-1 + a*x)/(1 + a*x)])))*ArcCosh[a*x]^2 - Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3 - a^2*x^2*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*ArcCosh[a*x]*(1 - 4*a^2*x^2*Log[1 + E^(-2*ArcCosh[a*x])]) + 2*a^4*x^4*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*PolyLog[2, -E^(-2*ArcCosh[a*x])])/(4*x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x])

Maple [A] time = 0.122, size = 180, normalized size = 1.

$$\frac{a^3(\operatorname{arccosh}(ax))^2\sqrt{ax-1}\sqrt{ax+1}}{2x} + \frac{a^4(\operatorname{arccosh}(ax))^2}{2} - \frac{a^3\sqrt{ax-1}\sqrt{ax+1}}{4x} + \frac{a^4}{4} + \frac{a(\operatorname{arccosh}(ax))^2\sqrt{ax-1}\sqrt{ax+1}}{4x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^3/x^5,x)

[Out] 1/2*a^3*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x+1/2*a^4*arccosh(a*x)^2-1/4*a^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x+1/4*a^4+1/4*a*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)/x^3+1/4*a^2*arccosh(a*x)/x^2-1/4*arccosh(a*x)^3/x^4-a^4*arccosh(a*x)*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)-1/2*a^4*polylog(2,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{4x^4} + \int \frac{3(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})^2}{4(a^3x^7 - ax^5 + (a^2x^6 - x^4)\sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^5,x, algorithm="maxima")

[Out] -1/4*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/x^4 + integrate(3/4*(a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2/(a^3*x^7 - a*x^5 + (a^2*x^6 - x^4)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{\text{arcosh}(ax)^3}{x^5}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^5,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^3/x^5, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}^3(ax)}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**3/x**5,x)

[Out] Integral(acosh(a*x)**3/x**5, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{arcosh}(ax)^3}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^3/x^5,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^3/x^5, x)

3.32 $\int x^5 \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=306

$$\frac{65x^4}{3456a^2} + \frac{245x^2}{1152a^4} + \frac{5x^4 \cosh^{-1}(ax)^2}{48a^2} - \frac{5x^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)^3}{36a^3} - \frac{65x^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{864a^3} + \frac{5x^2 \cosh^{-1}(ax)^4}{1152a^4}$$

```
[Out] (245*x^2)/(1152*a^4) + (65*x^4)/(3456*a^2) + x^6/324 - (245*x*Sqrt[-1 + a*x]
]*Sqrt[1 + a*x]*ArcCosh[a*x])/(576*a^5) - (65*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a
*x]*ArcCosh[a*x])/(864*a^3) - (x^5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x
])/ (54*a) - (245*ArcCosh[a*x]^2)/(1152*a^6) + (5*x^2*ArcCosh[a*x]^2)/(16*a^
4) + (5*x^4*ArcCosh[a*x]^2)/(48*a^2) + (x^6*ArcCosh[a*x]^2)/18 - (5*x*Sqrt[
-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(24*a^5) - (5*x^3*Sqrt[-1 + a*x]*Sq
rt[1 + a*x]*ArcCosh[a*x]^3)/(36*a^3) - (x^5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Ar
cCosh[a*x]^3)/(9*a) - (5*ArcCosh[a*x]^4)/(96*a^6) + (x^6*ArcCosh[a*x]^4)/6
```

Rubi [A] time = 2.19252, antiderivative size = 306, normalized size of antiderivative = 1., number of steps used = 23, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5662, 5759, 5676, 30}

$$\frac{65x^4}{3456a^2} + \frac{245x^2}{1152a^4} + \frac{5x^4 \cosh^{-1}(ax)^2}{48a^2} - \frac{5x^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)^3}{36a^3} - \frac{65x^3 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{864a^3} + \frac{5x^2 \cosh^{-1}(ax)^4}{1152a^4}$$

Antiderivative was successfully verified.

```
[In] Int[x^5*ArcCosh[a*x]^4, x]
```

```
[Out] (245*x^2)/(1152*a^4) + (65*x^4)/(3456*a^2) + x^6/324 - (245*x*Sqrt[-1 + a*x]
]*Sqrt[1 + a*x]*ArcCosh[a*x])/(576*a^5) - (65*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a
*x]*ArcCosh[a*x])/(864*a^3) - (x^5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x
])/ (54*a) - (245*ArcCosh[a*x]^2)/(1152*a^6) + (5*x^2*ArcCosh[a*x]^2)/(16*a^
4) + (5*x^4*ArcCosh[a*x]^2)/(48*a^2) + (x^6*ArcCosh[a*x]^2)/18 - (5*x*Sqrt[
-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(24*a^5) - (5*x^3*Sqrt[-1 + a*x]*Sq
rt[1 + a*x]*ArcCosh[a*x]^3)/(36*a^3) - (x^5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Ar
cCosh[a*x]^3)/(9*a) - (5*ArcCosh[a*x]^4)/(96*a^6) + (x^6*ArcCosh[a*x]^4)/6
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_.))^ (m_.))/(Sqrt[(d1
_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqr
t[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] := Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
```

Rule 30

```
Int[(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}
 \int x^5 \cosh^{-1}(ax)^4 dx &= \frac{1}{6}x^6 \cosh^{-1}(ax)^4 - \frac{1}{3}(2a) \int \frac{x^6 \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= -\frac{x^5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{9a} + \frac{1}{6}x^6 \cosh^{-1}(ax)^4 + \frac{1}{3} \int x^5 \cosh^{-1}(ax)^2 dx - \frac{5 \int \frac{x^4 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{9a} \\
 &= \frac{1}{18}x^6 \cosh^{-1}(ax)^2 - \frac{5x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{36a^3} - \frac{x^5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{9a} + \frac{1}{6}x^6 \cosh^{-1}(ax)^4 \\
 &= -\frac{x^5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{54a} + \frac{5x^4 \cosh^{-1}(ax)^2}{48a^2} + \frac{1}{18}x^6 \cosh^{-1}(ax)^2 - \frac{5x\sqrt{-1+ax}\sqrt{1+ax}}{24a^5} \\
 &= \frac{x^6}{324} - \frac{65x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{864a^3} - \frac{x^5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{54a} + \frac{5x^2 \cosh^{-1}(ax)^2}{16a^4} \\
 &= \frac{65x^4}{3456a^2} + \frac{x^6}{324} - \frac{245x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{576a^5} - \frac{65x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{864a^3} - \frac{x^5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{54a} \\
 &= \frac{245x^2}{1152a^4} + \frac{65x^4}{3456a^2} + \frac{x^6}{324} - \frac{245x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{576a^5} - \frac{65x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{864a^3}
 \end{aligned}$$

Mathematica [A] time = 0.152674, size = 175, normalized size = 0.57

$$\frac{a^2x^2(32a^4x^4 + 195a^2x^2 + 2205) + 108(16a^6x^6 - 5)\cosh^{-1}(ax)^4 - 144ax\sqrt{ax-1}\sqrt{ax+1}(8a^4x^4 + 10a^2x^2 + 15)\cosh^{-1}(ax)^3 + 10368a^6}{10368a^6}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^5*ArcCosh[a*x]^4, x]
```

```
[Out] (a^2*x^2*(2205 + 195*a^2*x^2 + 32*a^4*x^4) - 6*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(735 + 130*a^2*x^2 + 32*a^4*x^4)*ArcCosh[a*x] + 9*(-245 + 360*a^2*x^2 + 120*a^4*x^4 + 64*a^6*x^6)*ArcCosh[a*x]^2 - 144*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(15 + 10*a^2*x^2 + 8*a^4*x^4)*ArcCosh[a*x]^3 + 108*(-5 + 16*a^6*x^6)*ArcCosh[a*x]^4)/(10368*a^6)
```

Maple [A] time = 0.052, size = 344, normalized size = 1.1

$$\frac{1}{a^6} \left(\frac{a^4x^4 (\operatorname{arccosh}(ax))^4 (ax-1)(ax+1)}{6} + \frac{(\operatorname{arccosh}(ax))^4 (ax-1)(ax+1)a^2x^2}{6} + \frac{(\operatorname{arccosh}(ax))^4 a^2x^2}{6} - \frac{x^5a^5 (\operatorname{arccosh}(ax))^4}{9} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^5*arccosh(a*x)^4,x)

[Out] $\frac{1}{a^6} \left(\frac{1}{6} a^4 x^4 \operatorname{arccosh}(a x)^4 (a x - 1) (a x + 1) + \frac{1}{6} \operatorname{arccosh}(a x)^4 (a x - 1) (a x + 1) a^2 x^2 + \frac{1}{6} \operatorname{arccosh}(a x)^4 a^2 x^2 - \frac{1}{9} a^5 x^5 \operatorname{arccosh}(a x)^3 (a x - 1)^{1/2} (a x + 1)^{1/2} - \frac{5}{36} \operatorname{arccosh}(a x)^3 (a x - 1)^{1/2} (a x + 1)^{1/2} a^3 x^3 - \frac{5}{24} \operatorname{arccosh}(a x)^3 (a x - 1)^{1/2} (a x + 1)^{1/2} a x - \frac{5}{96} \operatorname{arccosh}(a x)^4 + \frac{1}{18} \operatorname{arccosh}(a x)^2 (a x - 1) (a x + 1) a^4 x^4 + \frac{23}{144} \operatorname{arccosh}(a x)^2 (a x - 1) (a x + 1) a^2 x^2 + \frac{17}{36} \operatorname{arccosh}(a x)^2 a^2 x^2 - \frac{1}{54} \operatorname{arccosh}(a x) (a x - 1)^{1/2} (a x + 1)^{1/2} a^5 x^5 - \frac{65}{864} \operatorname{arccosh}(a x) (a x - 1)^{1/2} (a x + 1)^{1/2} a^3 x^3 - \frac{245}{576} \operatorname{arccosh}(a x) a x (a x - 1)^{1/2} (a x + 1)^{1/2} - \frac{245}{1152} \operatorname{arccosh}(a x)^2 + \frac{1}{324} (a x - 1) (a x + 1) a^4 x^4 + \frac{227}{10368} (a x - 1) (a x + 1) a^2 x^2 + \frac{19}{81} a^2 x^2 \right)$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{6} x^6 \log \left(a x + \sqrt{a x + 1} \sqrt{a x - 1} \right)^4 - \int \frac{2 \left(a^3 x^8 + \sqrt{a x + 1} \sqrt{a x - 1} a^2 x^7 - a x^6 \right) \log \left(a x + \sqrt{a x + 1} \sqrt{a x - 1} \right)^3}{3 \left(a^3 x^3 + \left(a^2 x^2 - 1 \right) \sqrt{a x + 1} \sqrt{a x - 1} - a x \right)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^5*arccosh(a*x)^4,x, algorithm="maxima")

[Out] $\frac{1}{6} x^6 \log(a x + \sqrt{a x + 1} \sqrt{a x - 1})^4 - \operatorname{integrate} \left(\frac{2}{3} (a^3 x^8 + \sqrt{a x + 1} \sqrt{a x - 1} a^2 x^7 - a x^6) \log(a x + \sqrt{a x + 1} \sqrt{a x - 1})^3 / (a^3 x^3 + (a^2 x^2 - 1) \sqrt{a x + 1} \sqrt{a x - 1} - a x), x \right)$

Fricas [A] time = 2.39829, size = 497, normalized size = 1.62

$$32 a^6 x^6 + 195 a^4 x^4 + 108 \left(16 a^6 x^6 - 5 \right) \log \left(a x + \sqrt{a^2 x^2 - 1} \right)^4 - 144 \left(8 a^5 x^5 + 10 a^3 x^3 + 15 a x \right) \sqrt{a^2 x^2 - 1} \log \left(a x + \sqrt{a^2 x^2 - 1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^5*arccosh(a*x)^4,x, algorithm="fricas")

[Out] $\frac{1}{10368} \left(32 a^6 x^6 + 195 a^4 x^4 + 108 (16 a^6 x^6 - 5) \log(a x + \sqrt{a^2 x^2 - 1})^4 - 144 (8 a^5 x^5 + 10 a^3 x^3 + 15 a x) \sqrt{a^2 x^2 - 1} \log(a x + \sqrt{a^2 x^2 - 1})^3 + 2205 a^2 x^2 + 9 (64 a^6 x^6 + 120 a^4 x^4 + 360 a^2 x^2 - 245) \log(a x + \sqrt{a^2 x^2 - 1})^2 - 6 (32 a^5 x^5 + 130 a^3 x^3 + 735 a x) \sqrt{a^2 x^2 - 1} \log(a x + \sqrt{a^2 x^2 - 1}) \right) / a^6$

Sympy [A] time = 25.0856, size = 275, normalized size = 0.9

$$\left\{ \frac{x^6 \operatorname{acosh}^4(ax)}{\pi^4 x^6} + \frac{x^6 \operatorname{acosh}^2(ax)}{18} + \frac{x^6}{324} - \frac{x^5 \sqrt{a^2 x^2 - 1} \operatorname{acosh}^3(ax)}{9a} - \frac{x^5 \sqrt{a^2 x^2 - 1} \operatorname{acosh}(ax)}{54a} + \frac{5x^4 \operatorname{acosh}^2(ax)}{48a^2} + \frac{65x^4}{3456a^2} - \frac{5x^3 \sqrt{a^2 x^2 - 1} \operatorname{acosh}^3(ax)}{36a^3} \right\}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**5*acosh(a*x)**4,x)

```
[Out] Piecewise((x**6*acosh(a*x)**4/6 + x**6*acosh(a*x)**2/18 + x**6/324 - x**5*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(9*a) - x**5*sqrt(a**2*x**2 - 1)*acosh(a*x)/(54*a) + 5*x**4*acosh(a*x)**2/(48*a**2) + 65*x**4/(3456*a**2) - 5*x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(36*a**3) - 65*x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)/(864*a**3) + 5*x**2*acosh(a*x)**2/(16*a**4) + 245*x**2/(1152*a**4) - 5*x*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(24*a**5) - 245*x*sqrt(a**2*x**2 - 1)*acosh(a*x)/(576*a**5) - 5*acosh(a*x)**4/(96*a**6) - 245*acosh(a*x)**2/(152*a**6), Ne(a, 0)), (pi**4*x**6/96, True))
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^5 \operatorname{arcosh}(ax)^4 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^5*arccosh(a*x)^4,x, algorithm="giac")
```

```
[Out] integrate(x^5*arccosh(a*x)^4, x)
```


3.33 $\int x^4 \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=274

$$\frac{1088x^3}{16875a^2} + \frac{16x^3 \cosh^{-1}(ax)^2}{75a^2} - \frac{16x^2 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)^3}{75a^3} - \frac{1088x^2 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{5625a^3} + \frac{16576x}{5625a^4} +$$

```
[Out] (16576*x)/(5625*a^4) + (1088*x^3)/(16875*a^2) + (24*x^5)/3125 - (16576*sqrt
[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(5625*a^5) - (1088*x^2*sqrt[-1 + a*x]
)*sqrt[1 + a*x]*ArcCosh[a*x])/(5625*a^3) - (24*x^4*sqrt[-1 + a*x]*sqrt[1 +
a*x]*ArcCosh[a*x])/(625*a) + (32*x*ArcCosh[a*x]^2)/(25*a^4) + (16*x^3*ArcCo
sh[a*x]^2)/(75*a^2) + (12*x^5*ArcCosh[a*x]^2)/125 - (32*sqrt[-1 + a*x]*sqrt
[1 + a*x]*ArcCosh[a*x]^3)/(75*a^5) - (16*x^2*sqrt[-1 + a*x]*sqrt[1 + a*x]*A
rcCosh[a*x]^3)/(75*a^3) - (4*x^4*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x]^
3)/(25*a) + (x^5*ArcCosh[a*x]^4)/5
```

Rubi [A] time = 1.62758, antiderivative size = 274, normalized size of antiderivative = 1., number of steps used = 19, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5662, 5759, 5718, 5654, 8, 30}

$$\frac{1088x^3}{16875a^2} + \frac{16x^3 \cosh^{-1}(ax)^2}{75a^2} - \frac{16x^2 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)^3}{75a^3} - \frac{1088x^2 \sqrt{ax-1} \sqrt{ax+1} \cosh^{-1}(ax)}{5625a^3} + \frac{16576x}{5625a^4} +$$

Antiderivative was successfully verified.

```
[In] Int[x^4*ArcCosh[a*x]^4, x]
```

```
[Out] (16576*x)/(5625*a^4) + (1088*x^3)/(16875*a^2) + (24*x^5)/3125 - (16576*sqrt
[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/(5625*a^5) - (1088*x^2*sqrt[-1 + a*x]
)*sqrt[1 + a*x]*ArcCosh[a*x])/(5625*a^3) - (24*x^4*sqrt[-1 + a*x]*sqrt[1 +
a*x]*ArcCosh[a*x])/(625*a) + (32*x*ArcCosh[a*x]^2)/(25*a^4) + (16*x^3*ArcCo
sh[a*x]^2)/(75*a^2) + (12*x^5*ArcCosh[a*x]^2)/125 - (32*sqrt[-1 + a*x]*sqrt
[1 + a*x]*ArcCosh[a*x]^3)/(75*a^5) - (16*x^2*sqrt[-1 + a*x]*sqrt[1 + a*x]*A
rcCosh[a*x]^3)/(75*a^3) - (4*x^4*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x]^
3)/(25*a) + (x^5*ArcCosh[a*x]^4)/5
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(sqrt[-1
+ c*x]*sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)/(sqrt[(d1
_) + (e1_.)*(x_)]*sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*sqrt[d1 + e1*x]*sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(sqrt[d1 + e1*x]*sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*sqrt[d1 + e1*x]*sqrt
[d2 + e2*x])/(c*d1*d2*m*sqrt[1 + c*x]*sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```

Rule 5718

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)*((d1_.) + (e1_.)*(x_.))^(p_.)*((d2_.) + (e2_.)*(x_.))^(p_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(IntPart[p])*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]
```

Rule 5654

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]
```

Rule 8

```
Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]
```

Rule 30

```
Int[(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned} \int x^4 \cosh^{-1}(ax)^4 dx &= \frac{1}{5} x^5 \cosh^{-1}(ax)^4 - \frac{1}{5} (4a) \int \frac{x^5 \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{4x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{25a} + \frac{1}{5} x^5 \cosh^{-1}(ax)^4 + \frac{12}{25} \int x^4 \cosh^{-1}(ax)^2 dx - \frac{16 \int \frac{x^3 \cosh^{-1}(ax)}{\sqrt{-1+ax}} dx}{25a} \\ &= \frac{12}{125} x^5 \cosh^{-1}(ax)^2 - \frac{16x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{75a^3} - \frac{4x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{25a} + \frac{16}{25} \int x^3 \cosh^{-1}(ax) dx \\ &= -\frac{24x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{625a} + \frac{16x^3 \cosh^{-1}(ax)^2}{75a^2} + \frac{12}{125} x^5 \cosh^{-1}(ax)^2 - \frac{32\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{75a} \\ &= \frac{24x^5}{3125} - \frac{1088x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{5625a^3} - \frac{24x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{625a} + \frac{32x \cosh^{-1}(ax)^2}{25a^4} \\ &= \frac{1088x^3}{16875a^2} + \frac{24x^5}{3125} - \frac{16576\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{5625a^5} - \frac{1088x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{5625a^3} \\ &= \frac{16576x}{5625a^4} + \frac{1088x^3}{16875a^2} + \frac{24x^5}{3125} - \frac{16576\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{5625a^5} - \frac{1088x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{5625a^3} \end{aligned}$$

Mathematica [A] time = 0.127004, size = 158, normalized size = 0.58

$$\frac{8ax(81a^4x^4 + 680a^2x^2 + 31080) + 16875a^5x^5 \cosh^{-1}(ax)^4 + 900ax(9a^4x^4 + 20a^2x^2 + 120) \cosh^{-1}(ax)^2 - 4500\sqrt{ax-1} \cosh^{-1}(ax)}{84375a^5}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^4*ArcCosh[a*x]^4, x]
```

```
[Out] (8*a*x*(31080 + 680*a^2*x^2 + 81*a^4*x^4) - 120*Sqrt[-1 + a*x]*Sqrt[1 + a*x])*
(2072 + 136*a^2*x^2 + 27*a^4*x^4)*ArcCosh[a*x] + 900*a*x*(120 + 20*a^2*x^2 +
```

$$2 + 9a^4x^4) \operatorname{ArcCosh}[a*x]^2 - 4500 \operatorname{Sqrt}[-1 + a*x] \operatorname{Sqrt}[1 + a*x] * (8 + 4a^2x^2 + 3a^4x^4) \operatorname{ArcCosh}[a*x]^3 + 16875a^5x^5 \operatorname{ArcCosh}[a*x]^4) / (84375a^5)$$

Maple [A] time = 0.05, size = 300, normalized size = 1.1

$$\frac{1}{a^5} \left(\frac{a^3x^3 (\operatorname{arccosh}(ax))^4 (ax-1)(ax+1)}{5} + \frac{(ax-1)(ax+1) (\operatorname{arccosh}(ax))^4 ax}{5} + \frac{(\operatorname{arccosh}(ax))^4 ax}{5} - \frac{4 (\operatorname{arccosh}(ax))^4 ax}{25} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^4,x)

[Out] 1/a^5*(1/5*a^3*x^3*arccosh(a*x)^4*(a*x-1)*(a*x+1)+1/5*(a*x-1)*(a*x+1)*arccosh(a*x)^4*a*x+1/5*arccosh(a*x)^4*a*x-4/25*arccosh(a*x)^3*a^4*x^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)-32/75*arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)-16/75*arccosh(a*x)^3*a^2*x^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)+12/125*arccosh(a*x)^2*a^3*x^3*(a*x-1)*(a*x+1)+116/375*arccosh(a*x)^2*(a*x-1)*(a*x+1)*a*x+596/375*arccosh(a*x)^2*a*x-24/625*arccosh(a*x)*a^4*x^4*(a*x-1)^(1/2)*(a*x+1)^(1/2)-16576/5625*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1088/5625*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a^2*x^2+24/3125*(a*x-1)*(a*x+1)*a^3*x^3+6088/84375*(a*x-1)*(a*x+1)*a*x+254728/84375*a*x)

Maxima [A] time = 1.23144, size = 271, normalized size = 0.99

$$\frac{1}{5} x^5 \operatorname{arccosh}(ax)^4 - \frac{4}{75} \left(\frac{3 \sqrt{a^2x^2 - 1} x^4}{a^2} + \frac{4 \sqrt{a^2x^2 - 1} x^2}{a^4} + \frac{8 \sqrt{a^2x^2 - 1}}{a^6} \right) a \operatorname{arccosh}(ax)^3 - \frac{4}{84375} \left(2a \left(\frac{15 \left(27 \sqrt{a^2x^2 - 1} x^4 + 4 \sqrt{a^2x^2 - 1} x^2 + 8 \sqrt{a^2x^2 - 1} \right)}{a^6} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^4,x, algorithm="maxima")

[Out] 1/5*x^5*arccosh(a*x)^4 - 4/75*(3*sqrt(a^2*x^2 - 1)*x^4/a^2 + 4*sqrt(a^2*x^2 - 1)*x^2/a^4 + 8*sqrt(a^2*x^2 - 1)/a^6)*a*arccosh(a*x)^3 - 4/84375*(2*a*(15*(27*sqrt(a^2*x^2 - 1)*a^2*x^4 + 136*sqrt(a^2*x^2 - 1)*x^2 + 2072*sqrt(a^2*x^2 - 1)/a^2)*arccosh(a*x)/a^5 - (81*a^4*x^5 + 680*a^2*x^3 + 31080*x)/a^6) - 225*(9*a^4*x^5 + 20*a^2*x^3 + 120*x)*arccosh(a*x)^2/a^5)*a

Fricas [A] time = 2.61499, size = 466, normalized size = 1.7

$$16875 a^5 x^5 \log \left(ax + \sqrt{a^2 x^2 - 1} \right)^4 + 648 a^5 x^5 + 5440 a^3 x^3 - 4500 \left(3 a^4 x^4 + 4 a^2 x^2 + 8 \right) \sqrt{a^2 x^2 - 1} \log \left(ax + \sqrt{a^2 x^2 - 1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^4,x, algorithm="fricas")

[Out] 1/84375*(16875*a^5*x^5*log(a*x + sqrt(a^2*x^2 - 1))^4 + 648*a^5*x^5 + 5440*a^3*x^3 - 4500*(3*a^4*x^4 + 4*a^2*x^2 + 8)*sqrt(a^2*x^2 - 1)*log(a*x + sqrt

$$(a^2x^2 - 1)^3 + 900(9a^5x^5 + 20a^3x^3 + 120ax)\log(ax + \sqrt{a^2x^2 - 1})^2 - 120(27a^4x^4 + 136a^2x^2 + 2072)\sqrt{a^2x^2 - 1}\log(ax + \sqrt{a^2x^2 - 1}) + 248640ax/a^5$$

Sympy [A] time = 14.6522, size = 248, normalized size = 0.91

$$\left\{ \frac{x^5 \operatorname{acosh}^4(ax)}{80} + \frac{12x^5 \operatorname{acosh}^2(ax)}{125} + \frac{24x^5}{3125} - \frac{4x^4 \sqrt{a^2x^2 - 1} \operatorname{acosh}^3(ax)}{25a} - \frac{24x^4 \sqrt{a^2x^2 - 1} \operatorname{acosh}(ax)}{625a} + \frac{16x^3 \operatorname{acosh}^2(ax)}{75a^2} + \frac{1088x^3}{16875a^2} - \frac{16x^2 \sqrt{a^2x^2 - 1} \operatorname{acosh}(ax)}{75a^3} \right.$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4*acosh(a*x)**4,x)

[Out] Piecewise((x**5*acosh(a*x)**4/5 + 12*x**5*acosh(a*x)**2/125 + 24*x**5/3125 - 4*x**4*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(25*a) - 24*x**4*sqrt(a**2*x**2 - 1)*acosh(a*x)/(625*a) + 16*x**3*acosh(a*x)**2/(75*a**2) + 1088*x**3/(16875*a**2) - 16*x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(75*a**3) - 1088*x**2*sqrt(a**2*x**2 - 1)*acosh(a*x)/(5625*a**3) + 32*x*acosh(a*x)**2/(25*a**4) + 16576*x/(5625*a**4) - 32*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(75*a**5) - 16576*sqrt(a**2*x**2 - 1)*acosh(a*x)/(5625*a**5), Ne(a, 0)), (pi**4*x**5/80, True))

Giac [A] time = 1.84988, size = 293, normalized size = 1.07

$$\frac{1}{5}x^5 \log(ax + \sqrt{a^2x^2 - 1})^4 - \frac{4}{84375}a \left(\frac{1125 \left(3(a^2x^2 - 1)^{\frac{5}{2}} + 10(a^2x^2 - 1)^{\frac{3}{2}} + 15\sqrt{a^2x^2 - 1} \right) \log(ax + \sqrt{a^2x^2 - 1})^3}{a^6} - 16 \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^4,x, algorithm="giac")

[Out] 1/5*x^5*log(ax + sqrt(a^2*x^2 - 1))^4 - 4/84375*a*(1125*(3*(a^2*x^2 - 1)^(5/2) + 10*(a^2*x^2 - 1)^(3/2) + 15*sqrt(a^2*x^2 - 1))*log(ax + sqrt(a^2*x^2 - 1))^3/a^6 - (162*a^4*x^5 + 1360*a^2*x^3 + 225*(9*a^4*x^5 + 20*a^2*x^3 + 120*x)*log(ax + sqrt(a^2*x^2 - 1))^2 + 62160*x - 30*(27*(a^2*x^2 - 1)^(5/2) + 190*(a^2*x^2 - 1)^(3/2) + 2235*sqrt(a^2*x^2 - 1))*log(ax + sqrt(a^2*x^2 - 1))/a)/a^5)

3.34 $\int x^3 \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=214

$$\frac{45x^2}{128a^2} + \frac{9x^2 \cosh^{-1}(ax)^2}{16a^2} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{8a^3} - \frac{45x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{64a^3} - \frac{3 \cosh^{-1}(ax)^4}{32a^4} - \frac{45}{128a^2}$$

```
[Out] (45*x^2)/(128*a^2) + (3*x^4)/128 - (45*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(64*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(32*a^3) - (45*ArcCosh[a*x]^2)/(128*a^4) + (9*x^2*ArcCosh[a*x]^2)/(16*a^2) + (3*x^4*ArcCosh[a*x]^2)/16 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(8*a^3) - (x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(4*a) - (3*ArcCosh[a*x]^4)/(32*a^4) + (x^4*ArcCosh[a*x]^4)/4
```

Rubi [A] time = 1.31439, antiderivative size = 214, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5662, 5759, 5676, 30}

$$\frac{45x^2}{128a^2} + \frac{9x^2 \cosh^{-1}(ax)^2}{16a^2} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{8a^3} - \frac{45x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{64a^3} - \frac{3 \cosh^{-1}(ax)^4}{32a^4} - \frac{45}{128a^2}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*ArcCosh[a*x]^4,x]
```

```
[Out] (45*x^2)/(128*a^2) + (3*x^4)/128 - (45*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(64*a^3) - (3*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(32*a^3) - (45*ArcCosh[a*x]^2)/(128*a^4) + (9*x^2*ArcCosh[a*x]^2)/(16*a^2) + (3*x^4*ArcCosh[a*x]^2)/16 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(8*a^3) - (x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(4*a) - (3*ArcCosh[a*x]^4)/(32*a^4) + (x^4*ArcCosh[a*x]^4)/4
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)/(Sqrt[(d1_ + (e1_.)*(x_)]*Sqrt[(d2_ + (e2_.)*(x_))]), x_Symbol]
  :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(Sqrt[(d1_ + (e1_.)*(x_)]*Sqrt[(d2_ + (e2_.)*(x_))]), x_Symbol]
  :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] &&
```

EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned}
 \int x^3 \cosh^{-1}(ax)^4 dx &= \frac{1}{4}x^4 \cosh^{-1}(ax)^4 - a \int \frac{x^4 \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{4a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^4 + \frac{3}{4} \int x^3 \cosh^{-1}(ax)^2 dx - \frac{3 \int \frac{x^2 \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{4a} \\
 &= \frac{3}{16}x^4 \cosh^{-1}(ax)^2 - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{8a^3} - \frac{x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{4a} + \frac{1}{4}x^4 \\
 &= -\frac{3x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{32a} + \frac{9x^2 \cosh^{-1}(ax)^2}{16a^2} + \frac{3}{16}x^4 \cosh^{-1}(ax)^2 - \frac{3x\sqrt{-1+ax}\sqrt{1+ax}}{8a^3} \\
 &= \frac{3x^4}{128} - \frac{45x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{64a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{32a} + \frac{9x^2 \cosh^{-1}(ax)^2}{16a^2} \\
 &= \frac{45x^2}{128a^2} + \frac{3x^4}{128} - \frac{45x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{64a^3} - \frac{3x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{32a} - \frac{45 \cosh^{-1}(ax)^2}{128}
 \end{aligned}$$

Mathematica [A] time = 0.109415, size = 143, normalized size = 0.67

$$\frac{3a^2x^2(a^2x^2 + 15) + 4(8a^4x^4 - 3) \cosh^{-1}(ax)^4 - 16ax\sqrt{ax-1}\sqrt{ax+1}(2a^2x^2 + 3) \cosh^{-1}(ax)^3 + 3(8a^4x^4 + 24a^2x^2 - 15) \cosh^{-1}(ax)^2}{128a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3*ArcCosh[a*x]^4,x]

[Out] (3*a^2*x^2*(15 + a^2*x^2) - 6*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(15 + 2*a^2*x^2)*ArcCosh[a*x] + 3*(-15 + 24*a^2*x^2 + 8*a^4*x^4)*ArcCosh[a*x]^2 - 16*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(3 + 2*a^2*x^2)*ArcCosh[a*x]^3 + 4*(-3 + 8*a^4*x^4)*ArcCosh[a*x]^4)/(128*a^4)

Maple [A] time = 0.045, size = 224, normalized size = 1.1

$$\frac{1}{a^4} \left(\frac{(\operatorname{arccosh}(ax))^4 (ax-1)(ax+1) a^2 x^2}{4} + \frac{(\operatorname{arccosh}(ax))^4 a^2 x^2}{4} - \frac{(\operatorname{arccosh}(ax))^3 a^3 x^3 \sqrt{ax-1} \sqrt{ax+1}}{4} - \frac{3 (\operatorname{arccosh}(ax))^2}{8} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^4,x)

[Out] 1/a^4*(1/4*arccosh(a*x)^4*(a*x-1)*(a*x+1)*a^2*x^2+1/4*arccosh(a*x)^4*a^2*x^2-1/4*arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a^3*x^3-3/8*arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a*x-3/32*arccosh(a*x)^4+3/16*arccosh(a*x)^2*(a

$$\begin{aligned} & *x-1)*(a*x+1)*a^2*x^2+3/4*\operatorname{arccosh}(a*x)^2*a^2*x^2-3/32*\operatorname{arccosh}(a*x)*(a*x-1)^{1/2} \\ & *(a*x+1)^{1/2}*a^3*x^3-45/64*\operatorname{arccosh}(a*x)*a*x*(a*x-1)^{1/2}*(a*x+1)^{1/2} \\ & -45/128*\operatorname{arccosh}(a*x)^2+3/128*(a*x-1)*(a*x+1)*a^2*x^2+3/8*a^2*x^2 \end{aligned}$$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{4}x^4 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^4 - \int \frac{(a^3x^6 + \sqrt{ax+1}\sqrt{ax-1}a^2x^5 - ax^4) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^3}{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^4,x, algorithm="maxima")

[Out] 1/4*x^4*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^4 - integrate((a^3*x^6 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x^5 - a*x^4)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x), x)

Fricas [A] time = 2.4774, size = 402, normalized size = 1.88

$$\frac{3a^4x^4 + 4(8a^4x^4 - 3) \log\left(ax + \sqrt{a^2x^2 - 1}\right)^4 - 16(2a^3x^3 + 3ax)\sqrt{a^2x^2 - 1} \log\left(ax + \sqrt{a^2x^2 - 1}\right)^3 + 45a^2x^2 + 3(8a^4x^4 - 3)}{128a^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^4,x, algorithm="fricas")

[Out] 1/128*(3*a^4*x^4 + 4*(8*a^4*x^4 - 3)*log(a*x + sqrt(a^2*x^2 - 1))^4 - 16*(2*a^3*x^3 + 3*a*x)*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^3 + 45*a^2*x^2 + 3*(8*a^4*x^4 + 24*a^2*x^2 - 15)*log(a*x + sqrt(a^2*x^2 - 1))^2 - 6*(2*a^3*x^3 + 15*a*x)*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1)))/a^4

Sympy [A] time = 8.66786, size = 197, normalized size = 0.92

$$\left\{ \frac{x^4 \operatorname{acosh}^4(ax)}{\pi^4 x^4} + \frac{3x^4 \operatorname{acosh}^2(ax)}{16} + \frac{3x^4}{128} - \frac{x^3 \sqrt{a^2x^2 - 1} \operatorname{acosh}^3(ax)}{4a} - \frac{3x^3 \sqrt{a^2x^2 - 1} \operatorname{acosh}(ax)}{32a} + \frac{9x^2 \operatorname{acosh}^2(ax)}{16a^2} + \frac{45x^2}{128a^2} - \frac{3x \sqrt{a^2x^2 - 1} \operatorname{acosh}^3(ax)}{8a^3} \right\}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x)**4,x)

[Out] Piecewise((x**4*acosh(a*x)**4/4 + 3*x**4*acosh(a*x)**2/16 + 3*x**4/128 - x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(4*a) - 3*x**3*sqrt(a**2*x**2 - 1)*acosh(a*x)/(32*a) + 9*x**2*acosh(a*x)**2/(16*a**2) + 45*x**2/(128*a**2) - 3*x*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(8*a**3) - 45*x*sqrt(a**2*x**2 - 1)*acosh(a*x)/(64*a**3) - 3*acosh(a*x)**4/(32*a**4) - 45*acosh(a*x)**2/(128*a**4), Ne(a, 0)), (pi**4*x**4/64, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{arcosh}(ax)^4 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*arccosh(a*x)^4,x, algorithm="giac")
```

```
[Out] integrate(x^3*arccosh(a*x)^4, x)
```


3.35 $\int x^2 \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=182

$$\frac{160x}{27a^2} - \frac{8\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)^3}{9a^3} + \frac{8x\cosh^{-1}(ax)^2}{3a^2} - \frac{160\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{27a^3} + \frac{1}{3}x^3\cosh^{-1}(ax)^4 - \frac{4x^2}{3}$$

[Out] (160*x)/(27*a^2) + (8*x^3)/81 - (160*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(27*a^3) - (8*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(27*a) + (8*x*ArcCosh[a*x]^2)/(3*a^2) + (4*x^3*ArcCosh[a*x]^2)/9 - (8*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(9*a^3) - (4*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(9*a) + (x^3*ArcCosh[a*x]^4)/3

Rubi [A] time = 0.881492, antiderivative size = 182, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5662, 5759, 5718, 5654, 8, 30}

$$\frac{160x}{27a^2} - \frac{8\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)^3}{9a^3} + \frac{8x\cosh^{-1}(ax)^2}{3a^2} - \frac{160\sqrt{ax-1}\sqrt{ax+1}\cosh^{-1}(ax)}{27a^3} + \frac{1}{3}x^3\cosh^{-1}(ax)^4 - \frac{4x^2}{3}$$

Antiderivative was successfully verified.

[In] Int[x^2*ArcCosh[a*x]^4,x]

[Out] (160*x)/(27*a^2) + (8*x^3)/81 - (160*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(27*a^3) - (8*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(27*a) + (8*x*ArcCosh[a*x]^2)/(3*a^2) + (4*x^3*ArcCosh[a*x]^2)/9 - (8*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(9*a^3) - (4*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(9*a) + (x^3*ArcCosh[a*x]^4)/3

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b^n*(-(d1*d2))^(n-1)*IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(n-1)*IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p]), x], x]

$(p + 1/2)*(a + b*\text{ArcCosh}[c*x])^{(n - 1)}, x], x] /; \text{FreeQ}[\{a, b, c, d1, e1, d2, e2, p\}, x] \ \&\& \ \text{EqQ}[e1 - c*d1, 0] \ \&\& \ \text{EqQ}[e2 + c*d2, 0] \ \&\& \ \text{GtQ}[n, 0] \ \&\& \ \text{NeQ}[p, -1] \ \&\& \ \text{IntegerQ}[p + 1/2]$

Rule 5654

$\text{Int}[(a + b*\text{ArcCosh}[c*x])^{(n)}, x_Symbol] \ :> \ \text{Simp}[x*(a + b*\text{ArcCosh}[c*x])^{(n)}, x] - \text{Dist}[b*c*n, \text{Int}[(x*(a + b*\text{ArcCosh}[c*x])^{(n - 1)})/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /; \text{FreeQ}[\{a, b, c\}, x] \ \&\& \ \text{GtQ}[n, 0]$

Rule 8

$\text{Int}[a, x_Symbol] \ :> \ \text{Simp}[a*x, x] /; \text{FreeQ}[a, x]$

Rule 30

$\text{Int}[x^{(m)}, x_Symbol] \ :> \ \text{Simp}[x^{(m + 1)}/(m + 1), x] /; \text{FreeQ}[m, x] \ \&\& \ \text{NeQ}[m, -1]$

Rubi steps

$$\begin{aligned} \int x^2 \cosh^{-1}(ax)^4 dx &= \frac{1}{3}x^3 \cosh^{-1}(ax)^4 - \frac{1}{3}(4a) \int \frac{x^3 \cosh^{-1}(ax)^3}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx \\ &= -\frac{4x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^3}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^4 + \frac{4}{3} \int x^2 \cosh^{-1}(ax)^2 dx - \frac{8 \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1 + ax}\sqrt{1 + ax}} dx}{9a} \\ &= \frac{4}{9}x^3 \cosh^{-1}(ax)^2 - \frac{8\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^3}{9a^3} - \frac{4x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^3}{9a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^4 \\ &= -\frac{8x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{27a} + \frac{8x \cosh^{-1}(ax)^2}{3a^2} + \frac{4}{9}x^3 \cosh^{-1}(ax)^2 - \frac{8\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)^3}{9a^3} \\ &= \frac{8x^3}{81} - \frac{160\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{27a^3} - \frac{8x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{27a} + \frac{8x \cosh^{-1}(ax)^2}{3a^2} + \\ &= \frac{160x}{27a^2} + \frac{8x^3}{81} - \frac{160\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{27a^3} - \frac{8x^2\sqrt{-1 + ax}\sqrt{1 + ax} \cosh^{-1}(ax)}{27a} + \frac{8x \cosh^{-1}(ax)^2}{3a^2} \end{aligned}$$

Mathematica [A] time = 0.112116, size = 122, normalized size = 0.67

$$\frac{8ax(a^2x^2 + 60) + 27a^3x^3 \cosh^{-1}(ax)^4 - 36\sqrt{ax - 1}\sqrt{ax + 1}(a^2x^2 + 2) \cosh^{-1}(ax)^3 + 36ax(a^2x^2 + 6) \cosh^{-1}(ax)^2 - 24\sqrt{ax - 1}\sqrt{ax + 1} \cosh^{-1}(ax)}{81a^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2*ArcCosh[a*x]^4, x]

[Out] $(8*a*x*(60 + a^2*x^2) - 24*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*(20 + a^2*x^2)*\text{ArcCosh}[a*x] + 36*a*x*(6 + a^2*x^2)*\text{ArcCosh}[a*x]^2 - 36*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x]*(2 + a^2*x^2)*\text{ArcCosh}[a*x]^3 + 27*a^3*x^3*\text{ArcCosh}[a*x]^4)/(81*a^3)$

Maple [A] time = 0.04, size = 180, normalized size = 1.

$$\frac{1}{a^3} \left(\frac{(ax - 1)(ax + 1)(\text{arccosh}(ax))^4 ax}{3} + \frac{(\text{arccosh}(ax))^4 ax}{3} - \frac{4(\text{arccosh}(ax))^3 a^2 x^2 \sqrt{ax - 1} \sqrt{ax + 1}}{9} - \frac{8(\text{arccosh}(ax))^2 ax \sqrt{ax - 1} \sqrt{ax + 1}}{9} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^4,x)

[Out] $\frac{1}{a^3} \left(\frac{1}{3} (a^2 x^2 - 1) (a^2 x^2 + 1) \operatorname{arccosh}(ax)^4 + \frac{1}{3} \operatorname{arccosh}(ax)^4 a^2 x - \frac{4}{9} \operatorname{arccosh}(ax)^3 a^2 x^2 (a^2 x^2 - 1)^{1/2} (a^2 x^2 + 1)^{1/2} - \frac{8}{9} \operatorname{arccosh}(ax)^3 (a^2 x^2 - 1)^{1/2} (a^2 x^2 + 1)^{1/2} + \frac{4}{9} \operatorname{arccosh}(ax)^2 (a^2 x^2 - 1) (a^2 x^2 + 1) a^2 x + \frac{28}{9} \operatorname{arccosh}(ax)^2 a^2 x - \frac{8}{27} \operatorname{arccosh}(ax) (a^2 x^2 - 1)^{1/2} (a^2 x^2 + 1)^{1/2} a^2 x^2 - \frac{160}{27} \operatorname{arccosh}(ax) (a^2 x^2 - 1)^{1/2} (a^2 x^2 + 1)^{1/2} + \frac{8}{81} (a^2 x^2 - 1) (a^2 x^2 + 1) a^2 x + \frac{488}{81} a^2 x \right)$

Maxima [A] time = 1.2046, size = 193, normalized size = 1.06

$$\frac{1}{3} x^3 \operatorname{arccosh}(ax)^4 - \frac{4}{9} a \left(\frac{\sqrt{a^2 x^2 - 1} x^2}{a^2} + \frac{2 \sqrt{a^2 x^2 - 1}}{a^4} \right) \operatorname{arccosh}(ax)^3 - \frac{4}{81} \left(2 a \left(\frac{3 \left(\sqrt{a^2 x^2 - 1} x^2 + \frac{20 \sqrt{a^2 x^2 - 1}}{a^2} \right) \operatorname{arccosh}(ax)}{a^3} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^4,x, algorithm="maxima")

[Out] $\frac{1}{3} x^3 \operatorname{arccosh}(ax)^4 - \frac{4}{9} a \left(\sqrt{a^2 x^2 - 1} x^2 / a^2 + 2 \sqrt{a^2 x^2 - 1} / a^4 \right) \operatorname{arccosh}(ax)^3 - \frac{4}{81} \left(2 a \left(\frac{3 \left(\sqrt{a^2 x^2 - 1} x^2 + 20 \sqrt{a^2 x^2 - 1} / a^2 \right) \operatorname{arccosh}(ax)}{a^3} - (a^2 x^3 + 60 x) / a^4 \right) - 9 (a^2 x^3 + 6 x) \operatorname{arccosh}(ax)^2 / a^3 \right) a$

Fricas [A] time = 2.35788, size = 358, normalized size = 1.97

$$\frac{27 a^3 x^3 \log(ax + \sqrt{a^2 x^2 - 1})^4 + 8 a^3 x^3 - 36 (a^2 x^2 + 2) \sqrt{a^2 x^2 - 1} \log(ax + \sqrt{a^2 x^2 - 1})^3 + 36 (a^3 x^3 + 6 a x) \log(ax + \sqrt{a^2 x^2 - 1})^2 - 24 (a^2 x^2 + 20) \sqrt{a^2 x^2 - 1} \log(ax + \sqrt{a^2 x^2 - 1}) + 480 a x}{81 a^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^4,x, algorithm="fricas")

[Out] $\frac{1}{81} \left(27 a^3 x^3 \log(ax + \sqrt{a^2 x^2 - 1})^4 + 8 a^3 x^3 - 36 (a^2 x^2 + 2) \sqrt{a^2 x^2 - 1} \log(ax + \sqrt{a^2 x^2 - 1})^3 + 36 (a^3 x^3 + 6 a x) \log(ax + \sqrt{a^2 x^2 - 1})^2 - 24 (a^2 x^2 + 20) \sqrt{a^2 x^2 - 1} \log(ax + \sqrt{a^2 x^2 - 1}) + 480 a x \right) / a^3$

Sympy [A] time = 5.03241, size = 165, normalized size = 0.91

$$\left\{ \frac{x^3 \operatorname{acosh}^4(ax)}{\frac{\pi^4 x^3}{48}} + \frac{4x^3 \operatorname{acosh}^2(ax)}{9} + \frac{8x^3}{81} - \frac{4x^2 \sqrt{a^2 x^2 - 1} \operatorname{acosh}^3(ax)}{9a} - \frac{8x^2 \sqrt{a^2 x^2 - 1} \operatorname{acosh}(ax)}{27a} + \frac{8x \operatorname{acosh}^2(ax)}{3a^2} + \frac{160x}{27a^2} - \frac{8 \sqrt{a^2 x^2 - 1} \operatorname{acosh}^3(ax)}{9a^3} \right\}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**4,x)

```
[Out] Piecewise((x**3*acosh(a*x)**4/3 + 4*x**3*acosh(a*x)**2/9 + 8*x**3/81 - 4*x*
*2*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/(9*a) - 8*x**2*sqrt(a**2*x**2 - 1)*aco
sh(a*x)/(27*a) + 8*x*acosh(a*x)**2/(3*a**2) + 160*x/(27*a**2) - 8*sqrt(a**2
*x**2 - 1)*acosh(a*x)**3/(9*a**3) - 160*sqrt(a**2*x**2 - 1)*acosh(a*x)/(27*
a**3), Ne(a, 0)), (pi**4*x**3/48, True))
```

Giac [A] time = 1.77945, size = 230, normalized size = 1.26

$$\frac{1}{3}x^3 \log(ax + \sqrt{a^2x^2 - 1})^4 - \frac{4}{81}a \left(\frac{9 \left((a^2x^2 - 1)^{\frac{3}{2}} + 3\sqrt{a^2x^2 - 1} \right) \log(ax + \sqrt{a^2x^2 - 1})^3}{a^4} - \frac{2a^2x^3 + 9(a^2x^3 + 6x) \log(ax + \sqrt{a^2x^2 - 1})^2}{a^4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*arccosh(a*x)^4,x, algorithm="giac")
```

```
[Out] 1/3*x^3*log(a*x + sqrt(a^2*x^2 - 1))^4 - 4/81*a*(9*((a^2*x^2 - 1)^(3/2) + 3
*sqrt(a^2*x^2 - 1))*log(a*x + sqrt(a^2*x^2 - 1))^3/a^4 - (2*a^2*x^3 + 9*(a^
2*x^3 + 6*x)*log(a*x + sqrt(a^2*x^2 - 1))^2 + 120*x - 6*((a^2*x^2 - 1)^(3/2
) + 21*sqrt(a^2*x^2 - 1))*log(a*x + sqrt(a^2*x^2 - 1))/a)/a^3)
```

3.36 $\int x \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=120

$$-\frac{\cosh^{-1}(ax)^4}{4a^2} - \frac{3 \cosh^{-1}(ax)^2}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^4 + \frac{3}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{a} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a}$$

[Out] (3*x^2)/4 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(2*a) - (3*ArcCosh[a*x]^2)/(4*a^2) + (3*x^2*ArcCosh[a*x]^2)/2 - (x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/a - ArcCosh[a*x]^4/(4*a^2) + (x^2*ArcCosh[a*x]^4)/2

Rubi [A] time = 0.602508, antiderivative size = 120, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 5759, 5676, 30}

$$-\frac{\cosh^{-1}(ax)^4}{4a^2} - \frac{3 \cosh^{-1}(ax)^2}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^4 + \frac{3}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{a} - \frac{3x\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x]^4,x]

[Out] (3*x^2)/4 - (3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/(2*a) - (3*ArcCosh[a*x]^2)/(4*a^2) + (3*x^2*ArcCosh[a*x]^2)/2 - (x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/a - ArcCosh[a*x]^4/(4*a^2) + (x^2*ArcCosh[a*x]^4)/2

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5759

Int((((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int x \cosh^{-1}(ax)^4 dx &= \frac{1}{2}x^2 \cosh^{-1}(ax)^4 - (2a) \int \frac{x^2 \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} + \frac{1}{2}x^2 \cosh^{-1}(ax)^4 + 3 \int x \cosh^{-1}(ax)^2 dx - \frac{\int \frac{\cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{a} \\ &= \frac{3}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} - \frac{\cosh^{-1}(ax)^4}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^4 - (3a) \int \frac{\cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{2a} + \frac{3}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} - \frac{\cosh^{-1}(ax)^4}{4a^2} \\ &= \frac{3x^2}{4} - \frac{3x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{2a} - \frac{3 \cosh^{-1}(ax)^2}{4a^2} + \frac{3}{2}x^2 \cosh^{-1}(ax)^2 - \frac{x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} \end{aligned}$$

Mathematica [A] time = 0.0700765, size = 104, normalized size = 0.87

$$\frac{3a^2x^2 + (2a^2x^2 - 1) \cosh^{-1}(ax)^4 + (6a^2x^2 - 3) \cosh^{-1}(ax)^2 - 4ax\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3 - 6ax\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{4a^2}$$

Antiderivative was successfully verified.

[In] Integrate[x*ArcCosh[a*x]^4,x]

[Out] (3*a^2*x^2 - 6*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x] + (-3 + 6*a^2*x^2)*ArcCosh[a*x]^2 - 4*a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3 + (-1 + 2*a^2*x^2)*ArcCosh[a*x]^4)/(4*a^2)

Maple [A] time = 0.033, size = 104, normalized size = 0.9

$$\frac{1}{a^2} \left(\frac{(\operatorname{arccosh}(ax))^4 a^2 x^2}{2} - (\operatorname{arccosh}(ax))^3 \sqrt{ax-1} \sqrt{ax+1} ax - \frac{(\operatorname{arccosh}(ax))^4}{4} + \frac{3 (\operatorname{arccosh}(ax))^2 a^2 x^2}{2} - \frac{3 ax \operatorname{arccosh}(ax)}{2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x)^4,x)

[Out] 1/a^2*(1/2*arccosh(a*x)^4*a^2*x^2-arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)*a*x-1/4*arccosh(a*x)^4+3/2*arccosh(a*x)^2*a^2*x^2-3/2*arccosh(a*x)*a*x*(a*x-1)^(1/2)*(a*x+1)^(1/2)-3/4*arccosh(a*x)^2+3/4*a^2*x^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{1}{2}x^2 \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^4 - \int \frac{2(a^3x^4 + \sqrt{ax+1}\sqrt{ax-1}a^2x^3 - ax^2) \log\left(ax + \sqrt{ax+1}\sqrt{ax-1}\right)^3}{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^4,x, algorithm="maxima")

[Out] 1/2*x^2*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^4 - integrate(2*(a^3*x^4 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x^3 - a*x^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x), x)

Fricas [A] time = 2.60556, size = 316, normalized size = 2.63

$$\frac{4\sqrt{a^2x^2-1}ax\log\left(ax+\sqrt{a^2x^2-1}\right)^3 - (2a^2x^2-1)\log\left(ax+\sqrt{a^2x^2-1}\right)^4 - 3a^2x^2 + 6\sqrt{a^2x^2-1}ax\log\left(ax+\sqrt{a^2x^2-1}\right)}{4a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^4,x, algorithm="fricas")

[Out] -1/4*(4*sqrt(a^2*x^2 - 1)*a*x*log(a*x + sqrt(a^2*x^2 - 1))^3 - (2*a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^4 - 3*a^2*x^2 + 6*sqrt(a^2*x^2 - 1)*a*x*log(a*x + sqrt(a^2*x^2 - 1)) - 3*(2*a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^2)/a^2

Sympy [A] time = 2.61227, size = 110, normalized size = 0.92

$$\begin{cases} \frac{x^2 \operatorname{acosh}^4(ax)}{2} + \frac{3x^2 \operatorname{acosh}^2(ax)}{2} + \frac{3x^2}{4} - \frac{x\sqrt{a^2x^2-1}\operatorname{acosh}^3(ax)}{a} - \frac{3x\sqrt{a^2x^2-1}\operatorname{acosh}(ax)}{2a} - \frac{\operatorname{acosh}^4(ax)}{4a^2} - \frac{3\operatorname{acosh}^2(ax)}{4a^2} & \text{for } a \neq 0 \\ \frac{\pi^4 x^2}{32} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**4,x)

[Out] Piecewise((x**2*acosh(a*x)**4/2 + 3*x**2*acosh(a*x)**2/2 + 3*x**2/4 - x*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/a - 3*x*sqrt(a**2*x**2 - 1)*acosh(a*x)/(2*a) - acosh(a*x)**4/(4*a**2) - 3*acosh(a*x)**2/(4*a**2), Ne(a, 0)), (pi**4*x**2/32, True))

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{arcosh}(ax)^4 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(x*arccosh(a*x)^4, x)

3.37 $\int \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=77

$$x \cosh^{-1}(ax)^4 - \frac{4\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{a} + 12x \cosh^{-1}(ax)^2 - \frac{24\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 24x$$

[Out] 24*x - (24*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/a + 12*x*ArcCosh[a*x]^2 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/a + x*ArcCosh[a*x]^4

Rubi [A] time = 0.298058, antiderivative size = 77, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5654, 5718, 8}

$$x \cosh^{-1}(ax)^4 - \frac{4\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{a} + 12x \cosh^{-1}(ax)^2 - \frac{24\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 24x$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^4, x]

[Out] 24*x - (24*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x])/a + 12*x*ArcCosh[a*x]^2 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/a + x*ArcCosh[a*x]^4

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c^n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)*((d1_) + (e1_.)*(x_))^ (p_.)*((d2_) + (e2_.)*(x_))^ (p_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(IntPart[p])*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rubi steps

$$\begin{aligned}
\int \cosh^{-1}(ax)^4 dx &= x \cosh^{-1}(ax)^4 - (4a) \int \frac{x \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} + x \cosh^{-1}(ax)^4 + 12 \int \cosh^{-1}(ax)^2 dx \\
&= 12x \cosh^{-1}(ax)^2 - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} + x \cosh^{-1}(ax)^4 - (24a) \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{24\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{a} + 12x \cosh^{-1}(ax)^2 - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} + x \cosh^{-1}(ax)^4 \\
&= 24x - \frac{24\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)}{a} + 12x \cosh^{-1}(ax)^2 - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{a} + x \cosh^{-1}(ax)^4
\end{aligned}$$

Mathematica [A] time = 0.0284939, size = 77, normalized size = 1.

$$x \cosh^{-1}(ax)^4 - \frac{4\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^3}{a} + 12x \cosh^{-1}(ax)^2 - \frac{24\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)}{a} + 24x$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^4,x]

[Out] 24*x - (24*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x])/a + 12*x*ArcCosh[a*x]^2 - (4*sqrt[-1 + a*x]*sqrt[1 + a*x]*ArcCosh[a*x]^3)/a + x*ArcCosh[a*x]^4

Maple [A] time = 0.033, size = 71, normalized size = 0.9

$$\frac{1}{a} \left((\operatorname{arccosh}(ax))^4 ax - 4 (\operatorname{arccosh}(ax))^3 \sqrt{ax-1}\sqrt{ax+1} + 12 (\operatorname{arccosh}(ax))^2 ax - 24 \operatorname{arccosh}(ax) \sqrt{ax-1}\sqrt{ax+1} + 24ax \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^4,x)

[Out] 1/a*(arccosh(a*x)^4*a*x-4*arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)+12*arccosh(a*x)^2*a*x-24*arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+24*a*x)

Maxima [A] time = 1.15713, size = 99, normalized size = 1.29

$$x \operatorname{arccosh}(ax)^4 - \frac{4\sqrt{a^2x^2-1} \operatorname{arccosh}(ax)^3}{a} + 12 \left(\frac{x \operatorname{arccosh}(ax)^2}{a} + \frac{2 \left(x - \frac{\sqrt{a^2x^2-1} \operatorname{arccosh}(ax)}{a} \right)}{a} \right) a$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4,x, algorithm="maxima")

[Out] x*arccosh(a*x)^4 - 4*sqrt(a^2*x^2 - 1)*arccosh(a*x)^3/a + 12*(x*arccosh(a*x)^2/a + 2*(x - sqrt(a^2*x^2 - 1)*arccosh(a*x)/a)/a)*a

Fricas [A] time = 2.31198, size = 262, normalized size = 3.4

$$\frac{ax \log(ax + \sqrt{a^2x^2 - 1})^4 + 12ax \log(ax + \sqrt{a^2x^2 - 1})^2 - 4\sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})^3 + 24ax - 24\sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4,x, algorithm="fricas")

[Out] (a*x*log(a*x + sqrt(a^2*x^2 - 1))^4 + 12*a*x*log(a*x + sqrt(a^2*x^2 - 1))^2 - 4*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^3 + 24*a*x - 24*sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1)))/a

Sympy [A] time = 1.18142, size = 70, normalized size = 0.91

$$\begin{cases} x \operatorname{acosh}^4(ax) + 12x \operatorname{acosh}^2(ax) + 24x - \frac{4\sqrt{a^2x^2-1} \operatorname{acosh}^3(ax)}{a} - \frac{24\sqrt{a^2x^2-1} \operatorname{acosh}(ax)}{a} & \text{for } a \neq 0 \\ \frac{\pi^4 x}{16} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**4,x)

[Out] Piecewise((x*acosh(a*x)**4 + 12*x*acosh(a*x)**2 + 24*x - 4*sqrt(a**2*x**2 - 1)*acosh(a*x)**3/a - 24*sqrt(a**2*x**2 - 1)*acosh(a*x)/a, Ne(a, 0)), (pi**4*x/16, True))

Giac [A] time = 1.46721, size = 169, normalized size = 2.19

$$x \log(ax + \sqrt{a^2x^2 - 1})^4 - 4 \left(\frac{\sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})^3}{a^2} - \frac{3 \left(x \log(ax + \sqrt{a^2x^2 - 1})^2 + 2a \left(\frac{x}{a} - \frac{\sqrt{a^2x^2 - 1} \log(ax + \sqrt{a^2x^2 - 1})}{a^2} \right) \right)}{a} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4,x, algorithm="giac")

[Out] x*log(a*x + sqrt(a^2*x^2 - 1))^4 - 4*(sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))^3/a^2 - 3*(x*log(a*x + sqrt(a^2*x^2 - 1))^2 + 2*a*(x/a - sqrt(a^2*x^2 - 1)*log(a*x + sqrt(a^2*x^2 - 1))/a^2))/a)*a

$$3.38 \quad \int \frac{\cosh^{-1}(ax)^4}{x} dx$$

Optimal. Leaf size=103

$$2 \cosh^{-1}(ax)^3 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - 3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + 3 \cosh^{-1}(ax) \text{PolyLog}\left(4, -e^{2 \cosh^{-1}(ax)}\right) - 3 \text{PolyLog}\left(5, -e^{2 \cosh^{-1}(ax)}\right)$$

```
[Out] -ArcCosh[a*x]^5/5 + ArcCosh[a*x]^4*Log[1 + E^(2*ArcCosh[a*x])] + 2*ArcCosh[a*x]^3*PolyLog[2, -E^(2*ArcCosh[a*x])] - 3*ArcCosh[a*x]^2*PolyLog[3, -E^(2*ArcCosh[a*x])] + 3*ArcCosh[a*x]*PolyLog[4, -E^(2*ArcCosh[a*x])] - (3*PolyLog[5, -E^(2*ArcCosh[a*x])])/2
```

Rubi [A] time = 0.120114, antiderivative size = 103, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5660, 3718, 2190, 2531, 6609, 2282, 6589}

$$2 \cosh^{-1}(ax)^3 \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) - 3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + 3 \cosh^{-1}(ax) \text{PolyLog}\left(4, -e^{2 \cosh^{-1}(ax)}\right) - 3 \text{PolyLog}\left(5, -e^{2 \cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^4/x, x]
```

```
[Out] -ArcCosh[a*x]^5/5 + ArcCosh[a*x]^4*Log[1 + E^(2*ArcCosh[a*x])] + 2*ArcCosh[a*x]^3*PolyLog[2, -E^(2*ArcCosh[a*x])] - 3*ArcCosh[a*x]^2*PolyLog[3, -E^(2*ArcCosh[a*x])] + 3*ArcCosh[a*x]*PolyLog[4, -E^(2*ArcCosh[a*x])] - (3*PolyLog[5, -E^(2*ArcCosh[a*x])])/2
```

Rule 5660

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_/(x_), x_Symbol] := Subst[Int[(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n, 0]
```

Rule 3718

```
Int[((c_.) + (d_.)*(x_.))^m_*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)], x_Symbol] := -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c + d*x)^m*E^(2*(-I*e) + f*fz*x))]/(1 + E^(2*(-I*e) + f*fz*x)), x], x] /; FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]
```

Rule 2190

```
Int[(((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^n_)*((c_.) + (d_.)*(x_.))^m_)/((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_.))))^n_), x_Symbol] := Simp[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a]/(b*f*g*n*Log[F]), x] - Dist[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2531

```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_.))))^n_]*((f_.) + (g_.)*(x_.))^m_, x_Symbol] := -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x))))^n]/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m - 1)*PolyLog[2, -(e*(F^(c*(a + b*x))))^n], x], x] /; FreeQ[{F, a, b, c, e, f, g, n}, x] && GtQ[m, 0]
```

Rule 6609

```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*((a_.) + (b_.
)*(x_))))^(p_.)], x_Symbol] := Simp[((e + f*x)^m*PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p])/(b*c*p*Log[F]), x] - Dist[(f*m)/(b*c*p*Log[F]), Int[(e + f*x)^(
m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c,
d, e, f, n, p}, x] && GtQ[m, 0]
```

Rule 2282

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rule 6589

```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^4}{x} dx &= \text{Subst} \left(\int x^4 \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + 2 \text{Subst} \left(\int \frac{e^{2x} x^4}{1 + e^{2x}} dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) - 4 \text{Subst} \left(\int x^3 \log \left(1 + e^{2x} \right) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax)^3 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 6 \text{Subst} \left(\int x^2 \log \left(1 + e^{2x} \right) dx, x, \cosh^{-1}(ax) \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax)^3 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax)^3 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax)^3 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) \\ &= -\frac{1}{5} \cosh^{-1}(ax)^5 + \cosh^{-1}(ax)^4 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax)^3 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax)^2 \text{Li}_2 \left(-e^{2 \cosh^{-1}(ax)} \right) \end{aligned}$$

Mathematica [A] time = 0.0292115, size = 103, normalized size = 1.

$$-2 \cosh^{-1}(ax)^3 \text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax)^2 \text{PolyLog} \left(3, -e^{-2 \cosh^{-1}(ax)} \right) - 3 \cosh^{-1}(ax) \text{PolyLog} \left(4, -e^{-2 \cosh^{-1}(ax)} \right) - 3 \text{PolyLog} \left(5, -e^{-2 \cosh^{-1}(ax)} \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^4/x, x]

[Out] ArcCosh[a*x]^5/5 + ArcCosh[a*x]^4*Log[1 + E^(-2*ArcCosh[a*x])] - 2*ArcCosh[a*x]^3*PolyLog[2, -E^(-2*ArcCosh[a*x])] - 3*ArcCosh[a*x]^2*PolyLog[3, -E^(-2*ArcCosh[a*x])] - 3*ArcCosh[a*x]*PolyLog[4, -E^(-2*ArcCosh[a*x])] - (3*PolyLog[5, -E^(-2*ArcCosh[a*x])])/2

Maple [A] time = 0.037, size = 165, normalized size = 1.6

$$-\frac{(\operatorname{arccosh}(ax))^5}{5} + (\operatorname{arccosh}(ax))^4 \ln\left(1 + \left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right) + 2 (\operatorname{arccosh}(ax))^3 \operatorname{polylog}\left(2, -\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right) + 2 (\operatorname{arccosh}(ax))^2 \operatorname{polylog}\left(3, -\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right) + 3 \operatorname{arccosh}(ax) \operatorname{polylog}\left(4, -\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right) + 3 \operatorname{polylog}\left(5, -\left(ax + \sqrt{ax-1}\sqrt{ax+1}\right)^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^4/x, x)

[Out] -1/5*arccosh(a*x)^5+arccosh(a*x)^4*ln(1+(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)+2*arccosh(a*x)^3*polylog(2,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)-3*arccosh(a*x)^2*polylog(3,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)+3*arccosh(a*x)*polylog(4,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)-3/2*polylog(5,-(a*x+(a*x-1)^(1/2)*(a*x+1)^(1/2))^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^4}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4/x, x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^4/x, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^4}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4/x, x, algorithm="fricas")

[Out] integral(arccosh(a*x)^4/x, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^4(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**4/x, x)

[Out] Integral(acosh(a*x)**4/x, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^4}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^4/x,x, algorithm="giac")
```

```
[Out] integrate(arccosh(a*x)^4/x, x)
```

$$3.39 \quad \int \frac{\cosh^{-1}(ax)^4}{x^2} dx$$

Optimal. Leaf size=150

$$-12ia \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(3, -Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(3, Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(4, -Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(4, Ie^{\cosh^{-1}(ax)}\right)$$

```
[Out] -(ArcCosh[a*x]^4/x) + 8*a*ArcCosh[a*x]^3*ArcTan[E^ArcCosh[a*x]] - (12*I)*a*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (12*I)*a*ArcCosh[a*x]^2*PolyLog[2, I*E^ArcCosh[a*x]] + (24*I)*a*ArcCosh[a*x]*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (24*I)*a*ArcCosh[a*x]*PolyLog[3, I*E^ArcCosh[a*x]] - (24*I)*a*PolyLog[4, (-I)*E^ArcCosh[a*x]] + (24*I)*a*PolyLog[4, I*E^ArcCosh[a*x]]
```

Rubi [A] time = 0.334837, antiderivative size = 150, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5662, 5761, 4180, 2531, 6609, 2282, 6589}

$$-12ia \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(3, -Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(3, Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(4, -Ie^{\cosh^{-1}(ax)}\right) + 24ia \cosh^{-1}(ax) \text{PolyLog}\left(4, Ie^{\cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^4/x^2, x]
```

```
[Out] -(ArcCosh[a*x]^4/x) + 8*a*ArcCosh[a*x]^3*ArcTan[E^ArcCosh[a*x]] - (12*I)*a*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcCosh[a*x]] + (12*I)*a*ArcCosh[a*x]^2*PolyLog[2, I*E^ArcCosh[a*x]] + (24*I)*a*ArcCosh[a*x]*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (24*I)*a*ArcCosh[a*x]*PolyLog[3, I*E^ArcCosh[a*x]] - (24*I)*a*PolyLog[4, (-I)*E^ArcCosh[a*x]] + (24*I)*a*PolyLog[4, I*E^ArcCosh[a*x]]
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((d_.)*(x_))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5761

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_)]/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol]
:> Dist[1/(c^(m + 1)*Sqrt[-(d1*d2)]), Subst[Int[(a + b*x)^n*Cosh[x]^m, x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IGtQ[n, 0] && GtQ[d1, 0] && LtQ[d2, 0] && IntegerQ[m]
```

Rule 4180

```
Int[csc[(e_.) + Pi*(k_.) + (Complex[0, fz_])*(f_.)*(x_)]*((c_.) + (d_.)*(x_))^(m_.), x_Symbol]
:> Simp[(-2*(c + d*x)^m*ArcTanh[E^(-(I*e) + f*fz*x)/E^(I*k*Pi)])/(f*fz*I), x] + (-Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 - E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x] + Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 + E^(-(I*e) + f*fz*x)/E^(I*k*Pi)], x], x]) /; FreeQ[{c, d, e, f, fz}, x] && IntegerQ[2*k] && IGtQ[m, 0]
```

Rule 2531

```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_)))^(n_.))*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] := -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x)
)))^n]]/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m -
1)*PolyLog[2, -(e*(F^(c*(a + b*x)))^n]], x], x] /; FreeQ[{F, a, b, c, e, f
, g, n}, x] && GtQ[m, 0]
```

Rule 6609

```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*((a_.) + (b_.)
*(x_)))^(p_.)], x_Symbol] := Simp[((e + f*x)^m*PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p]]/(b*c*p*Log[F]), x] - Dist[(f*m)/(b*c*p*Log[F]), Int[(e + f*x)^(
m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c,
d, e, f, n, p}, x] && GtQ[m, 0]
```

Rule 2282

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_.)*((a_.)*(v_)^(n_.))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rule 6589

```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

Rubi steps

$$\begin{aligned} \int \frac{\cosh^{-1}(ax)^4}{x^2} dx &= -\frac{\cosh^{-1}(ax)^4}{x} + (4a) \int \frac{\cosh^{-1}(ax)^3}{x\sqrt{-1+ax}\sqrt{1+ax}} dx \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + (4a) \operatorname{Subst}\left(\int x^3 \operatorname{sech}(x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + 8a \cosh^{-1}(ax)^3 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - (12ia) \operatorname{Subst}\left(\int x^2 \log(1-ie^x) dx, x, \cosh^{-1}(ax)\right) \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + 8a \cosh^{-1}(ax)^3 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 12ia \cosh^{-1}(ax)^2 \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax) \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + 8a \cosh^{-1}(ax)^3 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 12ia \cosh^{-1}(ax)^2 \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax) \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + 8a \cosh^{-1}(ax)^3 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 12ia \cosh^{-1}(ax)^2 \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax) \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) \\ &= -\frac{\cosh^{-1}(ax)^4}{x} + 8a \cosh^{-1}(ax)^3 \tan^{-1}\left(e^{\cosh^{-1}(ax)}\right) - 12ia \cosh^{-1}(ax)^2 \operatorname{Li}_2\left(-ie^{\cosh^{-1}(ax)}\right) + 12ia \cosh^{-1}(ax) \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) \end{aligned}$$

Mathematica [B] time = 0.648351, size = 478, normalized size = 3.19

$$a \left(-12i \cosh^{-1}(ax)^2 \operatorname{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 12\pi \cosh^{-1}(ax) \operatorname{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) - 24i \cosh^{-1}(ax) \operatorname{PolyLog}\left(3, -ie^{\cosh^{-1}(ax)}\right) \right)$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[ArcCosh[a*x]^4/x^2, x]
```



```
[Out] a*(((-7*I)/16)*Pi^4 + (Pi^3*ArcCosh[a*x])/2 - ((3*I)/2)*Pi^2*ArcCosh[a*x]^2
- 2*Pi*ArcCosh[a*x]^3 + I*ArcCosh[a*x]^4 - ArcCosh[a*x]^4/(a*x) + (Pi^3*Log
[1 + I/E^ArcCosh[a*x]])/2 - (3*I)*Pi^2*ArcCosh[a*x]*Log[1 + I/E^ArcCosh[a*
x]] - 6*Pi*ArcCosh[a*x]^2*Log[1 + I/E^ArcCosh[a*x]] + (4*I)*ArcCosh[a*x]^3*
Log[1 + I/E^ArcCosh[a*x]] + (3*I)*Pi^2*ArcCosh[a*x]*Log[1 - I/E^ArcCosh[a*x
]] + 6*Pi*ArcCosh[a*x]^2*Log[1 - I/E^ArcCosh[a*x]] - (Pi^3*Log[1 + I/E^ArcC
osh[a*x]])/2 - (4*I)*ArcCosh[a*x]^3*Log[1 + I/E^ArcCosh[a*x]] + (Pi^3*Log[T
an[(Pi + (2*I)*ArcCosh[a*x])/4]])/2 + (3*I)*(Pi - (2*I)*ArcCosh[a*x])^2*Pol
yLog[2, (-I)/E^ArcCosh[a*x]] - (12*I)*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcC
osh[a*x]] + (3*I)*Pi^2*PolyLog[2, I*E^ArcCosh[a*x]] + 12*Pi*ArcCosh[a*x]*Po
lyLog[2, I*E^ArcCosh[a*x]] + 12*Pi*PolyLog[3, (-I)/E^ArcCosh[a*x]] - (24*I)
*ArcCosh[a*x]*PolyLog[3, (-I)/E^ArcCosh[a*x]] + (24*I)*ArcCosh[a*x]*PolyLog
[3, (-I)*E^ArcCosh[a*x]] - 12*Pi*PolyLog[3, I*E^ArcCosh[a*x]] - (24*I)*Poly
Log[4, (-I)/E^ArcCosh[a*x]] - (24*I)*PolyLog[4, (-I)*E^ArcCosh[a*x]]])
```

Maple [F] time = 0.086, size = 0, normalized size = 0.

$$\int \frac{(\operatorname{arccosh}(ax))^4}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(arccosh(a*x)^4/x^2,x)
```

```
[Out] int(arccosh(a*x)^4/x^2,x)
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^4}{x} + \int \frac{4(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{a^3x^4 - ax^2 + (a^2x^3 - x)\sqrt{ax+1}\sqrt{ax-1}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^4/x^2,x, algorithm="maxima")
```

```
[Out] -log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^4/x + integrate(4*(a^3*x^2 + sqrt(a
*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/(
a^3*x^4 - a*x^2 + (a^2*x^3 - x)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)
```

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arccosh}(ax)^4}{x^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^4/x^2,x, algorithm="fricas")
```

```
[Out] integral(arccosh(a*x)^4/x^2, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^4(ax)}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**4/x**2,x)

[Out] Integral(acosh(a*x)**4/x**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^4}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4/x^2,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^4/x^2, x)

3.40 $\int \frac{\cosh^{-1}(ax)^4}{x^3} dx$

Optimal. Leaf size=115

$$-6a^2 \cosh^{-1}(ax) \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + 3a^2 \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + 2a^2 \cosh^{-1}(ax)^3 - 6a^2 \cosh^{-1}(ax)^2 \log$$

```
[Out] 2*a^2*ArcCosh[a*x]^3 + (2*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/x
- ArcCosh[a*x]^4/(2*x^2) - 6*a^2*ArcCosh[a*x]^2*Log[1 + E^(2*ArcCosh[a*x])]
- 6*a^2*ArcCosh[a*x]*PolyLog[2, -E^(2*ArcCosh[a*x])] + 3*a^2*PolyLog[3, -E
^(2*ArcCosh[a*x])]
```

Rubi [A] time = 0.358169, antiderivative size = 115, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 8, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.8$, Rules used = {5662, 5724, 5660, 3718, 2190, 2531, 2282, 6589}

$$-6a^2 \cosh^{-1}(ax) \text{PolyLog}\left(2, -e^{2 \cosh^{-1}(ax)}\right) + 3a^2 \text{PolyLog}\left(3, -e^{2 \cosh^{-1}(ax)}\right) + 2a^2 \cosh^{-1}(ax)^3 - 6a^2 \cosh^{-1}(ax)^2 \log$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^4/x^3,x]
```

```
[Out] 2*a^2*ArcCosh[a*x]^3 + (2*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/x
- ArcCosh[a*x]^4/(2*x^2) - 6*a^2*ArcCosh[a*x]^2*Log[1 + E^(2*ArcCosh[a*x])]
- 6*a^2*ArcCosh[a*x]*PolyLog[2, -E^(2*ArcCosh[a*x])] + 3*a^2*PolyLog[3, -E
^(2*ArcCosh[a*x])]
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 5724

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_)*((d1_) + (e
1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] :> Simp[((f*x)^(m +
1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*
f*(m + 1)), x] + Dist[(b*c*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*
(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPa
rt[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n
- 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m, p}, x] && EqQ[e1 - c*
d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && EqQ[m + 2*p + 3, 0] && NeQ[m, -
1] && IntegerQ[p + 1/2]
```

Rule 5660

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)/(x_), x_Symbol] :> Subst[Int[
(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n,
0]
```

Rule 3718

```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_)], x
_Symbol] := -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c
+ d*x)^m*E^(2*(-I*e) + f*fz*x)))/(1 + E^(2*(-I*e) + f*fz*x)), x], x] /;
FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]
```

Rule 2190

```
Int((((F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.))/
((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)), x_Symbol] := Simp
[((c + d*x)^m*Log[1 + (b*(F^(g*(e + f*x)))^n)/a]]/(b*f*g*n*Log[F]), x] - Di
st[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)
))^n)/a], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2531

```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] := -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x)
))^n]])/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m -
1)*PolyLog[2, -(e*(F^(c*(a + b*x)))^n]], x], x] /; FreeQ[{F, a, b, c, e, f
, g, n}, x] && GtQ[m, 0]
```

Rule 2282

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_.)*((a_.)*(v_)^(n_.))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rule 6589

```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)^4}{x^3} dx &= -\frac{\cosh^{-1}(ax)^4}{2x^2} + (2a) \int \frac{\cosh^{-1}(ax)^3}{x^2\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - (6a^2) \int \frac{\cosh^{-1}(ax)^2}{x} dx \\
&= \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - (6a^2) \text{Subst} \left(\int x^2 \tanh(x) dx, x, \cosh^{-1}(ax) \right) \\
&= 2a^2 \cosh^{-1}(ax)^3 + \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - (12a^2) \text{Subst} \left(\int \frac{e^{2x}x^2}{1+e^{2x}} dx, \right. \\
&= 2a^2 \cosh^{-1}(ax)^3 + \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - 6a^2 \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\
&= 2a^2 \cosh^{-1}(ax)^3 + \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - 6a^2 \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\
&= 2a^2 \cosh^{-1}(ax)^3 + \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - 6a^2 \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right) \\
&= 2a^2 \cosh^{-1}(ax)^3 + \frac{2a\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3}{x} - \frac{\cosh^{-1}(ax)^4}{2x^2} - 6a^2 \cosh^{-1}(ax)^2 \log \left(1 + e^{2 \cosh^{-1}(ax)} \right)
\end{aligned}$$

Mathematica [A] time = 1.07254, size = 112, normalized size = 0.97

$$a^2 \left(6 \cosh^{-1}(ax) \text{PolyLog} \left(2, -e^{-2 \cosh^{-1}(ax)} \right) + 3 \text{PolyLog} \left(3, -e^{-2 \cosh^{-1}(ax)} \right) + 2 \cosh^{-1}(ax) \right)^2 \frac{\sqrt{\frac{ax-1}{ax+1}} (ax+1) \cosh^{-1}(ax)}{ax}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^4/x^3,x]

[Out] $-\text{ArcCosh}[a*x]^4/(2*x^2) + a^2*(2*\text{ArcCosh}[a*x]^2*(-\text{ArcCosh}[a*x] + (\text{Sqrt}[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*\text{ArcCosh}[a*x])/ (a*x) - 3*\text{Log}[1 + E^{(-2*\text{ArcCosh}[a*x])}]) + 6*\text{ArcCosh}[a*x]*\text{PolyLog}[2, -E^{(-2*\text{ArcCosh}[a*x])}] + 3*\text{PolyLog}[3, -E^{(-2*\text{ArcCosh}[a*x])}]])$

Maple [A] time = 0.071, size = 149, normalized size = 1.3

$$2a^2 (\text{arccosh}(ax))^3 - \frac{(\text{arccosh}(ax))^4}{2x^2} - 6a^2 (\text{arccosh}(ax))^2 \ln \left(1 + \left(ax + \sqrt{ax-1} \sqrt{ax+1} \right)^2 \right) - 6a^2 \text{arccosh}(ax) \text{po}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^4/x^3,x)

[Out] $2*a^2*\text{arccosh}(a*x)^3 - 1/2*\text{arccosh}(a*x)^4/x^2 - 6*a^2*\text{arccosh}(a*x)^2*\ln(1 + (a*x + (a*x-1)^{(1/2)}*(a*x+1)^{(1/2)})^2) - 6*a^2*\text{arccosh}(a*x)*\text{polylog}(2, -(a*x + (a*x-1)^{(1/2)}*(a*x+1)^{(1/2)})^2) + 3*a^2*\text{polylog}(3, -(a*x + (a*x-1)^{(1/2)}*(a*x+1)^{(1/2)})^2) + 2*a*\text{arccosh}(a*x)^3*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}/x$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^4}{2x^2} + \int \frac{2(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a) \log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{a^3x^5 - ax^3 + (a^2x^4 - x^2)\sqrt{ax+1}\sqrt{ax-1}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4/x^3,x, algorithm="maxima")

[Out] $-1/2*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))^4/x^2 + \text{integrate}(2*(a^3*x^2 + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1)*a^2*x - a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))^3/(a^3*x^5 - a*x^3 + (a^2*x^4 - x^2)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1)), x)$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral} \left(\frac{\text{arcosh}(ax)^4}{x^3}, x \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^4/x^3,x, algorithm="fricas")

[Out] `integral(arccosh(a*x)^4/x^3, x)`

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^4(ax)}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(acosh(a*x)**4/x**3,x)`

[Out] `Integral(acosh(a*x)**4/x**3, x)`

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^4}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^4/x^3,x, algorithm="giac")`

[Out] `integrate(arccosh(a*x)^4/x^3, x)`

3.41 $\int \frac{\cosh^{-1}(ax)^4}{x^4} dx$

Optimal. Leaf size=268

$$-2ia^3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 2ia^3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 4ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 4ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right)$$

```
[Out] (2*a^2*ArcCosh[a*x]^2)/x + (2*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(3*x^2) - ArcCosh[a*x]^4/(3*x^3) - 8*a^3*ArcCosh[a*x]*ArcTan[E^ArcCosh[a*x]] + (4*a^3*ArcCosh[a*x]^3*ArcTan[E^ArcCosh[a*x]])/3 + (4*I)*a^3*PolyLog[2, (-I)*E^ArcCosh[a*x]] - (2*I)*a^3*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcCosh[a*x]] - (4*I)*a^3*PolyLog[2, I*E^ArcCosh[a*x]] + (2*I)*a^3*ArcCosh[a*x]^2*PolyLog[2, I*E^ArcCosh[a*x]] + (4*I)*a^3*ArcCosh[a*x]*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (4*I)*a^3*ArcCosh[a*x]*PolyLog[3, I*E^ArcCosh[a*x]] - (4*I)*a^3*PolyLog[4, (-I)*E^ArcCosh[a*x]] + (4*I)*a^3*PolyLog[4, I*E^ArcCosh[a*x]]
```

Rubi [A] time = 0.80247, antiderivative size = 268, normalized size of antiderivative = 1., number of steps used = 19, number of rules used = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.$, Rules used = {5662, 5748, 5761, 4180, 2531, 6609, 2282, 6589, 2279, 2391}

$$-2ia^3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 2ia^3 \cosh^{-1}(ax)^2 \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right) + 4ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, -ie^{\cosh^{-1}(ax)}\right) + 4ia^3 \cosh^{-1}(ax) \text{PolyLog}\left(2, ie^{\cosh^{-1}(ax)}\right)$$

Antiderivative was successfully verified.

```
[In] Int[ArcCosh[a*x]^4/x^4, x]
```

```
[Out] (2*a^2*ArcCosh[a*x]^2)/x + (2*a*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^3)/(3*x^2) - ArcCosh[a*x]^4/(3*x^3) - 8*a^3*ArcCosh[a*x]*ArcTan[E^ArcCosh[a*x]] + (4*a^3*ArcCosh[a*x]^3*ArcTan[E^ArcCosh[a*x]])/3 + (4*I)*a^3*PolyLog[2, (-I)*E^ArcCosh[a*x]] - (2*I)*a^3*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcCosh[a*x]] - (4*I)*a^3*PolyLog[2, I*E^ArcCosh[a*x]] + (2*I)*a^3*ArcCosh[a*x]^2*PolyLog[2, I*E^ArcCosh[a*x]] + (4*I)*a^3*ArcCosh[a*x]*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (4*I)*a^3*ArcCosh[a*x]*PolyLog[3, I*E^ArcCosh[a*x]] - (4*I)*a^3*PolyLog[4, (-I)*E^ArcCosh[a*x]] + (4*I)*a^3*PolyLog[4, I*E^ArcCosh[a*x]]
```

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((d_.)*(x_))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c^n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]
```

Rule 5748

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_))^(m_)*((d1_) + (e1_.)*(x_))^(p_)*((d2_) + (e2_.)*(x_))^(p_), x_Symbol]
:> Simp[((f*x)^(m + 1)*(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(d1*d2*f*(m + 1)), x] + (Dist[(c^2*(m + 2*p + 3))/(f^2*(m + 1)), Int[(f*x)^(m + 2)*(d1 + e1*x)^p*(d2 + e2*x)^p*(a + b*ArcCosh[c*x])^n, x], x] + Dist[(b*c*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(f*(m + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(f*x)^(m + 1)*(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && LtQ[m, -1] && IntegerQ[m] && IntegerQ[p + 1/2]
```

Rule 5761

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)*(x_)^(m_))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] := Dist[1/(c^(m + 1)*Sqrt[-(d1*d2)]), Subst[Int[(a + b*x)^n*Cosh[x]^m, x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IGtQ[n, 0] && GtQ[d1, 0] && LtQ[d2, 0] && IntegerQ[m]
```

Rule 4180

```
Int[csc[(e_.) + Pi*(k_.) + (Complex[0, fz_])*(f_.)*(x_)]*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp[(-2*(c + d*x)^m*ArcTanh[E^(-I*e) + f*fz*x]/E^(I*k*Pi))]/(f*fz*I), x] + (-Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 - E^(-I*e) + f*fz*x]/E^(I*k*Pi)], x], x] + Dist[(d*m)/(f*fz*I), Int[(c + d*x)^(m - 1)*Log[1 + E^(-I*e) + f*fz*x]/E^(I*k*Pi)], x], x] /; FreeQ[{c, d, e, f, fz}, x] && IntegerQ[2*k] && IGtQ[m, 0]
```

Rule 2531

```
Int[Log[1 + (e_.)*((F_)^(c_.)*((a_.) + (b_.)*(x_)))^(n_.)]*((f_.) + (g_.)*(x_))^(m_.), x_Symbol] := -Simp[((f + g*x)^m*PolyLog[2, -(e*(F^(c*(a + b*x))))^n]]/(b*c*n*Log[F]), x] + Dist[(g*m)/(b*c*n*Log[F]), Int[(f + g*x)^(m - 1)*PolyLog[2, -(e*(F^(c*(a + b*x))))^n]], x], x] /; FreeQ[{F, a, b, c, e, f, g, n}, x] && GtQ[m, 0]
```

Rule 6609

```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^(c_.)*((a_.) + (b_.)*(x_)))^(p_.)], x_Symbol] := Simp[((e + f*x)^m*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p]]/(b*c*p*Log[F]), x] - Dist[(f*m)/(b*c*p*Log[F]), Int[(e + f*x)^(m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p]], x], x] /; FreeQ[{F, a, b, c, d, e, f, n, p}, x] && GtQ[m, 0]
```

Rule 2282

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x], Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; FunctionOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))* (F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rule 6589

```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_Symbol] := Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d, e, n, p}, x] && EqQ[b*d, a*e]
```

Rule 2279

```
Int[Log[(a_) + (b_.)*((F_)^(e_.)*((c_.) + (d_.)*(x_)))^(n_.)], x_Symbol] := Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x)))^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]
```

Rule 2391

```
Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] := -Simp[PolyLog[2, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cosh^{-1}(ax)^4}{x^4} dx &= -\frac{\cosh^{-1}(ax)^4}{3x^3} + \frac{1}{3}(4a) \int \frac{\cosh^{-1}(ax)^3}{x^3\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} - (2a^2) \int \frac{\cosh^{-1}(ax)^2}{x^2} dx + \frac{1}{3}(2a^3) \int \frac{\cosh^{-1}(ax)}{x\sqrt{-1+ax}} dx \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} + \frac{1}{3}(2a^3) \text{Subst}\left(\int x^3 \text{sech}^{-1}(x) dx, x, \frac{1+ax}{2}\right) \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} + \frac{4}{3}a^3\cosh^{-1}(ax)^3 \tan^{-1}\left(\frac{e^{\cosh^{-1}(ax)}}{1+e^{\cosh^{-1}(ax)}}\right) \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} - 8a^3\cosh^{-1}(ax) \tan^{-1}\left(\frac{e^{\cosh^{-1}(ax)}}{1+e^{\cosh^{-1}(ax)}}\right) \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} - 8a^3\cosh^{-1}(ax) \tan^{-1}\left(\frac{e^{\cosh^{-1}(ax)}}{1+e^{\cosh^{-1}(ax)}}\right) \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} - 8a^3\cosh^{-1}(ax) \tan^{-1}\left(\frac{e^{\cosh^{-1}(ax)}}{1+e^{\cosh^{-1}(ax)}}\right) \\
&= \frac{2a^2\cosh^{-1}(ax)^2}{x} + \frac{2a\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3}{3x^2} - \frac{\cosh^{-1}(ax)^4}{3x^3} - 8a^3\cosh^{-1}(ax) \tan^{-1}\left(\frac{e^{\cosh^{-1}(ax)}}{1+e^{\cosh^{-1}(ax)}}\right)
\end{aligned}$$

Mathematica [B] time = 3.07534, size = 595, normalized size = 2.22

$$a^3 \left(\frac{1}{2}i(-4\cosh^{-1}(ax)^2 - 4i\pi\cosh^{-1}(ax) + \pi^2 + 8) \text{PolyLog}\left(2, -ie^{-\cosh^{-1}(ax)}\right) - \frac{1}{96}i \left(192\cosh^{-1}(ax)^2 \text{PolyLog}\left(2, -ie^{-\cosh^{-1}(ax)}\right) \right. \right.$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^4/x^4, x]

[Out] a^3*((I/2)*(8 + Pi^2 - (4*I)*Pi*ArcCosh[a*x] - 4*ArcCosh[a*x]^2)*PolyLog[2, (-I)/E^ArcCosh[a*x]] - (I/96)*(7*Pi^4 + (8*I)*Pi^3*ArcCosh[a*x] + 24*Pi^2*ArcCosh[a*x]^2 + ((192*I)*ArcCosh[a*x]^2)/(a*x) - (32*I)*Pi*ArcCosh[a*x]^3 + ((64*I)*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*ArcCosh[a*x]^3)/(a^2*x^2) - 16*ArcCosh[a*x]^4 - ((32*I)*ArcCosh[a*x]^4)/(a^3*x^3) - 384*ArcCosh[a*x]*Log[1 - I/E^ArcCosh[a*x]] + (8*I)*Pi^3*Log[1 + I/E^ArcCosh[a*x]] + 384*ArcCosh[a*x]*Log[1 + I/E^ArcCosh[a*x]] + 48*Pi^2*ArcCosh[a*x]*Log[1 + I/E^ArcCosh[a*x]] - (96*I)*Pi*ArcCosh[a*x]^2*Log[1 + I/E^ArcCosh[a*x]] - 64*ArcCosh[a*x]^3*Log[1 + I/E^ArcCosh[a*x]] - 48*Pi^2*ArcCosh[a*x]*Log[1 - I/E^ArcCosh[a*x]] + (96*I)*Pi*ArcCosh[a*x]^2*Log[1 - I/E^ArcCosh[a*x]] - (8*I)*Pi^3*Log[1 + I/E^ArcCosh[a*x]] + 64*ArcCosh[a*x]^3*Log[1 + I/E^ArcCosh[a*x]] + (8*I)*Pi^3*Log[Tan[(Pi + (2*I)*ArcCosh[a*x])/4]] + 384*PolyLog[2, I/E^ArcCosh[a*x]] + 192*ArcCosh[a*x]^2*PolyLog[2, (-I)*E^ArcCosh[a*x]] - 48*Pi^2*PolyLog[2, I*E^ArcCosh[a*x]] + (192*I)*Pi*ArcCosh[a*x]*PolyLog[2, I*E^ArcCosh[a*x]] + (192*I)*Pi*PolyLog[3, (-I)/E^ArcCosh[a*x]] + 384*ArcCosh[a*x]*PolyLog[3, (-I)/E^ArcCosh[a*x]] - 384*ArcCosh[a*x]*PolyLog[3, (-I)*E^ArcCosh[a*x]] - (192*I)*Pi*PolyLog[3, I*E^ArcCosh[a*x]] + 384*PolyLog[4, (-I)/E^ArcCosh[a*x]] + 384*PolyLog[4, (-I)*E^ArcCosh[a*x]]))

Maple [F] time = 0.181, size = 0, normalized size = 0.

$$\int \frac{(\text{arccosh}(ax))^4}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(arccosh(a*x)^4/x^4,x)`

[Out] `int(arccosh(a*x)^4/x^4,x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$-\frac{\log(ax + \sqrt{ax+1}\sqrt{ax-1})^4}{3x^3} + \int \frac{4(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})^3}{3(a^3x^6 - ax^4 + (a^2x^5 - x^3)\sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^4/x^4,x, algorithm="maxima")`

[Out] `-1/3*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^4/x^3 + integrate(4/3*(a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3/(a^3*x^6 - a*x^4 + (a^2*x^5 - x^3)*sqrt(a*x + 1)*sqrt(a*x - 1)), x)`

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{\text{arcosh}(ax)^4}{x^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^4/x^4,x, algorithm="fricas")`

[Out] `integral(arccosh(a*x)^4/x^4, x)`

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{acosh}^4(ax)}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(acosh(a*x)**4/x**4,x)`

[Out] `Integral(acosh(a*x)**4/x**4, x)`

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{\text{arcosh}(ax)^4}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^4/x^4,x, algorithm="giac")`

[Out] `integrate(arccosh(a*x)^4/x^4, x)`

$$3.42 \quad \int \frac{x^6}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=55

$$\frac{5\text{Shi}(\cosh^{-1}(ax))}{64a^7} + \frac{9\text{Shi}(3 \cosh^{-1}(ax))}{64a^7} + \frac{5\text{Shi}(5 \cosh^{-1}(ax))}{64a^7} + \frac{\text{Shi}(7 \cosh^{-1}(ax))}{64a^7}$$

[Out] (5*SinhIntegral[ArcCosh[a*x]])/(64*a^7) + (9*SinhIntegral[3*ArcCosh[a*x]])/(64*a^7) + (5*SinhIntegral[5*ArcCosh[a*x]])/(64*a^7) + SinhIntegral[7*ArcCosh[a*x]]/(64*a^7)

Rubi [A] time = 0.0960031, antiderivative size = 55, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5670, 5448, 3298}

$$\frac{5\text{Shi}(\cosh^{-1}(ax))}{64a^7} + \frac{9\text{Shi}(3 \cosh^{-1}(ax))}{64a^7} + \frac{5\text{Shi}(5 \cosh^{-1}(ax))}{64a^7} + \frac{\text{Shi}(7 \cosh^{-1}(ax))}{64a^7}$$

Antiderivative was successfully verified.

[In] Int[x^6/ArcCosh[a*x], x]

[Out] (5*SinhIntegral[ArcCosh[a*x]])/(64*a^7) + (9*SinhIntegral[3*ArcCosh[a*x]])/(64*a^7) + (5*SinhIntegral[5*ArcCosh[a*x]])/(64*a^7) + SinhIntegral[7*ArcCosh[a*x]]/(64*a^7)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^(m_.), x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned}
\int \frac{x^6}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^6(x) \sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^7} \\
&= \frac{\text{Subst}\left(\int \left(\frac{5 \sinh(x)}{64x} + \frac{9 \sinh(3x)}{64x} + \frac{5 \sinh(5x)}{64x} + \frac{\sinh(7x)}{64x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^7} \\
&= \frac{\text{Subst}\left(\int \frac{\sinh(7x)}{x} dx, x, \cosh^{-1}(ax)\right)}{64a^7} + \frac{5 \text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{64a^7} + \frac{5 \text{Subst}\left(\int \frac{\sinh(5x)}{x} dx, x, \cosh^{-1}(ax)\right)}{64a^7} \\
&= \frac{5 \text{Shi}\left(\cosh^{-1}(ax)\right)}{64a^7} + \frac{9 \text{Shi}\left(3 \cosh^{-1}(ax)\right)}{64a^7} + \frac{5 \text{Shi}\left(5 \cosh^{-1}(ax)\right)}{64a^7} + \frac{\text{Shi}\left(7 \cosh^{-1}(ax)\right)}{64a^7}
\end{aligned}$$

Mathematica [A] time = 0.0946018, size = 40, normalized size = 0.73

$$\frac{5 \text{Shi}\left(\cosh^{-1}(ax)\right) + 9 \text{Shi}\left(3 \cosh^{-1}(ax)\right) + 5 \text{Shi}\left(5 \cosh^{-1}(ax)\right) + \text{Shi}\left(7 \cosh^{-1}(ax)\right)}{64a^7}$$

Antiderivative was successfully verified.

[In] Integrate[x^6/ArcCosh[a*x], x]

[Out] (5*SinhIntegral[ArcCosh[a*x]] + 9*SinhIntegral[3*ArcCosh[a*x]] + 5*SinhIntegral[5*ArcCosh[a*x]] + SinhIntegral[7*ArcCosh[a*x]])/(64*a^7)

Maple [A] time = 0.039, size = 40, normalized size = 0.7

$$\frac{1}{a^7} \left(\frac{5 \text{Shi}(\text{arccosh}(ax))}{64} + \frac{9 \text{Shi}(3 \text{arccosh}(ax))}{64} + \frac{5 \text{Shi}(5 \text{arccosh}(ax))}{64} + \frac{\text{Shi}(7 \text{arccosh}(ax))}{64} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^6/arccosh(a*x), x)

[Out] 1/a^7*(5/64*Shi(arccosh(a*x))+9/64*Shi(3*arccosh(a*x))+5/64*Shi(5*arccosh(a*x))+1/64*Shi(7*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^6}{\text{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^6/arccosh(a*x), x, algorithm="maxima")

[Out] integrate(x^6/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^6}{\text{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^6/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^6/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^6}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**6/acosh(a*x),x)

[Out] Integral(x**6/acosh(a*x), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^6}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^6/arccosh(a*x),x, algorithm="giac")

[Out] integrate(x^6/arccosh(a*x), x)

$$3.43 \quad \int \frac{x^5}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=43

$$\frac{5\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{32a^6} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^6} + \frac{\text{Shi}\left(6 \cosh^{-1}(ax)\right)}{32a^6}$$

[Out] (5*SinhIntegral[2*ArcCosh[a*x]])/(32*a^6) + SinhIntegral[4*ArcCosh[a*x]]/(8*a^6) + SinhIntegral[6*ArcCosh[a*x]]/(32*a^6)

Rubi [A] time = 0.0841293, antiderivative size = 43, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5670, 5448, 3298}

$$\frac{5\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{32a^6} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^6} + \frac{\text{Shi}\left(6 \cosh^{-1}(ax)\right)}{32a^6}$$

Antiderivative was successfully verified.

[In] Int[x^5/ArcCosh[a*x], x]

[Out] (5*SinhIntegral[2*ArcCosh[a*x]])/(32*a^6) + SinhIntegral[4*ArcCosh[a*x]]/(8*a^6) + SinhIntegral[6*ArcCosh[a*x]]/(32*a^6)

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Dist[
1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^ (m_.)*Sinh[(a_.) +
(b_.)*(x_.)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a +
b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &
& IGtQ[p, 0]
```

Rule 3298

```
Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbo
l] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f
, fz}, x] && EqQ[d*e - c*f*fz*I, 0]
```

Rubi steps

$$\begin{aligned}
\int \frac{x^5}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^5(x)\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^6} \\
&= \frac{\text{Subst}\left(\int \left(\frac{5\sinh(2x)}{32x} + \frac{\sinh(4x)}{8x} + \frac{\sinh(6x)}{32x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^6} \\
&= \frac{\text{Subst}\left(\int \frac{\sinh(6x)}{x} dx, x, \cosh^{-1}(ax)\right)}{32a^6} + \frac{\text{Subst}\left(\int \frac{\sinh(4x)}{x} dx, x, \cosh^{-1}(ax)\right)}{8a^6} + \frac{5 \text{Subst}\left(\int \frac{\sinh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{32a^6} \\
&= \frac{5\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{32a^6} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^6} + \frac{\text{Shi}\left(6 \cosh^{-1}(ax)\right)}{32a^6}
\end{aligned}$$

Mathematica [A] time = 0.0828145, size = 33, normalized size = 0.77

$$\frac{5\text{Shi}\left(2 \cosh^{-1}(ax)\right) + 4\text{Shi}\left(4 \cosh^{-1}(ax)\right) + \text{Shi}\left(6 \cosh^{-1}(ax)\right)}{32a^6}$$

Antiderivative was successfully verified.

[In] Integrate[x^5/ArcCosh[a*x], x]

[Out] (5*SinhIntegral[2*ArcCosh[a*x]] + 4*SinhIntegral[4*ArcCosh[a*x]] + SinhIntegral[6*ArcCosh[a*x]])/(32*a^6)

Maple [A] time = 0.033, size = 33, normalized size = 0.8

$$\frac{1}{a^6} \left(\frac{5 \text{Shi}(2 \operatorname{arccosh}(ax))}{32} + \frac{\text{Shi}(4 \operatorname{arccosh}(ax))}{8} + \frac{\text{Shi}(6 \operatorname{arccosh}(ax))}{32} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^5/arccosh(a*x), x)

[Out] 1/a^6*(5/32*Shi(2*arccosh(a*x))+1/8*Shi(4*arccosh(a*x))+1/32*Shi(6*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^5}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^5/arccosh(a*x), x, algorithm="maxima")

[Out] integrate(x^5/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{x^5}{\operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^5/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^5/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^5}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**5/acosh(a*x),x)

[Out] Integral(x**5/acosh(a*x), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^5}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^5/arccosh(a*x),x, algorithm="giac")

[Out] integrate(x^5/arccosh(a*x), x)

$$3.44 \quad \int \frac{x^4}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=41

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{8a^5} + \frac{3\text{Shi}(3\cosh^{-1}(ax))}{16a^5} + \frac{\text{Shi}(5\cosh^{-1}(ax))}{16a^5}$$

[Out] SinhIntegral[ArcCosh[a*x]]/(8*a^5) + (3*SinhIntegral[3*ArcCosh[a*x]])/(16*a^5) + SinhIntegral[5*ArcCosh[a*x]]/(16*a^5)

Rubi [A] time = 0.0801527, antiderivative size = 41, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5670, 5448, 3298}

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{8a^5} + \frac{3\text{Shi}(3\cosh^{-1}(ax))}{16a^5} + \frac{\text{Shi}(5\cosh^{-1}(ax))}{16a^5}$$

Antiderivative was successfully verified.

[In] Int[x^4/ArcCosh[a*x],x]

[Out] SinhIntegral[ArcCosh[a*x]]/(8*a^5) + (3*SinhIntegral[3*ArcCosh[a*x]])/(16*a^5) + SinhIntegral[5*ArcCosh[a*x]]/(16*a^5)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^n*(x_)^m, x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sinh[(a_.) + (b_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] & IGtQ[p, 0]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned}
\int \frac{x^4}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^4(x) \sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= \frac{\text{Subst}\left(\int \left(\frac{\sinh(x)}{8x} + \frac{3\sinh(3x)}{16x} + \frac{\sinh(5x)}{16x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= \frac{\text{Subst}\left(\int \frac{\sinh(5x)}{x} dx, x, \cosh^{-1}(ax)\right)}{16a^5} + \frac{\text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \frac{3 \text{Subst}\left(\int \frac{\sinh(3x)}{x} dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\
&= \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{8a^5} + \frac{3\text{Shi}\left(3 \cosh^{-1}(ax)\right)}{16a^5} + \frac{\text{Shi}\left(5 \cosh^{-1}(ax)\right)}{16a^5}
\end{aligned}$$

Mathematica [A] time = 0.0713324, size = 31, normalized size = 0.76

$$\frac{2\text{Shi}\left(\cosh^{-1}(ax)\right) + 3\text{Shi}\left(3 \cosh^{-1}(ax)\right) + \text{Shi}\left(5 \cosh^{-1}(ax)\right)}{16a^5}$$

Antiderivative was successfully verified.

[In] Integrate[x^4/ArcCosh[a*x], x]

[Out] (2*SinhIntegral[ArcCosh[a*x]] + 3*SinhIntegral[3*ArcCosh[a*x]] + SinhIntegral[5*ArcCosh[a*x]])/(16*a^5)

Maple [A] time = 0.026, size = 31, normalized size = 0.8

$$\frac{1}{a^5} \left(\frac{\text{Shi}(\text{arccosh}(ax))}{8} + \frac{3 \text{Shi}(3 \text{arccosh}(ax))}{16} + \frac{\text{Shi}(5 \text{arccosh}(ax))}{16} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4/arccosh(a*x), x)

[Out] 1/a^5*(1/8*Shi(arccosh(a*x))+3/16*Shi(3*arccosh(a*x))+1/16*Shi(5*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\text{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x), x, algorithm="maxima")

[Out] integrate(x^4/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^4}{\text{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4/arccosh(a*x),x, algorithm="fricas")
```

```
[Out] integral(x^4/arccosh(a*x), x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**4/acosh(a*x),x)
```

```
[Out] Integral(x**4/acosh(a*x), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4/arccosh(a*x),x, algorithm="giac")
```

```
[Out] integrate(x^4/arccosh(a*x), x)
```

$$3.45 \quad \int \frac{x^3}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=29

$$\frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{4a^4} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^4}$$

[Out] SinhIntegral[2*ArcCosh[a*x]]/(4*a^4) + SinhIntegral[4*ArcCosh[a*x]]/(8*a^4)

Rubi [A] time = 0.0655709, antiderivative size = 29, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5670, 5448, 3298}

$$\frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{4a^4} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^4}$$

Antiderivative was successfully verified.

[In] Int[x^3/ArcCosh[a*x], x]

[Out] SinhIntegral[2*ArcCosh[a*x]]/(4*a^4) + SinhIntegral[4*ArcCosh[a*x]]/(8*a^4)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^ (m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] & IGtQ[p, 0]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] := Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^3(x) \sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= \frac{\text{Subst}\left(\int \left(\frac{\sinh(2x)}{4x} + \frac{\sinh(4x)}{8x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(4x)}{x} dx, x, \cosh^{-1}(ax)\right)}{8a^4} + \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{4a^4} \\ &= \frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{4a^4} + \frac{\text{Shi}\left(4 \cosh^{-1}(ax)\right)}{8a^4} \end{aligned}$$

Mathematica [A] time = 0.06114, size = 24, normalized size = 0.83

$$\frac{2\text{Shi}\left(2\cosh^{-1}(ax)\right) + \text{Shi}\left(4\cosh^{-1}(ax)\right)}{8a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3/ArcCosh[a*x],x]

[Out] (2*SinhIntegral[2*ArcCosh[a*x]] + SinhIntegral[4*ArcCosh[a*x]])/(8*a^4)

Maple [A] time = 0.027, size = 24, normalized size = 0.8

$$\frac{1}{a^4} \left(\frac{\text{Shi}(2 \operatorname{arccosh}(ax))}{4} + \frac{\text{Shi}(4 \operatorname{arccosh}(ax))}{8} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x),x)

[Out] 1/a^4*(1/4*Shi(2*arccosh(a*x))+1/8*Shi(4*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(x^3/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{x^3}{\operatorname{arccosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^3/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3/acosh(a*x),x)
```

```
[Out] Integral(x**3/acosh(a*x), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3/arccosh(a*x),x, algorithm="giac")
```

```
[Out] integrate(x^3/arccosh(a*x), x)
```

$$3.46 \quad \int \frac{x^2}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=27

$$\frac{\operatorname{Shi}(\cosh^{-1}(ax))}{4a^3} + \frac{\operatorname{Shi}(3 \cosh^{-1}(ax))}{4a^3}$$

[Out] SinhIntegral[ArcCosh[a*x]]/(4*a^3) + SinhIntegral[3*ArcCosh[a*x]]/(4*a^3)

Rubi [A] time = 0.0640484, antiderivative size = 27, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5670, 5448, 3298}

$$\frac{\operatorname{Shi}(\cosh^{-1}(ax))}{4a^3} + \frac{\operatorname{Shi}(3 \cosh^{-1}(ax))}{4a^3}$$

Antiderivative was successfully verified.

[In] Int[x^2/ArcCosh[a*x], x]

[Out] SinhIntegral[ArcCosh[a*x]]/(4*a^3) + SinhIntegral[3*ArcCosh[a*x]]/(4*a^3)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_*(x_)^m_., x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^p_.*((c_.) + (d_.)*(x_.))^m_*Sinh[(a_.) + (b_.)*(x_.)]^n_., x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] & IGtQ[p, 0]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]]/((c_.) + (d_.)*(x_.)), x_Symbol] := Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\cosh^{-1}(ax)} dx &= \frac{\operatorname{Subst}\left(\int \frac{\cosh^2(x) \sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^3} \\ &= \frac{\operatorname{Subst}\left(\int \left(\frac{\sinh(x)}{4x} + \frac{\sinh(3x)}{4x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^3} \\ &= \frac{\operatorname{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \frac{\operatorname{Subst}\left(\int \frac{\sinh(3x)}{x} dx, x, \cosh^{-1}(ax)\right)}{4a^3} \\ &= \frac{\operatorname{Shi}(\cosh^{-1}(ax))}{4a^3} + \frac{\operatorname{Shi}(3 \cosh^{-1}(ax))}{4a^3} \end{aligned}$$

Mathematica [A] time = 0.0523676, size = 20, normalized size = 0.74

$$\frac{\operatorname{Shi}(\cosh^{-1}(ax)) + \operatorname{Shi}(3 \cosh^{-1}(ax))}{4a^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2/ArcCosh[a*x],x]

[Out] (SinhIntegral[ArcCosh[a*x]] + SinhIntegral[3*ArcCosh[a*x]])/(4*a^3)

Maple [A] time = 0.03, size = 22, normalized size = 0.8

$$\frac{1}{a^3} \left(\frac{\operatorname{Shi}(\operatorname{arccosh}(ax))}{4} + \frac{\operatorname{Shi}(3 \operatorname{arccosh}(ax))}{4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x),x)

[Out] 1/a^3*(1/4*Shi(arccosh(a*x))+1/4*Shi(3*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(x^2/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{x^2}{\operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^2/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.


```
[In] integrate(x**2/acosh(a*x),x)
```

```
[Out] Integral(x**2/acosh(a*x), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2/arccosh(a*x),x, algorithm="giac")
```

```
[Out] integrate(x^2/arccosh(a*x), x)
```

$$3.47 \quad \int \frac{x}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=14

$$\frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{2a^2}$$

[Out] SinhIntegral[2*ArcCosh[a*x]]/(2*a^2)

Rubi [A] time = 0.0369433, antiderivative size = 14, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5670, 5448, 12, 3298}

$$\frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{2a^2}$$

Antiderivative was successfully verified.

[In] Int[x/ArcCosh[a*x], x]

[Out] SinhIntegral[2*ArcCosh[a*x]]/(2*a^2)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] & IGtQ[p, 0]

Rule 12

Int[(a_.)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_.)*(v_)] /; FreeQ[b, x]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned}
\int \frac{x}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\
&= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{2x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\
&= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{2a^2} \\
&= \frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{2a^2}
\end{aligned}$$

Mathematica [A] time = 0.0218729, size = 14, normalized size = 1.

$$\frac{\text{Shi}\left(2 \cosh^{-1}(ax)\right)}{2a^2}$$

Antiderivative was successfully verified.

[In] Integrate[x/ArcCosh[a*x],x]

[Out] SinhIntegral[2*ArcCosh[a*x]]/(2*a^2)

Maple [A] time = 0.024, size = 13, normalized size = 0.9

$$\frac{\text{Shi}\left(2 \operatorname{arccosh}(ax)\right)}{2a^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x),x)

[Out] 1/2*Shi(2*arccosh(a*x))/a^2

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(x/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{x}{\operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/acosh(a*x),x)

[Out] Integral(x/acosh(a*x), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x),x, algorithm="giac")

[Out] integrate(x/arccosh(a*x), x)

$$3.48 \quad \int \frac{1}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=9

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{a}$$

[Out] SinhIntegral[ArcCosh[a*x]]/a

Rubi [A] time = 0.0171132, antiderivative size = 9, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {5658, 3298}

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{a}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^(-1),x]

[Out] SinhIntegral[ArcCosh[a*x]]/a

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_), x_Symbol] :> -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{1}{\cosh^{-1}(ax)} dx &= \frac{\text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a} \\ &= \frac{\text{Shi}(\cosh^{-1}(ax))}{a} \end{aligned}$$

Mathematica [A] time = 0.0224391, size = 9, normalized size = 1.

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{a}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^(-1),x]

[Out] SinhIntegral[ArcCosh[a*x]]/a

Maple [A] time = 0.021, size = 10, normalized size = 1.1

$$\frac{\text{Shi}(\text{arccosh}(ax))}{a}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x),x)

[Out] Shi(arccosh(a*x))/a

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(1/arccosh(a*x), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{\text{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x),x, algorithm="fricas")

[Out] integral(1/arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/acosh(a*x),x)

[Out] Integral(1/acosh(a*x), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/arccosh(a*x),x, algorithm="giac")
```

```
[Out] integrate(1/arccosh(a*x), x)
```

$$3.49 \quad \int \frac{1}{x \cosh^{-1}(ax)} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]), x]

Rubi [A] time = 0.0138482, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)} dx = \int \frac{1}{x \cosh^{-1}(ax)} dx$$

Mathematica [A] time = 0.19446, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]), x]

[Out] Integrate[1/(x*ArcCosh[a*x]), x]

Maple [A] time = 0.065, size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x), x)

[Out] int(1/x/arccosh(a*x), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(1/(x*arccosh(a*x)), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{1}{x \operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x),x, algorithm="fricas")

[Out] integral(1/(x*arccosh(a*x)), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x),x)

[Out] Integral(1/(x*acosh(a*x)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x),x, algorithm="giac")

[Out] integrate(1/(x*arccosh(a*x)), x)

$$3.50 \quad \int \frac{1}{x^2 \cosh^{-1}(ax)} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x^2 \cosh^{-1}(ax)}, x\right)$$

[Out] Unintegrable[1/(x^2*ArcCosh[a*x]), x]

Rubi [A] time = 0.01444, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x^2 \cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x^2*ArcCosh[a*x]), x]

[Out] Defer[Int][1/(x^2*ArcCosh[a*x]), x]

Rubi steps

$$\int \frac{1}{x^2 \cosh^{-1}(ax)} dx = \int \frac{1}{x^2 \cosh^{-1}(ax)} dx$$

Mathematica [A] time = 0.420528, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x^2*ArcCosh[a*x]), x]

[Out] Integrate[1/(x^2*ArcCosh[a*x]), x]

Maple [A] time = 0.089, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x^2/arccosh(a*x), x)

[Out] int(1/x^2/arccosh(a*x), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(1/(x^2*arccosh(a*x)), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{1}{x^2 \operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x),x, algorithm="fricas")

[Out] integral(1/(x^2*arccosh(a*x)), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x**2/acosh(a*x),x)

[Out] Integral(1/(x**2*acosh(a*x)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x),x, algorithm="giac")

[Out] integrate(1/(x^2*arccosh(a*x)), x)

3.51 $\int \frac{x^4}{\cosh^{-1}(ax)^2} dx$

Optimal. Leaf size=73

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{8a^5} + \frac{9\text{Chi}(3\cosh^{-1}(ax))}{16a^5} + \frac{5\text{Chi}(5\cosh^{-1}(ax))}{16a^5} - \frac{x^4\sqrt{ax-1}\sqrt{ax+1}}{a\cosh^{-1}(ax)}$$

[Out] $-\left(\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[\text{ArcCosh}[ax]]/(8a^5) + (9\text{CoshIntegral}[3\text{ArcCosh}[ax]])/(16a^5) + (5\text{CoshIntegral}[5\text{ArcCosh}[ax]])/(16a^5)$

Rubi [A] time = 0.0643322, antiderivative size = 73, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.2$, Rules used = {5666, 3301}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{8a^5} + \frac{9\text{Chi}(3\cosh^{-1}(ax))}{16a^5} + \frac{5\text{Chi}(5\cosh^{-1}(ax))}{16a^5} - \frac{x^4\sqrt{ax-1}\sqrt{ax+1}}{a\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] $\text{Int}[x^4/\text{ArcCosh}[ax]^2, x]$

[Out] $-\left(\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[\text{ArcCosh}[ax]]/(8a^5) + (9\text{CoshIntegral}[3\text{ArcCosh}[ax]])/(16a^5) + (5\text{CoshIntegral}[5\text{ArcCosh}[ax]])/(16a^5)$

Rule 5666

$\text{Int}[\left((a_.) + \text{ArcCosh}[c_.](x_.)\right)^{(n_.)}(x_.)^{(m_.)}, x_Symbol] \rightarrow \text{Simp}[x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\text{ArcCosh}[cx])^{(n+1)}]/(b^c(n+1)), x] + \text{Dist}[1/(b^c(m+1)(n+1)), \text{Subst}[\text{Int}[\text{ExpandTrigReduce}[(a+bx)^{(n+1)}\text{Cosh}[x]^{(m-1)}(m-(m+1)\text{Cosh}[x]^2), x], x], x, \text{ArcCosh}[cx]], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

$\text{Int}[\sin[(e_.) + (\text{Complex}[0, fz_])](f_.)(x_.)]/((c_.) + (d_.)(x_.)), x_Symbol] \rightarrow \text{Simp}[\text{CoshIntegral}[(c*f+fz)/d + f*fz*x]/d, x] /;$ FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^4}{\cosh^{-1}(ax)^2} dx &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int\left(-\frac{\cosh(x)}{8x} - \frac{9\cosh(3x)}{16x} - \frac{5\cosh(5x)}{16x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int\frac{\cosh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \frac{5\text{Subst}\left(\int\frac{\cosh(5x)}{x} dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} + \frac{\text{Chi}(\cosh^{-1}(ax))}{8a^5} + \frac{9\text{Chi}(3\cosh^{-1}(ax))}{16a^5} + \frac{5\text{Chi}(5\cosh^{-1}(ax))}{16a^5} \end{aligned}$$

Mathematica [A] time = 0.208964, size = 101, normalized size = 1.38

$$\frac{-16a^5x^5\sqrt{\frac{ax-1}{ax+1}} - 16a^4x^4\sqrt{\frac{ax-1}{ax+1}} + 2\cosh^{-1}(ax)\text{Chi}(\cosh^{-1}(ax)) + 9\cosh^{-1}(ax)\text{Chi}(3\cosh^{-1}(ax)) + 5\cosh^{-1}(ax)\text{Chi}(5\cosh^{-1}(ax))}{16a^5\cosh^{-1}(ax)}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^4/ArcCosh[a*x]^2,x]

[Out] $(-16a^4x^4\sqrt{\frac{-1+a*x}{1+a*x}} - 16a^5x^5\sqrt{\frac{-1+a*x}{1+a*x}} + 2\text{ArcCosh}[a*x]*\text{CoshIntegral}[\text{ArcCosh}[a*x]] + 9\text{ArcCosh}[a*x]*\text{CoshIntegral}[3\text{ArcCosh}[a*x]] + 5\text{ArcCosh}[a*x]*\text{CoshIntegral}[5\text{ArcCosh}[a*x]])/(16a^5\text{ArcCosh}[a*x])$

Maple [A] time = 0.037, size = 83, normalized size = 1.1

$$\frac{1}{a^5} \left(-\frac{1}{8\text{arccosh}(ax)}\sqrt{ax-1}\sqrt{ax+1} + \frac{\text{Chi}(\text{arccosh}(ax))}{8} - \frac{3\sinh(3\text{arccosh}(ax))}{16\text{arccosh}(ax)} + \frac{9\text{Chi}(3\text{arccosh}(ax))}{16} - \frac{\sinh(5\text{arccosh}(ax))}{16\text{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4/arccosh(a*x)^2,x)

[Out] $1/a^5*(-1/8/\text{arccosh}(a*x)*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}+1/8*\text{Chi}(\text{arccosh}(a*x))-3/16/\text{arccosh}(a*x)*\sinh(3*\text{arccosh}(a*x))+9/16*\text{Chi}(3*\text{arccosh}(a*x))-1/16/\text{arccosh}(a*x)*\sinh(5*\text{arccosh}(a*x))+5/16*\text{Chi}(5*\text{arccosh}(a*x)))$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^7 - ax^5 + (a^2x^6 - x^4)\sqrt{ax+1}\sqrt{ax-1}}{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{5a^5x^8 - 10a^3x^6 + 5ax^4 + (5a^3x^6 - 3ax^4)(ax + 1)}{(a^5x^4 + (ax+1)(ax-1)a^3x^2 - 2a^3x^2 + 2(a^4x^3 - a^2x))} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^2,x, algorithm="maxima")

[Out] $-(a^3x^7 - ax^5 + (a^2x^6 - x^4)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^3x^2 + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1)*a^2x - a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))) + \text{integrate}((5*a^5*x^8 - 10*a^3*x^6 + 5*a*x^4 + (5*a^3*x^6 - 3*a*x^4)*(a*x + 1)*(a*x - 1) + (10*a^4*x^7 - 13*a^2*x^5 + 4*x^3)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^5*x^4 + (a*x + 1)*(a*x - 1)*a^3*x^2 - 2*a^3*x^2 + 2*(a^4*x^3 - a^2*x)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1) + a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))), x)$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^4}{\text{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(x^4/arccosh(a*x)^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4/acosh(a*x)**2,x)

[Out] Integral(x**4/acosh(a*x)**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x^4/arccosh(a*x)^2, x)

$$3.52 \quad \int \frac{x^3}{\cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=61

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Chi}\left(4 \cosh^{-1}(ax)\right)}{2a^4} - \frac{x^3 \sqrt{ax-1} \sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

[Out] $-\left(\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{a \text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[2 \text{ArcCosh}[ax]]/(2a^4) + \text{CoshIntegral}[4 \text{ArcCosh}[ax]]/(2a^4)$

Rubi [A] time = 0.0501213, antiderivative size = 61, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.2$, Rules used = {5666, 3301}

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Chi}\left(4 \cosh^{-1}(ax)\right)}{2a^4} - \frac{x^3 \sqrt{ax-1} \sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^3/ArcCosh[a*x]^2,x]

[Out] $-\left(\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{a \text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[2 \text{ArcCosh}[ax]]/(2a^4) + \text{CoshIntegral}[4 \text{ArcCosh}[ax]]/(2a^4)$

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_.)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1+c*x]*Sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + Dist[1/(b*c^(m+1)*(n+1)), Subst[Int[ExpandTrigReduce[(a+b*x)^(n+1)*Cosh[x]^(m-1)*(m-(m+1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\cosh^{-1}(ax)^2} dx &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{a \cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \left(-\frac{\cosh(2x)}{2x} - \frac{\cosh(4x)}{2x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\cosh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Subst}\left(\int \frac{\cosh(4x)}{x} dx, x, \cosh^{-1}(ax)\right)}{2a^4} \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Chi}\left(4 \cosh^{-1}(ax)\right)}{2a^4} \end{aligned}$$

Mathematica [A] time = 0.230709, size = 58, normalized size = 0.95

$$\frac{-\frac{2a^3 x^3 \sqrt{\frac{ax-1}{ax+1}} (ax+1)}{\cosh^{-1}(ax)} + \text{Chi}\left(2 \cosh^{-1}(ax)\right) + \text{Chi}\left(4 \cosh^{-1}(ax)\right)}{2a^4}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/ArcCosh[a*x]^2,x]

[Out] $((-2*a^3*x^3*\text{Sqrt}[(-1 + a*x)/(1 + a*x)]*(1 + a*x))/\text{ArcCosh}[a*x] + \text{CoshIntegral}[2*\text{ArcCosh}[a*x]] + \text{CoshIntegral}[4*\text{ArcCosh}[a*x]])/(2*a^4)$

Maple [A] time = 0.033, size = 54, normalized size = 0.9

$$\frac{1}{a^4} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{4 \operatorname{arccosh}(ax)} + \frac{\operatorname{Chi}(2 \operatorname{arccosh}(ax))}{2} - \frac{\sinh(4 \operatorname{arccosh}(ax))}{8 \operatorname{arccosh}(ax)} + \frac{\operatorname{Chi}(4 \operatorname{arccosh}(ax))}{2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x)^2,x)

[Out] $1/a^4*(-1/4/\operatorname{arccosh}(a*x)*\sinh(2*\operatorname{arccosh}(a*x))+1/2*\operatorname{Chi}(2*\operatorname{arccosh}(a*x))-1/8/\operatorname{arccosh}(a*x)*\sinh(4*\operatorname{arccosh}(a*x))+1/2*\operatorname{Chi}(4*\operatorname{arccosh}(a*x)))$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^6 - ax^4 + (a^2x^5 - x^3)\sqrt{ax+1}\sqrt{ax-1}}{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{4a^5x^7 - 8a^3x^5 + 4ax^3 + 2(2a^3x^5 - ax^3)(ax+1)(a^5x^4 + (ax+1)(ax-1)a^3x^2 - 2a^3x^2 + 2(a^4x^3 - a^2x^2))}{(a^5x^4 + (ax+1)(ax-1)a^3x^2 - 2a^3x^2 + 2(a^4x^3 - a^2x^2))} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x)^2,x, algorithm="maxima")

[Out] $-(a^3*x^6 - a*x^4 + (a^2*x^5 - x^3)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^3*x^2 + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1)*a^2*x - a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))) + \text{integrate}((4*a^5*x^7 - 8*a^3*x^5 + 4*a*x^3 + 2*(2*a^3*x^5 - a*x^3)*(a*x + 1)*(a*x - 1) + (8*a^4*x^6 - 10*a^2*x^4 + 3*x^2)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^5*x^4 + (a*x + 1)*(a*x - 1)*a^3*x^2 - 2*a^3*x^2 + 2*(a^4*x^3 - a^2*x^2)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1) + a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))), x)$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^3}{\operatorname{arccosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(x^3/arccosh(a*x)^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3/acosh(a*x)**2,x)

[Out] Integral(x**3/acosh(a*x)**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x^3/arccosh(a*x)^2, x)

$$3.53 \quad \int \frac{x^2}{\cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=59

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{4a^3} + \frac{3\text{Chi}(3\cosh^{-1}(ax))}{4a^3} - \frac{x^2\sqrt{ax-1}\sqrt{ax+1}}{a\cosh^{-1}(ax)}$$

[Out] $-\left(\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[\text{ArcCosh}[ax]]/(4a^3) + (3\text{CoshIntegral}[3\text{ArcCosh}[ax]])/(4a^3)$

Rubi [A] time = 0.0472113, antiderivative size = 59, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.2$, Rules used = {5666, 3301}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{4a^3} + \frac{3\text{Chi}(3\cosh^{-1}(ax))}{4a^3} - \frac{x^2\sqrt{ax-1}\sqrt{ax+1}}{a\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^2/ArcCosh[a*x]^2,x]

[Out] $-\left(\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[\text{ArcCosh}[ax]]/(4a^3) + (3\text{CoshIntegral}[3\text{ArcCosh}[ax]])/(4a^3)$

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1 + c*x]*sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\cosh^{-1}(ax)^2} dx &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int\left(-\frac{\cosh(x)}{4x} - \frac{3\cosh(3x)}{4x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^3} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int\frac{\cosh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \frac{3\text{Subst}\left(\int\frac{\cosh(3x)}{x} dx, x, \cosh^{-1}(ax)\right)}{4a^3} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\cosh^{-1}(ax)} + \frac{\text{Chi}(\cosh^{-1}(ax))}{4a^3} + \frac{3\text{Chi}(3\cosh^{-1}(ax))}{4a^3} \end{aligned}$$

Mathematica [A] time = 0.226049, size = 58, normalized size = 0.98

$$\frac{-\frac{4a^2x^2\sqrt{\frac{ax-1}{ax+1}}(ax+1)}{\cosh^{-1}(ax)} + \text{Chi}(\cosh^{-1}(ax)) + 3\text{Chi}(3\cosh^{-1}(ax))}{4a^3}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/ArcCosh[a*x]^2,x]

[Out] $((-4*a^2*x^2*\text{Sqrt}[(-1 + a*x)/(1 + a*x)]*(1 + a*x))/\text{ArcCosh}[a*x] + \text{CoshIntegral}[\text{ArcCosh}[a*x]] + 3*\text{CoshIntegral}[3*\text{ArcCosh}[a*x]])/(4*a^3)$

Maple [A] time = 0.03, size = 59, normalized size = 1.

$$\frac{1}{a^3} \left(-\frac{1}{4 \operatorname{arccosh}(ax)} \sqrt{ax-1} \sqrt{ax+1} + \frac{\operatorname{Chi}(\operatorname{arccosh}(ax))}{4} - \frac{\sinh(3 \operatorname{arccosh}(ax))}{4 \operatorname{arccosh}(ax)} + \frac{3 \operatorname{Chi}(3 \operatorname{arccosh}(ax))}{4} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x)^2,x)

[Out] $1/a^3*(-1/4/\operatorname{arccosh}(a*x)*(a*x-1)^{(1/2)}*(a*x+1)^{(1/2)}+1/4*\operatorname{Chi}(\operatorname{arccosh}(a*x))-1/4/\operatorname{arccosh}(a*x)*\sinh(3*\operatorname{arccosh}(a*x))+3/4*\operatorname{Chi}(3*\operatorname{arccosh}(a*x)))$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^5 - ax^3 + (a^2x^4 - x^2)\sqrt{ax+1}\sqrt{ax-1}}{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{3a^5x^6 - 6a^3x^4 + (3a^3x^4 - ax^2)(ax+1)(ax-1)}{(a^5x^4 + (ax+1)(ax-1)a^3x^2 - 2a^3x^2 + 2(a^4x^3 -$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^2,x, algorithm="maxima")

[Out] $-(a^3*x^5 - a*x^3 + (a^2*x^4 - x^2)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^3*x^2 + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1)*a^2*x - a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))) + \text{integrate}((3*a^5*x^6 - 6*a^3*x^4 + (3*a^3*x^4 - a*x^2)*(a*x + 1)*(a*x - 1) + 3*a*x^2 + (6*a^4*x^5 - 7*a^2*x^3 + 2*x)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))/((a^5*x^4 + (a*x + 1)*(a*x - 1)*a^3*x^2 - 2*a^3*x^2 + 2*(a^4*x^3 - a^2*x)*\text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1) + a)*\log(a*x + \text{sqrt}(a*x + 1)*\text{sqrt}(a*x - 1))), x)$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^2}{\operatorname{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(x^2/arccosh(a*x)^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2/acosh(a*x)**2,x)

[Out] Integral(x**2/acosh(a*x)**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x^2/arccosh(a*x)^2, x)

$$3.54 \quad \int \frac{x}{\cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=42

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{a^2} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

[Out] $-\left(\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[2\text{ArcCosh}[ax]]/a^2$

Rubi [A] time = 0.0251702, antiderivative size = 42, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.25$, Rules used = {5666, 3301}

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{a^2} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x/ArcCosh[a*x]^2,x]

[Out] $-\left(\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{a\text{ArcCosh}[ax]}\right) + \text{CoshIntegral}[2\text{ArcCosh}[ax]]/a^2$

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)])/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x}{\cosh^{-1}(ax)^2} dx &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\cosh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{a^2} \end{aligned}$$

Mathematica [A] time = 0.240567, size = 44, normalized size = 1.05

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right) - \frac{ax\sqrt{\frac{ax-1}{ax+1}}(ax+1)}{\cosh^{-1}(ax)}}{a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/ArcCosh[a*x]^2,x]

[Out] $-\left(\frac{a*x*\sqrt{(-1+a*x)/(1+a*x)}}{1+a*x}\right)/\text{ArcCosh}[a*x] + \text{CoshIntegral}[2*\text{ArcCosh}[a*x]]/a^2$

Maple [A] time = 0.026, size = 28, normalized size = 0.7

$$\frac{1}{a^2} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{2 \operatorname{arccosh}(ax)} + \operatorname{Chi}(2 \operatorname{arccosh}(ax)) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^2,x)

[Out] $1/a^2*(-1/2/\operatorname{arccosh}(a*x)*\sinh(2*\operatorname{arccosh}(a*x))+\operatorname{Chi}(2*\operatorname{arccosh}(a*x)))$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^4 - ax^2 + (a^2x^3 - x)\sqrt{ax+1}\sqrt{ax-1}}{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{2a^5x^5 + 2(ax+1)(ax-1)a^3x^3 - 4a^3x^3 + (4a^4x^4 - 4a^2x^2 + 1)\sqrt{ax+1}\sqrt{ax-1} + 2ax}{(a^5x^4 + (ax+1)(ax-1)a^3x^2 - 2a^3x^2 + 2(a^4x^3 - a^2x - a)\log(ax + \sqrt{ax+1}\sqrt{ax-1}))} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^2,x, algorithm="maxima")

[Out] $-(a^3*x^4 - a*x^2 + (a^2*x^3 - x)*\sqrt{a*x + 1}*\sqrt{a*x - 1})/((a^3*x^2 + \sqrt{a*x + 1}*\sqrt{a*x - 1}*a^2*x - a)*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})) + \text{integrate}((2*a^5*x^5 + 2*(a*x + 1)*(a*x - 1)*a^3*x^3 - 4*a^3*x^3 + (4*a^4*x^4 - 4*a^2*x^2 + 1)*\sqrt{a*x + 1}*\sqrt{a*x - 1} + 2*a*x)/((a^5*x^4 + (a*x + 1)*(a*x - 1)*a^3*x^2 - 2*a^3*x^2 + 2*(a^4*x^3 - a^2*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1} + a)*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})), x)$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x}{\operatorname{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(x/arccosh(a*x)^2, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/acosh(a*x)**2,x)
```

```
[Out] Integral(x/acosh(a*x)**2, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/arccosh(a*x)^2,x, algorithm="giac")
```

```
[Out] integrate(x/arccosh(a*x)^2, x)
```

$$3.55 \quad \int \frac{1}{\cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=39

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{a} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

[Out] -((Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*ArcCosh[a*x])) + CoshIntegral[ArcCosh[a*x]]/a

Rubi [A] time = 0.184479, antiderivative size = 39, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5656, 5781, 3301}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{a} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^(-2), x]

[Out] -((Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*ArcCosh[a*x])) + CoshIntegral[ArcCosh[a*x]]/a

Rule 5656

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_), x_Symbol] := Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] := Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{1}{\cosh^{-1}(ax)^2} dx &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{a \cosh^{-1}(ax)} + a \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} dx \\ &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\cosh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a} \\ &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{a \cosh^{-1}(ax)} + \frac{\text{Chi}\left(\cosh^{-1}(ax)\right)}{a} \end{aligned}$$

Mathematica [A] time = 0.100184, size = 60, normalized size = 1.54

$$\frac{\sqrt{\frac{ax-1}{ax+1}} \cosh^{-1}(ax) \text{Chi}\left(\cosh^{-1}(ax)\right) - ax + 1}{a \sqrt{\frac{ax-1}{ax+1}} \cosh^{-1}(ax)}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^(-2), x]

[Out] (1 - a*x + Sqrt[(-1 + a*x)/(1 + a*x)]*ArcCosh[a*x]*CoshIntegral[ArcCosh[a*x]])/(a*Sqrt[(-1 + a*x)/(1 + a*x)]*ArcCosh[a*x])

Maple [A] time = 0.026, size = 33, normalized size = 0.9

$$\frac{1}{a} \left(-\frac{1}{\text{arccosh}(ax)} \sqrt{ax-1} \sqrt{ax+1} + \text{Chi}(\text{arccosh}(ax)) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^2, x)

[Out] 1/a*(-1/arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+Chi(arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax}{(a^3x^2 + \sqrt{ax+1}\sqrt{ax-1}a^2x - a) \log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{a^4x^4 - 2a^2x^2 + (a^2x^2 + 1)(ax+1)(ax-1)}{(a^4x^4 + (ax+1)(ax-1)a^2x^2 - 2a^2x^2 + 2(a^3x^3 - a^2x^2 + 1)) \log(ax + \sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^2, x, algorithm="maxima")

[Out] -(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x)/((a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))) + integrate((a^4*x^4 - 2*a^2*x^2 + (a^2*x^2 + 1)*(a*x + 1)*(a*x - 1) + (2*a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + 1)/((a^4*x^4 + (a*x + 1)*(a*x - 1)*a^2*x^2 - 2*a^2*x^2 + 2*(a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + 1)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{\text{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^(-2), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/acosh(a*x)**2,x)

[Out] Integral(acosh(a*x)**(-2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^(-2), x)

$$3.56 \quad \int \frac{1}{x \cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^2}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^2), x]

Rubi [A] time = 0.0127509, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^2), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^2), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^2} dx = \int \frac{1}{x \cosh^{-1}(ax)^2} dx$$

Mathematica [A] time = 4.3499, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^2), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^2), x]

Maple [A] time = 0.05, size = 0, normalized size = 0.

$$\int \frac{1}{x (\operatorname{arccosh}(ax))^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^2, x)

[Out] int(1/x/arccosh(a*x)^2, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax}{(a^3x^3 + \sqrt{ax+1}\sqrt{ax-1}a^2x^2 - ax)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} + \int \frac{2(ax+1)(ax-1)ax + \dots}{(a^5x^6 + (ax+1)(ax-1)a^3x^4 - 2a^3x^4 + ax^2 + 2(a^4x^5 - a^2x^3)\sqrt{ax+1}\sqrt{ax-1})\log(ax + \sqrt{ax+1}\sqrt{ax-1})} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^2,x, algorithm="maxima")

[Out] $-(a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax)/((a^3x^3 + \sqrt{ax+1}\sqrt{ax-1}a^2x^2 - a^2x^2 - a^2x^2 - a^2x^2)\log(ax + \sqrt{ax+1}\sqrt{ax-1})) + \text{integrate}((2*(ax+1)*(ax-1)*ax + (2*a^2*x^2 - 1)*\sqrt{ax+1}*\sqrt{ax-1}))/((a^5*x^6 + (ax+1)*(ax-1)*a^3*x^4 - 2*a^3*x^4 + ax^2 + 2*(a^4*x^5 - a^2*x^3)*\sqrt{ax+1}\sqrt{ax-1})*\log(ax + \sqrt{ax+1}\sqrt{ax-1})), x)$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{x \operatorname{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(1/(x*arccosh(a*x)^2), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x)**2,x)

[Out] Integral(1/(x*acosh(a*x)**2), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(1/(x*arccosh(a*x)^2), x)

$$3.57 \quad \int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x^2 \cosh^{-1}(ax)^2}, x\right)$$

[Out] Unintegrable[1/(x^2*ArcCosh[a*x]^2), x]

Rubi [A] time = 0.0140318, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x^2*ArcCosh[a*x]^2), x]

[Out] Defer[Int][1/(x^2*ArcCosh[a*x]^2), x]

Rubi steps

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx = \int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx$$

Mathematica [A] time = 7.91706, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x^2*ArcCosh[a*x]^2), x]

[Out] Integrate[1/(x^2*ArcCosh[a*x]^2), x]

Maple [A] time = 0.091, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 (\operatorname{arccosh}(ax))^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x^2/arccosh(a*x)^2, x)

[Out] int(1/x^2/arccosh(a*x)^2, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\frac{a^3x^3 + (a^2x^2 - 1)\sqrt{ax+1}\sqrt{ax-1} - ax}{(a^3x^4 + \sqrt{ax+1}\sqrt{ax-1}a^2x^3 - ax^2)\log(ax + \sqrt{ax+1}\sqrt{ax-1})} - \int \frac{a^5x^5 - 2a^3x^3 + (a^3x^3 - 3ax)(ax+1)(ax-1)}{(a^5x^7 + (ax+1)(ax-1)a^3x^5 - 2a^3x^5 + ax^3 + 2a^3x^3 - 3ax)(ax+1)(ax-1)}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^2,x, algorithm="maxima")

[Out] -(a^3*x^3 + (a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x)/((a^3*x^4 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x^3 - a*x^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))) - integrate((a^5*x^5 - 2*a^3*x^3 + (a^3*x^3 - 3*a*x)*(a*x + 1)*(a*x - 1) + (2*a^4*x^4 - 5*a^2*x^2 + 2)*sqrt(a*x + 1)*sqrt(a*x - 1) + a*x)/((a^5*x^7 + (a*x + 1)*(a*x - 1)*a^3*x^5 - 2*a^3*x^5 + a*x^3 + 2*(a^4*x^6 - a^2*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{x^2 \operatorname{arccosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(1/(x^2*arccosh(a*x)^2), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x**2/acosh(a*x)**2,x)

[Out] Integral(1/(x**2*acosh(a*x)**2), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(1/(x^2*arccosh(a*x)^2), x)

$$3.58 \quad \int \frac{x^4}{\cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=102

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{16a^5} + \frac{27\text{Shi}(3\cosh^{-1}(ax))}{32a^5} + \frac{25\text{Shi}(5\cosh^{-1}(ax))}{32a^5} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} - \frac{x^4\sqrt{ax-1}\sqrt{ax}}{2a \cosh^{-1}(ax)}$$

[Out] $-(x^4\sqrt{-1+ax}\sqrt{1+ax})/(2a\text{ArcCosh}[ax]^2) + (2x^3)/(a^2\text{ArcCosh}[ax]) - (5x^5)/(2\text{ArcCosh}[ax]) + \text{SinhIntegral}[\text{ArcCosh}[ax]]/(16a^5) + (27*\text{SinhIntegral}[3*\text{ArcCosh}[ax]])/(32a^5) + (25*\text{SinhIntegral}[5*\text{ArcCosh}[ax]])/(32a^5)$

Rubi [A] time = 0.644703, antiderivative size = 102, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5668, 5775, 5670, 5448, 3298}

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{16a^5} + \frac{27\text{Shi}(3\cosh^{-1}(ax))}{32a^5} + \frac{25\text{Shi}(5\cosh^{-1}(ax))}{32a^5} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} - \frac{x^4\sqrt{ax-1}\sqrt{ax}}{2a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^4/ArcCosh[a*x]^3,x]

[Out] $-(x^4\sqrt{-1+ax}\sqrt{1+ax})/(2a\text{ArcCosh}[ax]^2) + (2x^3)/(a^2\text{ArcCosh}[ax]) - (5x^5)/(2\text{ArcCosh}[ax]) + \text{SinhIntegral}[\text{ArcCosh}[ax]]/(16a^5) + (27*\text{SinhIntegral}[3*\text{ArcCosh}[ax]])/(32a^5) + (25*\text{SinhIntegral}[5*\text{ArcCosh}[ax]])/(32a^5)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_.))^ (m_.))/(sqrt[(d1_.) + (e1_.)*(x_.)]*sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Dist[1/c^(m+1), Subst[Int[(a+b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^ (m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c+d*x)^m, Sinh[a +

$b*x]^n*\text{Cosh}[a + b*x]^p, x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x\} \&\& \text{IGtQ}[n, 0] \&$
 $\& \text{IGtQ}[p, 0]$

Rule 3298

$\text{Int}[\sin[(e_.) + (\text{Complex}[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_ \text{Symbo}$
 $l] \text{:> Simp}[(I*\text{SinhIntegral}[(c*f*fz)/d + f*fz*x])/d, x] /; \text{FreeQ}\{c, d, e, f$
 $, fz\}, x\} \&\& \text{EqQ}[d*e - c*f*fz*I, 0]$

Rubi steps

$$\begin{aligned} \int \frac{x^4}{\cosh^{-1}(ax)^3} dx &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{2 \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx}{a} + \frac{1}{2}(5a) \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} + \frac{25}{2} \int \frac{x^4}{\cosh^{-1}(ax)} dx - \frac{6 \int \frac{x^2}{\cosh^{-1}(ax)} dx}{a^2} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} - \frac{6 \text{Subst}\left(\int \frac{\cosh^2(x)\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^5} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} - \frac{6 \text{Subst}\left(\int \left(\frac{\sinh(x)}{4x} + \frac{\sinh(3x)}{4x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} + \frac{25 \text{Subst}\left(\int \frac{\sinh(5x)}{x} dx, x, \cosh^{-1}(ax)\right)}{32a^5} \\ &= -\frac{x^4\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{2x^3}{a^2 \cosh^{-1}(ax)} - \frac{5x^5}{2 \cosh^{-1}(ax)} + \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{16a^5} + \frac{27\text{Shi}\left(3 \cosh^{-1}(ax)\right)}{32a^5} \end{aligned}$$

Mathematica [A] time = 0.134561, size = 107, normalized size = 1.05

$$\frac{-16a^4x^4\sqrt{ax-1}\sqrt{ax+1} - 80a^5x^5 \cosh^{-1}(ax) + 64a^3x^3 \cosh^{-1}(ax) + 2 \cosh^{-1}(ax)^2 \text{Shi}\left(\cosh^{-1}(ax)\right) + 27 \cosh^{-1}(ax)^2 \text{Shi}\left(3 \cosh^{-1}(ax)\right)}{32a^5 \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] Integrate[x^4/ArcCosh[a*x]^3, x]

[Out] $(-16*a^4*x^4*\text{Sqrt}[-1 + a*x]*\text{Sqrt}[1 + a*x] + 64*a^3*x^3*\text{ArcCosh}[a*x] - 80*a^5*x^5*\text{ArcCosh}[a*x] + 2*\text{ArcCosh}[a*x]^2*\text{SinhIntegral}[\text{ArcCosh}[a*x]] + 27*\text{ArcCosh}[a*x]^2*\text{SinhIntegral}[3*\text{ArcCosh}[a*x]] + 25*\text{ArcCosh}[a*x]^2*\text{SinhIntegral}[5*\text{ArcCosh}[a*x]])/(32*a^5*\text{ArcCosh}[a*x]^2)$

Maple [A] time = 0.042, size = 123, normalized size = 1.2

$$\frac{1}{a^5} \left(-\frac{1}{16 (\text{arccosh}(ax))^2} \sqrt{ax-1}\sqrt{ax+1} - \frac{ax}{16 \text{arccosh}(ax)} + \frac{\text{Shi}(\text{arccosh}(ax))}{16} - \frac{3 \sinh(3 \text{arccosh}(ax))}{32 (\text{arccosh}(ax))^2} - \frac{9 \cosh(3 \text{arccosh}(ax))}{32 \text{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4/arccosh(a*x)^3, x)


```
[Out] 1/a^5*(-1/16/arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/16*a*x/arccosh(a*x)+1/16*Shi(arccosh(a*x))-3/32/arccosh(a*x)^2*sinh(3*arccosh(a*x))-9/32/arccosh(a*x)*cosh(3*arccosh(a*x))+27/32*Shi(3*arccosh(a*x))-1/32/arccosh(a*x)^2*sinh(5*arccosh(a*x))-5/32/arccosh(a*x)*cosh(5*arccosh(a*x))+25/32*Shi(5*arccosh(a*x)))
```

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4/arccosh(a*x)^3,x, algorithm="maxima")
```

```
[Out] -1/2*(a^8*x^11 - 3*a^6*x^9 + 3*a^4*x^7 - a^2*x^5 + (a^5*x^8 - a^3*x^6)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + (3*a^6*x^9 - 5*a^4*x^7 + 2*a^2*x^5)*(a*x + 1)*(a*x - 1) + (3*a^7*x^10 - 7*a^5*x^8 + 5*a^3*x^6 - a*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1) + (5*a^8*x^11 - 15*a^6*x^9 + 15*a^4*x^7 - 5*a^2*x^5 + (5*a^5*x^8 - 8*a^3*x^6 + 3*a*x^4)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + (15*a^6*x^9 - 31*a^4*x^7 + 20*a^2*x^5 - 4*x^3)*(a*x + 1)*(a*x - 1) + (15*a^7*x^10 - 38*a^5*x^8 + 32*a^3*x^6 - 9*a*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^8*x^6 + (a*x + 1)^(3/2)*(a*x - 1)^(3/2)*a^5*x^3 - 3*a^6*x^4 + 3*a^4*x^2 + 3*(a^6*x^4 - a^4*x^2)*(a*x + 1)*(a*x - 1) + 3*(a^7*x^5 - 2*a^5*x^3 + a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2) + integrate(1/2*(25*a^10*x^12 - 100*a^8*x^10 + 150*a^6*x^8 - 100*a^4*x^6 + 25*a^2*x^4 + (25*a^6*x^8 - 24*a^4*x^6 + 3*a^2*x^4)*(a*x + 1)^2*(a*x - 1)^2 + (100*a^7*x^9 - 172*a^5*x^7 + 87*a^3*x^5 - 12*a*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 3*(50*a^8*x^10 - 124*a^6*x^8 + 105*a^4*x^6 - 35*a^2*x^4 + 4*x^2)*(a*x + 1)*(a*x - 1) + (100*a^9*x^11 - 324*a^7*x^9 + 381*a^5*x^7 - 193*a^3*x^5 + 36*a*x^3)*sqrt(a*x + 1)*sqrt(a*x - 1))/((a^10*x^8 + (a*x + 1)^2*(a*x - 1)^2*a^6*x^4 - 4*a^8*x^6 + 6*a^6*x^4 - 4*a^4*x^2 + 4*(a^7*x^5 - a^5*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 6*(a^8*x^6 - 2*a^6*x^4 + a^4*x^2)*(a*x + 1)*(a*x - 1) + 4*(a^9*x^7 - 3*a^7*x^5 + 3*a^5*x^3 - a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)
```

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^4}{\text{arcosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4/arccosh(a*x)^3,x, algorithm="fricas")
```

```
[Out] integral(x^4/arccosh(a*x)^3, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**4/acosh(a*x)**3,x)
```

```
[Out] Integral(x**4/acosh(a*x)**3, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x^4/arccosh(a*x)^3, x)
```

$$3.59 \quad \int \frac{x^3}{\cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=87

$$\frac{\operatorname{Shi}(2 \cosh^{-1}(ax))}{2a^4} + \frac{\operatorname{Shi}(4 \cosh^{-1}(ax))}{a^4} + \frac{3x^2}{2a^2 \cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} - \frac{x^3 \sqrt{ax-1} \sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

[Out] $-(x^3 \sqrt{-1+ax} \sqrt{1+ax}) / (2a \operatorname{ArcCosh}[ax]^2) + (3x^2) / (2a^2 \operatorname{ArcCosh}[ax]) - (2x^4) / \operatorname{ArcCosh}[ax] + \operatorname{SinhIntegral}[2 \operatorname{ArcCosh}[ax]] / (2a^4) + \operatorname{SinhIntegral}[4 \operatorname{ArcCosh}[ax]] / a^4$

Rubi [A] time = 0.597955, antiderivative size = 87, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5668, 5775, 5670, 5448, 3298, 12}

$$\frac{\operatorname{Shi}(2 \cosh^{-1}(ax))}{2a^4} + \frac{\operatorname{Shi}(4 \cosh^{-1}(ax))}{a^4} + \frac{3x^2}{2a^2 \cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} - \frac{x^3 \sqrt{ax-1} \sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] Int[x^3/ArcCosh[a*x]^3,x]

[Out] $-(x^3 \sqrt{-1+ax} \sqrt{1+ax}) / (2a \operatorname{ArcCosh}[ax]^2) + (3x^2) / (2a^2 \operatorname{ArcCosh}[ax]) - (2x^4) / \operatorname{ArcCosh}[ax] + \operatorname{SinhIntegral}[2 \operatorname{ArcCosh}[ax]] / (2a^4) + \operatorname{SinhIntegral}[4 \operatorname{ArcCosh}[ax]] / a^4$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] := Simp[(x^m*Sqrt[-1+c*x]*Sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int((((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*((f_.)*(x_)^(m_.))/(Sqrt[(d1_.) + (e1_.)*(x_)])*Sqrt[(d2_.) + (e2_.)*(x_)]), x_Symbol] := Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*Sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] := Dist[1/c^(m+1), Subst[Int[(a+b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)^(p_.)*((c_.) + (d_.)*(x_)^(m_.))*Sinh[(a_.) + (b_.)*(x_)^(n_.)], x_Symbol] := Int[ExpandTrigReduce[(c+d*x)^m, Sinh[a+b*x]^n*Cosh[a+b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &

& IGtQ[p, 0]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rule 12

Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\cosh^{-1}(ax)^3} dx &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} - \frac{3\int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2} dx}{2a} + (2a) \int \frac{x^4}{\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^2} dx \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} + \frac{3x^2}{2a^2\cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} + 8 \int \frac{x^3}{\cosh^{-1}(ax)} dx - \frac{3\int \frac{x}{\cosh^{-1}(ax)} dx}{a^2} \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} + \frac{3x^2}{2a^2\cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} - \frac{3\text{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} + \frac{3x^2}{2a^2\cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} - \frac{3\text{Subst}\left(\int \frac{\sinh(2x)}{2x} dx, x, \cosh^{-1}(ax)\right)}{a^4} + \dots \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} + \frac{3x^2}{2a^2\cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\sinh(4x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^4} - \dots \\ &= -\frac{x^3\sqrt{-1+ax}\sqrt{1+ax}}{2a\cosh^{-1}(ax)^2} + \frac{3x^2}{2a^2\cosh^{-1}(ax)} - \frac{2x^4}{\cosh^{-1}(ax)} + \frac{\text{Shi}\left(2\cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Shi}\left(4\cosh^{-1}(ax)\right)}{a^4} \end{aligned}$$

Mathematica [A] time = 0.166134, size = 75, normalized size = 0.86

$$\frac{-\frac{a^2x^2((4a^2x^2-3)\cosh^{-1}(ax)+ax\sqrt{ax-1}\sqrt{ax+1})}{\cosh^{-1}(ax)^2} + \text{Shi}\left(2\cosh^{-1}(ax)\right) + 2\text{Shi}\left(4\cosh^{-1}(ax)\right)}{2a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3/ArcCosh[a*x]^3, x]

[Out] (-((a^2*x^2*(a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x] + (-3 + 4*a^2*x^2)*ArcCosh[a*x]))/ArcCosh[a*x]^2) + SinhIntegral[2*ArcCosh[a*x]] + 2*SinhIntegral[4*ArcCosh[a*x]])/(2*a^4)

Maple [A] time = 0.036, size = 82, normalized size = 0.9

$$\frac{1}{a^4} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{8 (\operatorname{arccosh}(ax))^2} - \frac{\cosh(2 \operatorname{arccosh}(ax))}{4 \operatorname{arccosh}(ax)} + \frac{\text{Shi}(2 \operatorname{arccosh}(ax))}{2} - \frac{\sinh(4 \operatorname{arccosh}(ax))}{16 (\operatorname{arccosh}(ax))^2} - \frac{\cosh(4 \operatorname{arccosh}(ax))}{4 \operatorname{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x³/arccosh(a*x)³,x)

[Out] 1/a⁴*(-1/8/arccosh(a*x)²*sinh(2*arccosh(a*x))-1/4/arccosh(a*x)*cosh(2*arccosh(a*x))+1/2*Shi(2*arccosh(a*x))-1/16/arccosh(a*x)²*sinh(4*arccosh(a*x))-1/4/arccosh(a*x)*cosh(4*arccosh(a*x))+Shi(4*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x³/arccosh(a*x)³,x, algorithm="maxima")

[Out] -1/2*(a⁸*x¹⁰ - 3*a⁶*x⁸ + 3*a⁴*x⁶ - a²*x⁴ + (a⁵*x⁷ - a³*x⁵)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + (3*a⁶*x⁸ - 5*a⁴*x⁶ + 2*a²*x⁴)*(a*x + 1)*(a*x - 1) + (3*a⁷*x⁹ - 7*a⁵*x⁷ + 5*a³*x⁵ - a*x³)*sqrt(a*x + 1)*sqrt(a*x - 1) + (4*a⁸*x¹⁰ - 12*a⁶*x⁸ + 12*a⁴*x⁶ - 4*a²*x⁴ + 2*(2*a⁵*x⁷ - 3*a³*x⁵ + a*x³)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 3*(4*a⁶*x⁸ - 8*a⁴*x⁶ + 5*a²*x⁴ - x²)*(a*x + 1)*(a*x - 1) + (12*a⁷*x⁹ - 30*a⁵*x⁷ + 25*a³*x⁵ - 7*a*x³)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a⁸*x⁶ + (a*x + 1)^(3/2)*(a*x - 1)^(3/2)*a⁵*x³ - 3*a⁶*x⁴ + 3*a⁴*x² + 3*(a⁶*x⁴ - a⁴*x²)*(a*x + 1)*(a*x - 1) + 3*(a⁷*x⁵ - 2*a⁵*x³ + a³*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a²)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))² + integrate(1/2*(16*a¹⁰*x¹¹ - 64*a⁸*x⁹ + 96*a⁶*x⁷ - 64*a⁴*x⁵ + 4*(4*a⁶*x⁷ - 3*a⁴*x⁵)*(a*x + 1)²*(a*x - 1)² + 16*a²*x³ + (64*a⁷*x⁸ - 100*a⁵*x⁶ + 42*a³*x⁴ - 3*a*x²)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 6*(16*a⁸*x⁹ - 38*a⁶*x⁷ + 30*a⁴*x⁵ - 9*a²*x³ + x)*(a*x + 1)*(a*x - 1) + (64*a⁹*x¹⁰ - 204*a⁷*x⁸ + 234*a⁵*x⁶ - 115*a³*x⁴ + 21*a*x²)*sqrt(a*x + 1)*sqrt(a*x - 1)))/((a¹⁰*x⁸ + (a*x + 1)²*(a*x - 1)²*a⁶*x⁴ - 4*a⁸*x⁶ + 6*a⁶*x⁴ - 4*a⁴*x² + 4*(a⁷*x⁵ - a⁵*x³)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 6*(a⁸*x⁶ - 2*a⁶*x⁴ + a⁴*x²)*(a*x + 1)*(a*x - 1) + 4*(a⁹*x⁷ - 3*a⁷*x⁵ + 3*a⁵*x³ - a³*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + a²)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^3}{\text{arccosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x³/arccosh(a*x)³,x, algorithm="fricas")

[Out] integral(x³/arccosh(a*x)³, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3/acosh(a*x)**3,x)
```

```
[Out] Integral(x**3/acosh(a*x)**3, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x^3/arccosh(a*x)^3, x)
```

$$3.60 \quad \int \frac{x^2}{\cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=85

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{8a^3} + \frac{9\text{Shi}(3\cosh^{-1}(ax))}{8a^3} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} - \frac{x^2 \sqrt{ax-1} \sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

[Out] $-(x^2 \sqrt{-1+ax} \sqrt{1+ax}) / (2a \text{ArcCosh}[ax]^2) + x / (a^2 \text{ArcCosh}[ax]) - (3x^3) / (2 \text{ArcCosh}[ax]) + \text{SinhIntegral}[\text{ArcCosh}[ax]] / (8a^3) + (9 \text{SinhIntegral}[3 \text{ArcCosh}[ax]]) / (8a^3)$

Rubi [A] time = 0.504109, antiderivative size = 85, normalized size of antiderivative = 1., number of steps used = 10, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5668, 5775, 5670, 5448, 3298, 5658}

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{8a^3} + \frac{9\text{Shi}(3\cosh^{-1}(ax))}{8a^3} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} - \frac{x^2 \sqrt{ax-1} \sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] Int[x^2/ArcCosh[a*x]^3,x]

[Out] $-(x^2 \sqrt{-1+ax} \sqrt{1+ax}) / (2a \text{ArcCosh}[ax]^2) + x / (a^2 \text{ArcCosh}[ax]) - (3x^3) / (2 \text{ArcCosh}[ax]) + \text{SinhIntegral}[\text{ArcCosh}[ax]] / (8a^3) + (9 \text{SinhIntegral}[3 \text{ArcCosh}[ax]]) / (8a^3)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] := Simp[(x^m*Sqrt[-1+c*x]*Sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int((((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((f_.)*(x_)^(m_.))/(Sqrt[(d1_.) + (e1_.)*(x_)])*Sqrt[(d2_.) + (e2_.)*(x_)]), x_Symbol] := Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*Sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] := Dist[1/c^(m+1), Subst[Int[(a+b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sinh[(a_.) + (b_.)*(x_)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c+d*x)^m, Sinh[a+b*x]^n*Cosh[a+b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &

& IGtQ[p, 0]

Rule 3298

```
Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol]
:> Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x]
&& EqQ[d*e - c*f*fz*I, 0]
```

Rule 5658

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_, x_Symbol]
:> -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\cosh^{-1}(ax)^3} dx &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{\int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx}{a} + \frac{1}{2}(3a) \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} + \frac{9}{2} \int \frac{x^2}{\cosh^{-1}(ax)} dx - \frac{\int \frac{1}{\cosh^{-1}(ax)} dx}{a^2} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^3} + \frac{9 \text{Subst}\left(\int \frac{1}{\cosh^{-1}(ax)} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} - \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{a^3} + \frac{9 \text{Subst}\left(\int \left(\frac{\sinh(x)}{4x} + \frac{1}{4x}\right) dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} - \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{a^3} + \frac{9 \text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{8a^3} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{x}{a^2 \cosh^{-1}(ax)} - \frac{3x^3}{2 \cosh^{-1}(ax)} + \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{8a^3} + \frac{9 \text{Shi}\left(3 \cosh^{-1}(ax)\right)}{8a^3} \end{aligned}$$

Mathematica [A] time = 0.14575, size = 69, normalized size = 0.81

$$\frac{-\frac{4ax((3a^2x^2-2)\cosh^{-1}(ax)+ax\sqrt{ax-1}\sqrt{ax+1})}{\cosh^{-1}(ax)^2} + \text{Shi}\left(\cosh^{-1}(ax)\right) + 9\text{Shi}\left(3 \cosh^{-1}(ax)\right)}{8a^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2/ArcCosh[a*x]^3, x]
```

```
[Out] ((-4*a*x*(a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x] + (-2 + 3*a^2*x^2)*ArcCosh[a*x])/ArcCosh[a*x]^2 + SinhIntegral[ArcCosh[a*x]] + 9*SinhIntegral[3*ArcCosh[a*x]])/(8*a^3)
```

Maple [A] time = 0.029, size = 84, normalized size = 1.

$$\frac{1}{a^3} \left(-\frac{1}{8 (\text{arccosh}(ax))^2} \sqrt{ax-1} \sqrt{ax+1} - \frac{ax}{8 \text{arccosh}(ax)} + \frac{\text{Shi}(\text{arccosh}(ax))}{8} - \frac{\sinh(3 \text{arccosh}(ax))}{8 (\text{arccosh}(ax))^2} - \frac{3 \cosh(3 \text{arccosh}(ax))}{8 \text{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x)^3,x)

[Out] 1/a^3*(-1/8/arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/8*a*x/arccosh(a*x)+1/8*Shi(arccosh(a*x))-1/8/arccosh(a*x)^2*sinh(3*arccosh(a*x))-3/8/arccosh(a*x)*cosh(3*arccosh(a*x))+9/8*Shi(3*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^3,x, algorithm="maxima")

[Out] -1/2*(a^8*x^9 - 3*a^6*x^7 + 3*a^4*x^5 - a^2*x^3 + (a^5*x^6 - a^3*x^4)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + (3*a^6*x^7 - 5*a^4*x^5 + 2*a^2*x^3)*(a*x + 1)*(a*x - 1) + (3*a^7*x^8 - 7*a^5*x^6 + 5*a^3*x^4 - a*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1) + (3*a^8*x^9 - 9*a^6*x^7 + 9*a^4*x^5 - 3*a^2*x^3 + (3*a^5*x^6 - 4*a^3*x^4 + a*x^2)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + (9*a^6*x^7 - 17*a^4*x^5 + 10*a^2*x^3 - 2*x)*(a*x + 1)*(a*x - 1) + (9*a^7*x^8 - 22*a^5*x^6 + 18*a^3*x^4 - 5*a*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^8*x^6 + (a*x + 1)^(3/2)*(a*x - 1)^(3/2)*a^5*x^3 - 3*a^6*x^4 + 3*a^4*x^2 + 3*(a^6*x^4 - a^4*x^2)*(a*x + 1)*(a*x - 1) + 3*(a^7*x^5 - 2*a^5*x^3 + a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2) + integrate(1/2*(9*a^10*x^10 - 36*a^8*x^8 + 54*a^6*x^6 - 36*a^4*x^4 + (9*a^6*x^6 - 4*a^4*x^4 - a^2*x^2)*(a*x + 1)^2*(a*x - 1)^2 + (36*a^7*x^7 - 48*a^5*x^5 + 13*a^3*x^3 + 2*a*x)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 9*a^2*x^2 + (54*a^8*x^8 - 120*a^6*x^6 + 83*a^4*x^4 - 19*a^2*x^2 + 2)*(a*x + 1)*(a*x - 1) + (36*a^9*x^9 - 112*a^7*x^7 + 123*a^5*x^5 - 57*a^3*x^3 + 10*a*x)*sqrt(a*x + 1)*sqrt(a*x - 1))/((a^10*x^8 + (a*x + 1)^2*(a*x - 1)^2*a^6*x^4 - 4*a^8*x^6 + 6*a^6*x^4 - 4*a^4*x^2 + 4*(a^7*x^5 - a^5*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 6*(a^8*x^6 - 2*a^6*x^4 + a^4*x^2)*(a*x + 1)*(a*x - 1) + 4*(a^9*x^7 - 3*a^7*x^5 + 3*a^5*x^3 - a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^2}{\text{arccosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^3,x, algorithm="fricas")

[Out] integral(x^2/arccosh(a*x)^3, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2/acosh(a*x)**3,x)
```

```
[Out] Integral(x**2/acosh(a*x)**3, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x^2/arccosh(a*x)^3, x)
```

3.61 $\int \frac{x}{\cosh^{-1}(ax)^3} dx$

Optimal. Leaf size=68

$$\frac{\operatorname{Shi}\left(2 \cosh^{-1}(ax)\right)}{a^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

[Out] $-(x\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(2*a*\operatorname{ArcCosh}[a*x]^2) + 1/(2*a^2*\operatorname{ArcCosh}[a*x]) - x^2/\operatorname{ArcCosh}[a*x] + \operatorname{SinhIntegral}[2*\operatorname{ArcCosh}[a*x]]/a^2$

Rubi [A] time = 0.392987, antiderivative size = 68, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 7, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {5668, 5775, 5670, 5448, 12, 3298, 5676}

$$\frac{\operatorname{Shi}\left(2 \cosh^{-1}(ax)\right)}{a^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/\operatorname{ArcCosh}[a*x]^3, x]$

[Out] $-(x\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(2*a*\operatorname{ArcCosh}[a*x]^2) + 1/(2*a^2*\operatorname{ArcCosh}[a*x]) - x^2/\operatorname{ArcCosh}[a*x] + \operatorname{SinhIntegral}[2*\operatorname{ArcCosh}[a*x]]/a^2$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}(c*x))*b]^n * x^m, x_Symbol] \rightarrow \operatorname{Simp}[x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[x^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x]) /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}(c*x))*b]^n * (f*x)^m / (\sqrt{(d1 + e1*x)*sqrt{(d2 + e2*x)}}), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(b*c*\sqrt{-(d1*d2)}*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\sqrt{-(d1*d2)}*(n+1)), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}], x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5670

$\operatorname{Int}[(a + \operatorname{ArcCosh}(c*x))*b]^n * x^m, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

$\operatorname{Int}[\operatorname{Cosh}(a + b*x)^p * (c + d*x)^m * \operatorname{Sinh}(a + b*x)^n, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sinh}[a + b*x]^n*\operatorname{Cosh}[a + b*x]^p, x], x] /;$ FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 3298

```
Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] := Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] := Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
```

Rubi steps

$$\begin{aligned} \int \frac{x}{\cosh^{-1}(ax)^3} dx &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{\int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx}{2a} + a \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} + 2 \int \frac{x}{\cosh^{-1}(ax)} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} + \frac{2 \operatorname{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} + \frac{2 \operatorname{Subst}\left(\int \frac{\sinh(2x)}{2x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} + \frac{\operatorname{Subst}\left(\int \frac{\sinh(2x)}{x} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2a^2 \cosh^{-1}(ax)} - \frac{x^2}{\cosh^{-1}(ax)} + \frac{\operatorname{Shi}\left(2 \cosh^{-1}(ax)\right)}{a^2} \end{aligned}$$

Mathematica [A] time = 0.0493593, size = 67, normalized size = 0.99

$$\frac{\operatorname{Shi}\left(2 \cosh^{-1}(ax)\right)}{a^2} + \frac{1 - 2a^2x^2}{2a^2 \cosh^{-1}(ax)} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x/ArcCosh[a*x]^3, x]
```

```
[Out] -(x*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*a*ArcCosh[a*x]^2) + (1 - 2*a^2*x^2)/(2*a^2*ArcCosh[a*x]) + SinhIntegral[2*ArcCosh[a*x]]/a^2
```

Maple [A] time = 0.026, size = 43, normalized size = 0.6

$$\frac{1}{a^2} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{4 (\operatorname{arccosh}(ax))^2} - \frac{\cosh(2 \operatorname{arccosh}(ax))}{2 \operatorname{arccosh}(ax)} + \operatorname{Shi}(2 \operatorname{arccosh}(ax)) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x/arccosh(a*x)^3,x)`

[Out] `1/a^2*(-1/4/arccosh(a*x)^2*sinh(2*arccosh(a*x))-1/2/arccosh(a*x)*cosh(2*arccosh(a*x))+Shi(2*arccosh(a*x)))`

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/arccosh(a*x)^3,x, algorithm="maxima")`

[Out] `-1/2*(a^8*x^8 - 3*a^6*x^6 + 3*a^4*x^4 + (a^5*x^5 - a^3*x^3)*(a*x + 1)^(3/2) * (a*x - 1)^(3/2) - a^2*x^2 + (3*a^6*x^6 - 5*a^4*x^4 + 2*a^2*x^2)*(a*x + 1)*(a*x - 1) + (3*a^7*x^7 - 7*a^5*x^5 + 5*a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + (2*a^8*x^8 - 6*a^6*x^6 + 6*a^4*x^4 + 2*(a^5*x^5 - a^3*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) - 2*a^2*x^2 + (6*a^6*x^6 - 10*a^4*x^4 + 5*a^2*x^2 - 1)*(a*x + 1)*(a*x - 1) + (6*a^7*x^7 - 14*a^5*x^5 + 11*a^3*x^3 - 3*a*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^8*x^6 + (a*x + 1)^(3/2)*(a*x - 1)^(3/2)*a^5*x^3 - 3*a^6*x^4 + 3*a^4*x^2 + 3*(a^6*x^4 - a^4*x^2)*(a*x + 1)*(a*x - 1) + 3*(a^7*x^5 - 2*a^5*x^3 + a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2) + integrate(1/2*(4*a^9*x^9 + 4*(a*x + 1)^2*(a*x - 1)^2*a^5*x^5 - 16*a^7*x^7 + 24*a^5*x^5 - 16*a^3*x^3 + (16*a^6*x^6 - 16*a^4*x^4 + 3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 24*(a^7*x^7 - 2*a^5*x^5 + a^3*x^3)*(a*x + 1)*(a*x - 1) + (16*a^8*x^8 - 48*a^6*x^6 + 48*a^4*x^4 - 19*a^2*x^2 + 3)*sqrt(a*x + 1)*sqrt(a*x - 1) + 4*a*x)/((a^9*x^8 + (a*x + 1)^2*(a*x - 1)^2*a^5*x^4 - 4*a^7*x^6 + 6*a^5*x^4 - 4*a^3*x^2 + 4*(a^6*x^5 - a^4*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 6*(a^7*x^6 - 2*a^5*x^4 + a^3*x^2)*(a*x + 1)*(a*x - 1) + 4*(a^8*x^7 - 3*a^6*x^5 + 3*a^4*x^3 - a^2*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)`

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x}{\text{arccosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/arccosh(a*x)^3,x, algorithm="fricas")`

[Out] `integral(x/arccosh(a*x)^3, x)`

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/acosh(a*x)**3,x)
```

```
[Out] Integral(x/acosh(a*x)**3, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x/arccosh(a*x)^3, x)
```

$$3.62 \quad \int \frac{1}{\cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=55

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{2a} - \frac{x}{2 \cosh^{-1}(ax)} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*a*ArcCosh[a*x]^2) - x/(2*ArcCosh[a*x]) + SinhIntegral[ArcCosh[a*x]]/(2*a)

Rubi [A] time = 0.187885, antiderivative size = 55, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.667$, Rules used = {5656, 5775, 5658, 3298}

$$\frac{\text{Shi}(\cosh^{-1}(ax))}{2a} - \frac{x}{2 \cosh^{-1}(ax)} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^(-3), x]

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*a*ArcCosh[a*x]^2) - x/(2*ArcCosh[a*x]) + SinhIntegral[ArcCosh[a*x]]/(2*a)

Rule 5656

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_), x_Symbol] := Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_)*((f_.)*(x_))^(m_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] := Simp[((f*x)^m*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n + 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_), x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3298

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] := Simp[(I*SinhIntegral[(c*f*fz)/d + f*fz*x])/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*e - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned}
\int \frac{1}{\cosh^{-1}(ax)^3} dx &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} + \frac{1}{2}a \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^2} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{x}{2 \cosh^{-1}(ax)} + \frac{1}{2} \int \frac{1}{\cosh^{-1}(ax)} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{x}{2 \cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\sinh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{2a} \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{2a \cosh^{-1}(ax)^2} - \frac{x}{2 \cosh^{-1}(ax)} + \frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{2a}
\end{aligned}$$

Mathematica [A] time = 0.0419904, size = 55, normalized size = 1.

$$\frac{\text{Shi}\left(\cosh^{-1}(ax)\right)}{2a} - \frac{x}{2 \cosh^{-1}(ax)} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)^2}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^(-3), x]

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(2*a*ArcCosh[a*x]^2) - x/(2*ArcCosh[a*x]) + SinhIntegral[ArcCosh[a*x]]/(2*a)

Maple [A] time = 0.027, size = 45, normalized size = 0.8

$$\frac{1}{a} \left(-\frac{1}{2 (\text{arccosh}(ax))^2} \sqrt{ax-1}\sqrt{ax+1} - \frac{ax}{2 \text{arccosh}(ax)} + \frac{\text{Shi}(\text{arccosh}(ax))}{2} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^3,x)

[Out] 1/a*(-1/2/arccosh(a*x)^2*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/2*a*x/arccosh(a*x)+1/2*Shi(arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^3,x, algorithm="maxima")

[Out] -1/2*(a^7*x^7 - 3*a^5*x^5 + 3*a^3*x^3 + (a^4*x^4 - a^2*x^2)*(a*x + 1)^(3/2) * (a*x - 1)^(3/2) + (3*a^5*x^5 - 5*a^3*x^3 + 2*a*x)*(a*x + 1)*(a*x - 1) + (3*a^6*x^6 - 7*a^4*x^4 + 5*a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x + (a^7*x^7 - 3*a^5*x^5 + 3*a^3*x^3 + (a^4*x^4 - 1)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 3*(a^5*x^5 - a^3*x^3)*(a*x + 1)*(a*x - 1) + (3*a^6*x^6 - 6*a^4*x^4 + 4*a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^7*x^6 + (a*x + 1)^(3/2)*(a*x - 1)^(3/2)*a^4*x^3 - 3*a^5


```
*x^4 + 3*a^3*x^2 + 3*(a^5*x^4 - a^3*x^2)*(a*x + 1)*(a*x - 1) + 3*(a^6*x^5 -
2*a^4*x^3 + a^2*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*log(a*x + sqrt(a*x + 1)
)*sqrt(a*x - 1))^2) + integrate(1/2*(a^8*x^8 - 4*a^6*x^6 + 6*a^4*x^4 + (a^4
*x^4 + 3)*(a*x + 1)^2*(a*x - 1)^2 + (4*a^5*x^5 - 4*a^3*x^3 + 3*a*x)*(a*x +
1)^(3/2)*(a*x - 1)^(3/2) - 4*a^2*x^2 + 3*(2*a^6*x^6 - 4*a^4*x^4 + a^2*x^2 +
1)*(a*x + 1)*(a*x - 1) + (4*a^7*x^7 - 12*a^5*x^5 + 9*a^3*x^3 - a*x)*sqrt(a
*x + 1)*sqrt(a*x - 1) + 1)/((a^8*x^8 + (a*x + 1)^2*(a*x - 1)^2*a^4*x^4 - 4*
a^6*x^6 + 6*a^4*x^4 + 4*(a^5*x^5 - a^3*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2)
- 4*a^2*x^2 + 6*(a^6*x^6 - 2*a^4*x^4 + a^2*x^2)*(a*x + 1)*(a*x - 1) + 4*(a
^7*x^7 - 3*a^5*x^5 + 3*a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + 1)*log(
a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)
```

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{\text{arcosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/arccosh(a*x)^3,x, algorithm="fricas")
```

```
[Out] integral(arccosh(a*x)^(-3), x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/acosh(a*x)**3,x)
```

```
[Out] Integral(acosh(a*x)**(-3), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(arccosh(a*x)^(-3), x)
```

$$3.63 \quad \int \frac{1}{x \cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^3}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^3), x]

Rubi [A] time = 0.0136231, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^3), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^3), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^3} dx = \int \frac{1}{x \cosh^{-1}(ax)^3} dx$$

Mathematica [A] time = 0.658753, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^3), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^3), x]

Maple [A] time = 0.065, size = 0, normalized size = 0.

$$\int \frac{1}{x (\operatorname{arccosh}(ax))^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^3, x)

[Out] int(1/x/arccosh(a*x)^3, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^3,x, algorithm="maxima")

[Out]
$$-1/2*(a^8*x^8 - 3*a^6*x^6 + 3*a^4*x^4 + (a^5*x^5 - a^3*x^3)*(a*x + 1)^{(3/2)} * (a*x - 1)^{(3/2)} - a^2*x^2 + (3*a^6*x^6 - 5*a^4*x^4 + 2*a^2*x^2)*(a*x + 1) * (a*x - 1) + (3*a^7*x^7 - 7*a^5*x^5 + 5*a^3*x^3 - a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1} + (2*(a^3*x^3 - a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (4*a^4*x^4 - 5*a^2*x^2 + 1)*(a*x + 1)*(a*x - 1) + (2*a^5*x^5 - 3*a^3*x^3 + a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1})*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))/((a^8*x^8 + (a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*a^5*x^5 - 3*a^6*x^6 + 3*a^4*x^4 - a^2*x^2 + 3*(a^6*x^6 - a^4*x^4)*(a*x + 1)*(a*x - 1) + 3*(a^7*x^7 - 2*a^5*x^5 + a^3*x^3)*\sqrt{a*x + 1}*\sqrt{a*x - 1})*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))^2 - \text{integrate}(1/2*(4*(a^4*x^4 - 2*a^2*x^2)*(a*x + 1)^2*(a*x - 1)^2 + (12*a^5*x^5 - 22*a^3*x^3 + 7*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(6*a^6*x^6 - 10*a^4*x^4 + 5*a^2*x^2 - 1)*(a*x + 1)*(a*x - 1) + (4*a^7*x^7 - 6*a^5*x^5 + 3*a^3*x^3 - a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}))/((a^{10}*x^{11} + (a*x + 1)^2*(a*x - 1)^2*a^6*x^7 - 4*a^8*x^9 + 6*a^6*x^7 - 4*a^4*x^5 + a^2*x^3 + 4*(a^7*x^8 - a^5*x^6)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 6*(a^8*x^9 - 2*a^6*x^7 + a^4*x^5)*(a*x + 1)*(a*x - 1) + 4*(a^9*x^{10} - 3*a^7*x^8 + 3*a^5*x^6 - a^3*x^4)*\sqrt{a*x + 1}*\sqrt{a*x - 1})*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})), x)$$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{x \operatorname{arccosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^3,x, algorithm="fricas")

[Out] integral(1/(x*arccosh(a*x)^3), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x)**3,x)

[Out] Integral(1/(x*acosh(a*x)**3), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/x/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(1/(x*arccosh(a*x)^3), x)
```

$$3.64 \quad \int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x^2 \cosh^{-1}(ax)^3}, x\right)$$

[Out] Unintegrable[1/(x^2*ArcCosh[a*x]^3), x]

Rubi [A] time = 0.0149753, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x^2*ArcCosh[a*x]^3), x]

[Out] Defer[Int][1/(x^2*ArcCosh[a*x]^3), x]

Rubi steps

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx = \int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx$$

Mathematica [A] time = 2.19435, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x^2*ArcCosh[a*x]^3), x]

[Out] Integrate[1/(x^2*ArcCosh[a*x]^3), x]

Maple [A] time = 0.089, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 (\operatorname{arccosh}(ax))^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x^2/arccosh(a*x)^3, x)

[Out] int(1/x^2/arccosh(a*x)^3, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^3,x, algorithm="maxima")

[Out]
$$-1/2*(a^8*x^8 - 3*a^6*x^6 + 3*a^4*x^4 + (a^5*x^5 - a^3*x^3)*(a*x + 1)^{(3/2)} * (a*x - 1)^{(3/2)} - a^2*x^2 + (3*a^6*x^6 - 5*a^4*x^4 + 2*a^2*x^2)*(a*x + 1)*(a*x - 1) + (3*a^7*x^7 - 7*a^5*x^5 + 5*a^3*x^3 - a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1} - (a^8*x^8 - 3*a^6*x^6 + 3*a^4*x^4 + (a^5*x^5 - 4*a^3*x^3 + 3*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} - a^2*x^2 + (3*a^6*x^6 - 11*a^4*x^4 + 10*a^2*x^2 - 2)*(a*x + 1)*(a*x - 1) + (3*a^7*x^7 - 10*a^5*x^5 + 10*a^3*x^3 - 3*a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}))*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))/((a^8*x^9 + (a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*a^5*x^6 - 3*a^6*x^7 + 3*a^4*x^5 - a^2*x^3 + 3*(a^6*x^7 - a^4*x^5)*(a*x + 1)*(a*x - 1) + 3*(a^7*x^8 - 2*a^5*x^6 + a^3*x^4)*\sqrt{a*x + 1}*\sqrt{a*x - 1}))*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))^2 + \int (1/2*(a^{10}*x^{10} - 4*a^8*x^8 + 6*a^6*x^6 - 4*a^4*x^4 + (a^6*x^6 - 12*a^4*x^4 + 15*a^2*x^2)*(a*x + 1)^2*(a*x - 1)^2 + (4*a^7*x^7 - 4*0*a^5*x^5 + 57*a^3*x^3 - 18*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + a^2*x^2 + 3*(2*a^8*x^8 - 16*a^6*x^6 + 25*a^4*x^4 - 13*a^2*x^2 + 2)*(a*x + 1)*(a*x - 1) + (4*a^9*x^9 - 24*a^7*x^7 + 39*a^5*x^5 - 25*a^3*x^3 + 6*a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}))/((a^{10}*x^{12} + (a*x + 1)^2*(a*x - 1)^2*a^6*x^8 - 4*a^8*x^{10} + 6*a^6*x^8 - 4*a^4*x^6 + a^2*x^4 + 4*(a^7*x^9 - a^5*x^7)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 6*(a^8*x^{10} - 2*a^6*x^8 + a^4*x^6)*(a*x + 1)*(a*x - 1) + 4*(a^9*x^{11} - 3*a^7*x^9 + 3*a^5*x^7 - a^3*x^5)*\sqrt{a*x + 1}*\sqrt{a*x - 1}))*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})), x)$$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arccosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^3,x, algorithm="fricas")

[Out] integral(1/(x^2*arccosh(a*x)^3), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x**2/acosh(a*x)**3,x)

[Out] Integral(1/(x**2*acosh(a*x)**3), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arccosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/x^2/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(1/(x^2*arccosh(a*x)^3), x)
```

$$3.65 \quad \int \frac{x^4}{\cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=170

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{48a^5} + \frac{27\text{Chi}(3\cosh^{-1}(ax))}{32a^5} + \frac{125\text{Chi}(5\cosh^{-1}(ax))}{96a^5} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} + \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}}{a^3 \cosh^{-1}(ax)} - \frac{5}{6 \cosh^{-1}(ax)}$$

[Out] $-(x^4\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[a*x]^3) + (2x^3)/(3a^2\text{ArcCosh}[a*x]^2) - (5x^5)/(6\text{ArcCosh}[a*x]^2) + (2x^2\sqrt{-1+ax}\sqrt{1+ax})/(a^3\text{ArcCosh}[a*x]) - (25x^4\sqrt{-1+ax}\sqrt{1+ax})/(6a\text{ArcCosh}[a*x]) + \text{CoshIntegral}[\text{ArcCosh}[a*x]]/(48a^5) + (27\text{CoshIntegral}[3\text{ArcCosh}[a*x]])/(32a^5) + (125\text{CoshIntegral}[5\text{ArcCosh}[a*x]])/(96a^5)$

Rubi [A] time = 0.617029, antiderivative size = 170, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5668, 5775, 5666, 3301}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{48a^5} + \frac{27\text{Chi}(3\cosh^{-1}(ax))}{32a^5} + \frac{125\text{Chi}(5\cosh^{-1}(ax))}{96a^5} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} + \frac{2x^2\sqrt{ax-1}\sqrt{ax+1}}{a^3 \cosh^{-1}(ax)} - \frac{5}{6 \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^4/ArcCosh[a*x]^4, x]

[Out] $-(x^4\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[a*x]^3) + (2x^3)/(3a^2\text{ArcCosh}[a*x]^2) - (5x^5)/(6\text{ArcCosh}[a*x]^2) + (2x^2\sqrt{-1+ax}\sqrt{1+ax})/(a^3\text{ArcCosh}[a*x]) - (25x^4\sqrt{-1+ax}\sqrt{1+ax})/(6a\text{ArcCosh}[a*x]) + \text{CoshIntegral}[\text{ArcCosh}[a*x]]/(48a^5) + (27\text{CoshIntegral}[3\text{ArcCosh}[a*x]])/(32a^5) + (125\text{CoshIntegral}[5\text{ArcCosh}[a*x]])/(96a^5)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*((f_.)*(x_)^(m_.)))/(sqrt[(d1_) + (e1_.)*(x_)]*sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + Dist[1/(b*c^(m+1)*(n+1)), Subst[Int[ExpandTrigReduce[(a+b*x)^(n+1)*Cosh[x]^(m-1)*(m-(m+1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^4}{\cosh^{-1}(ax)^4} dx &= -\frac{x^4 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{4 \int \frac{x^3}{\sqrt{-1+ax} \sqrt{1+ax} \cosh^{-1}(ax)^3} dx}{3a} + \frac{1}{3}(5a) \int \frac{x^5}{\sqrt{-1+ax} \sqrt{1+ax} \cosh^{-1}(ax)^2} dx \\ &= -\frac{x^4 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} - \frac{5x^5}{6 \cosh^{-1}(ax)^2} + \frac{25}{6} \int \frac{x^4}{\cosh^{-1}(ax)^2} dx - \frac{2 \int \frac{x^2}{\cosh^{-1}(ax)} dx}{a^2} \\ &= -\frac{x^4 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} - \frac{5x^5}{6 \cosh^{-1}(ax)^2} + \frac{2x^2 \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{25x^4 \sqrt{-1+ax} \sqrt{1+ax}}{6a \cosh^{-1}(ax)} \\ &= -\frac{x^4 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} - \frac{5x^5}{6 \cosh^{-1}(ax)^2} + \frac{2x^2 \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{25x^4 \sqrt{-1+ax} \sqrt{1+ax}}{6a \cosh^{-1}(ax)} \\ &= -\frac{x^4 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{2x^3}{3a^2 \cosh^{-1}(ax)^2} - \frac{5x^5}{6 \cosh^{-1}(ax)^2} + \frac{2x^2 \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{25x^4 \sqrt{-1+ax} \sqrt{1+ax}}{6a \cosh^{-1}(ax)} \end{aligned}$$

Mathematica [A] time = 0.608565, size = 126, normalized size = 0.74

$$\frac{-\frac{16a^2x^2(2a^2x^2\sqrt{ax-1}\sqrt{ax+1}+ax(5a^2x^2-4)\cosh^{-1}(ax)+\sqrt{ax-1}\sqrt{ax+1}(25a^2x^2-12)\cosh^{-1}(ax)^2)}{\cosh^{-1}(ax)^3} + 2\text{Chi}(\cosh^{-1}(ax)) + 81\text{Chi}(3\cosh^{-1}(ax))}{96a^5}$$

Antiderivative was successfully verified.

[In] Integrate[x^4/ArcCosh[a*x]^4, x]

[Out] ((-16*a^2*x^2*(2*a^2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x] + a*x*(-4 + 5*a^2*x^2)*ArcCosh[a*x] + Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(-12 + 25*a^2*x^2)*ArcCosh[a*x]^2))/ArcCosh[a*x]^3 + 2*CoshIntegral[ArcCosh[a*x]] + 81*CoshIntegral[3*ArcCosh[a*x]] + 125*CoshIntegral[5*ArcCosh[a*x]])/(96*a^5)

Maple [A] time = 0.043, size = 175, normalized size = 1.

$$\frac{1}{a^5} \left(-\frac{1}{24 (\operatorname{arccosh}(ax))^3} \sqrt{ax-1} \sqrt{ax+1} - \frac{ax}{48 (\operatorname{arccosh}(ax))^2} - \frac{1}{48 \operatorname{arccosh}(ax)} \sqrt{ax-1} \sqrt{ax+1} + \frac{\operatorname{Chi}(\operatorname{arccosh}(ax))}{48} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4/arccosh(a*x)^4, x)

[Out] 1/a^5*(-1/24/arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/48*a*x/arccosh(a*x)^2-1/48/arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+1/48*Chi(arccosh(a*x))-1/16/arccosh(a*x)^3*sinh(3*arccosh(a*x))-3/32/arccosh(a*x)^2*cosh(3*arccosh(a*x))-9/32/arccosh(a*x)*sinh(3*arccosh(a*x))+27/32*Chi(3*arccosh(a*x))-1/48/arccosh(a*x)^3*sinh(5*arccosh(a*x))-5/96/arccosh(a*x)^2*cosh(5*arccosh(a*x))-25/96/arccosh(a*x)*sinh(5*arccosh(a*x))+125/96*Chi(5*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^4,x, algorithm="maxima")

[Out]
$$-1/6*(2*a^{13}*x^{15} - 10*a^{11}*x^{13} + 20*a^9*x^{11} - 20*a^7*x^9 + 10*a^5*x^7 - 2*a^3*x^5 + 2*(a^8*x^{10} - a^6*x^8)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 2*(5*a^9*x^{11} - 9*a^7*x^9 + 4*a^5*x^7)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^{10}*x^{12} - 13*a^8*x^{10} + 11*a^6*x^8 - 3*a^4*x^6)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 4*(5*a^{11}*x^{13} - 17*a^9*x^{11} + 21*a^7*x^9 - 11*a^5*x^7 + 2*a^3*x^5)*(a*x + 1)*(a*x - 1) + (25*a^{13}*x^{15} - 125*a^{11}*x^{13} + 250*a^9*x^{11} - 250*a^7*x^9 + 125*a^5*x^7 - 25*a^3*x^5 + (25*a^8*x^{10} - 49*a^6*x^8 + 27*a^4*x^6 - 3*a^2*x^4)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (125*a^9*x^{11} - 321*a^7*x^9 + 286*a^5*x^7 - 102*a^3*x^5 + 12*a*x^3)*(a*x + 1)^2*(a*x - 1)^2 + (250*a^{10}*x^{12} - 794*a^8*x^{10} + 946*a^6*x^8 - 519*a^4*x^6 + 129*a^2*x^4 - 12*x^2)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(125*a^{11}*x^{13} - 473*a^9*x^{11} + 696*a^7*x^9 - 497*a^5*x^7 + 173*a^3*x^5 - 24*a*x^3)*(a*x + 1)*(a*x - 1) + (125*a^{12}*x^{14} - 549*a^{10}*x^{12} + 955*a^8*x^{10} - 824*a^6*x^8 + 354*a^4*x^6 - 61*a^2*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^{12}*x^{14} - 21*a^{10}*x^{12} + 34*a^8*x^{10} - 26*a^6*x^8 + 9*a^4*x^6 - a^2*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1) + (5*a^{13}*x^{15} - 25*a^{11}*x^{13} + 50*a^9*x^{11} - 50*a^7*x^9 + 25*a^5*x^7 - 5*a^3*x^5 + (5*a^8*x^{10} - 8*a^6*x^8 + 3*a^4*x^6)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (25*a^9*x^{11} - 57*a^7*x^9 + 42*a^5*x^7 - 10*a^3*x^5)*(a*x + 1)^2*(a*x - 1)^2 + (50*a^{10}*x^{12} - 148*a^8*x^{10} + 158*a^6*x^8 - 71*a^4*x^6 + 11*a^2*x^4)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(25*a^{11}*x^{13} - 91*a^9*x^{11} + 126*a^7*x^9 - 81*a^5*x^7 + 23*a^3*x^5 - 2*a*x^3)*(a*x + 1)*(a*x - 1) + (25*a^{12}*x^{14} - 108*a^{10}*x^{12} + 183*a^8*x^{10} - 151*a^6*x^8 + 60*a^4*x^6 - 9*a^2*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1))*sqrt(a*x - 1)))/((a^{13}*x^{10} - 5*a^{11}*x^8 + (a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)})*a^8*x^5 + 10*a^9*x^6 - 10*a^7*x^4 + 5*a^5*x^2 + 5*(a^9*x^6 - a^7*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 10*(a^{10}*x^7 - 2*a^8*x^5 + a^6*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 10*(a^{11}*x^8 - 3*a^9*x^6 + 3*a^7*x^4 - a^5*x^2)*(a*x + 1)*(a*x - 1) - a^3 + 5*(a^{12}*x^9 - 4*a^{10}*x^7 + 6*a^8*x^5 - 4*a^6*x^3 + a^4*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3) + integrate(1/6*(125*a^{15}*x^{16} - 750*a^{13}*x^{14} + 1875*a^{11}*x^{12} - 2500*a^9*x^{10} + 1875*a^7*x^8 - 750*a^5*x^6 + (125*a^9*x^{10} - 147*a^7*x^8 + 27*a^5*x^6 + 3*a^3*x^4)*(a*x + 1)^3*(a*x - 1)^3 + 125*a^3*x^4 + (750*a^{10}*x^{11} - 1485*a^8*x^9 + 901*a^6*x^7 - 147*a^4*x^5 - 12*a^2*x^3)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (1875*a^{11}*x^{12} - 5220*a^9*x^{10} + 5209*a^7*x^8 - 2185*a^5*x^6 + 321*a^3*x^4)*(a*x + 1)^2*(a*x - 1)^2 + (2500*a^{12}*x^{13} - 8970*a^{10}*x^{11} + 12366*a^8*x^9 - 8143*a^6*x^7 + 2583*a^4*x^5 - 360*a^2*x^3 + 24*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (1875*a^{13}*x^{14} - 8235*a^{11}*x^{12} + 14449*a^9*x^{10} - 12834*a^7*x^8 + 6030*a^5*x^6 - 1429*a^3*x^4 + 144*a*x^2)*(a*x + 1)*(a*x - 1) + (750*a^{14}*x^{15} - 3897*a^{12}*x^{13} + 8293*a^{10}*x^{11} - 9226*a^8*x^9 + 5655*a^6*x^7 - 1819*a^4*x^5 + 244*a^2*x^3)*sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^{15}*x^{12} - 6*a^{13}*x^{10} + (a*x + 1)^3*(a*x - 1)^3*a^9*x^6 + 15*a^{11}*x^8 - 20*a^9*x^6 + 15*a^7*x^4 - 6*a^5*x^2 + 6*(a^{10}*x^7 - a^8*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 15*(a^{11}*x^8 - 2*a^9*x^6 + a^7*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^{12}*x^9 - 3*a^{10}*x^7 + 3*a^8*x^5 - a^6*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{13}*x^{10} - 4*a^{11}*x^8 + 6*a^9*x^6 - 4*a^7*x^4 + a^5*x^2)*(a*x + 1)*(a*x - 1) + a^3 + 6*(a^{14}*x^{11} - 5*a^{12}*x^9 + 10*a^{10}*x^7 - 10*a^8*x^5 + 5*a^6*x^3 - a^4*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)$$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^4}{\text{arcosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^4,x, algorithm="fricas")

[Out] integral(x^4/arccosh(a*x)^4, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\text{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4/acosh(a*x)**4,x)

[Out] Integral(x**4/acosh(a*x)**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\text{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4/arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(x^4/arccosh(a*x)^4, x)

3.66 $\int \frac{x^3}{\cosh^{-1}(ax)^4} dx$

Optimal. Leaf size=155

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{3a^4} + \frac{4\text{Chi}\left(4 \cosh^{-1}(ax)\right)}{3a^4} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} + \frac{x\sqrt{ax-1}\sqrt{ax+1}}{a^3 \cosh^{-1}(ax)} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} - \frac{8x^3\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)}$$

[Out] $-(x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[ax]^3) + x^2/(2a^2\text{ArcCosh}[ax]^2) - (2x^4)/(3\text{ArcCosh}[ax]^2) + (x\sqrt{-1+ax}\sqrt{1+ax})/(a^3\text{ArcCosh}[ax]) - (8x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[ax]) + \text{CoshIntegral}[2\text{ArcCosh}[ax]]/(3a^4) + (4\text{CoshIntegral}[4\text{ArcCosh}[ax]])/(3a^4)$

Rubi [A] time = 0.587555, antiderivative size = 155, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5668, 5775, 5666, 3301}

$$\frac{\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{3a^4} + \frac{4\text{Chi}\left(4 \cosh^{-1}(ax)\right)}{3a^4} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} + \frac{x\sqrt{ax-1}\sqrt{ax+1}}{a^3 \cosh^{-1}(ax)} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} - \frac{8x^3\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^3/ArcCosh[a*x]^4, x]

[Out] $-(x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[ax]^3) + x^2/(2a^2\text{ArcCosh}[ax]^2) - (2x^4)/(3\text{ArcCosh}[ax]^2) + (x\sqrt{-1+ax}\sqrt{1+ax})/(a^3\text{ArcCosh}[ax]) - (8x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[ax]) + \text{CoshIntegral}[2\text{ArcCosh}[ax]]/(3a^4) + (4\text{CoshIntegral}[4\text{ArcCosh}[ax]])/(3a^4)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1+c*x]*Sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*((f_.)*(x_)^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*Sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1+c*x]*Sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + Dist[1/(b*c^(m+1)*(n+1)), Subst[Int[ExpandTrigReduce[(a+b*x)^(n+1)*Cosh[x]^(m-1)*(m-(m+1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\cosh^{-1}(ax)^4} dx &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{\int \frac{x^2}{\sqrt{-1+ax} \sqrt{1+ax} \cosh^{-1}(ax)^3} dx}{a} + \frac{1}{3}(4a) \int \frac{x^4}{\sqrt{-1+ax} \sqrt{1+ax} \cosh^{-1}(ax)^3} dx \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} + \frac{8}{3} \int \frac{x^3}{\cosh^{-1}(ax)^2} dx - \frac{\int \frac{x}{\cosh^{-1}(ax)}}{a^2} \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} + \frac{x \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{8x^3 \sqrt{-1+ax}}{3a \cosh^{-1}(ax)} \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} + \frac{x \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{8x^3 \sqrt{-1+ax}}{3a \cosh^{-1}(ax)} \\ &= -\frac{x^3 \sqrt{-1+ax} \sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{x^2}{2a^2 \cosh^{-1}(ax)^2} - \frac{2x^4}{3 \cosh^{-1}(ax)^2} + \frac{x \sqrt{-1+ax} \sqrt{1+ax}}{a^3 \cosh^{-1}(ax)} - \frac{8x^3 \sqrt{-1+ax}}{3a \cosh^{-1}(ax)} \end{aligned}$$

Mathematica [A] time = 0.373256, size = 188, normalized size = 1.21

$$\frac{\sqrt{ax-1} \left(ax \sqrt{\frac{ax-1}{ax+1}} \left(-2a^4 x^4 + 2a^2 x^2 - ax \sqrt{ax-1} \sqrt{ax+1} (4a^2 x^2 - 3) \cosh^{-1}(ax) - 2(8a^4 x^4 - 11a^2 x^2 + 3) \cosh^{-1}(ax) \right) \right)}{6a^4 \left(\frac{ax-1}{ax+1} \right)^{3/2} (ax+1)^{3/2} \cosh^{-1}(ax)}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/ArcCosh[a*x]^4, x]

[Out] (Sqrt[-1 + a*x]*(a*x*Sqrt[(-1 + a*x)/(1 + a*x)]*(2*a^2*x^2 - 2*a^4*x^4 - a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(-3 + 4*a^2*x^2)*ArcCosh[a*x] - 2*(3 - 11*a^2*x^2 + 8*a^4*x^4)*ArcCosh[a*x]^2) + 2*(-1 + a*x)*ArcCosh[a*x]^3*CoshIntegral[2*ArcCosh[a*x]] + 8*(-1 + a*x)*ArcCosh[a*x]^3*CoshIntegral[4*ArcCosh[a*x]]))/(6*a^4*((-1 + a*x)/(1 + a*x))^(3/2)*(1 + a*x)^(3/2)*ArcCosh[a*x]^3)

Maple [A] time = 0.043, size = 114, normalized size = 0.7

$$\frac{1}{a^4} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{12 (\operatorname{arccosh}(ax))^3} - \frac{\cosh(2 \operatorname{arccosh}(ax))}{12 (\operatorname{arccosh}(ax))^2} - \frac{\sinh(2 \operatorname{arccosh}(ax))}{6 \operatorname{arccosh}(ax)} + \frac{\operatorname{Chi}(2 \operatorname{arccosh}(ax))}{3} - \frac{\sinh(4 \operatorname{arccosh}(ax))}{24 (\operatorname{arccosh}(ax))^3} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x)^4, x)

[Out] 1/a^4*(-1/12/arccosh(a*x)^3*sinh(2*arccosh(a*x))-1/12/arccosh(a*x)^2*cosh(2*arccosh(a*x))-1/6/arccosh(a*x)*sinh(2*arccosh(a*x))+1/3*Chi(2*arccosh(a*x))-1/24/arccosh(a*x)^3*sinh(4*arccosh(a*x))-1/12/arccosh(a*x)^2*cosh(4*arccosh(a*x))-1/3/arccosh(a*x)*sinh(4*arccosh(a*x))+4/3*Chi(4*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x³/arccosh(a*x)⁴,x, algorithm="maxima")

[Out]
$$-1/6*(2*a^{13}*x^{14} - 10*a^{11}*x^{12} + 20*a^9*x^{10} - 20*a^7*x^8 + 10*a^5*x^6 - 2*a^3*x^4 + 2*(a^8*x^9 - a^6*x^7)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 2*(5*a^9*x^{10} - 9*a^7*x^8 + 4*a^5*x^6)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^{10}*x^{11} - 13*a^8*x^9 + 11*a^6*x^7 - 3*a^4*x^5)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 4*(5*a^{11}*x^{12} - 17*a^9*x^{10} + 21*a^7*x^8 - 11*a^5*x^6 + 2*a^3*x^4)*(a*x + 1)*(a*x - 1) + (16*a^{13}*x^{14} - 80*a^{11}*x^{12} + 160*a^9*x^{10} - 160*a^7*x^8 + 80*a^5*x^6 - 16*a^3*x^4 + 4*(4*a^8*x^9 - 7*a^6*x^7 + 3*a^4*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (80*a^9*x^{10} - 192*a^7*x^8 + 154*a^5*x^6 - 45*a^3*x^4 + 3*a*x^2)*(a*x + 1)^2*(a*x - 1)^2 + (160*a^{10}*x^{11} - 488*a^8*x^9 + 550*a^6*x^7 - 279*a^4*x^5 + 63*a^2*x^3 - 6*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (160*a^{11}*x^{12} - 592*a^9*x^{10} + 846*a^7*x^8 - 583*a^5*x^6 + 196*a^3*x^4 - 27*a*x^2)*(a*x + 1)*(a*x - 1) + (80*a^{12}*x^{13} - 348*a^{10}*x^{11} + 598*a^8*x^9 - 509*a^6*x^7 + 216*a^4*x^5 - 37*a^2*x^3)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^{12}*x^{13} - 21*a^{10}*x^{11} + 34*a^8*x^9 - 26*a^6*x^7 + 9*a^4*x^5 - a^2*x^3)*sqrt(a*x + 1)*sqrt(a*x - 1) + (4*a^{13}*x^{14} - 20*a^{11}*x^{12} + 40*a^9*x^{10} - 40*a^7*x^8 + 20*a^5*x^6 - 4*a^3*x^4 + 2*(2*a^8*x^9 - 3*a^6*x^7 + a^4*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (20*a^9*x^{10} - 44*a^7*x^8 + 31*a^5*x^6 - 7*a^3*x^4)*(a*x + 1)^2*(a*x - 1)^2 + (40*a^{10}*x^{11} - 116*a^8*x^9 + 121*a^6*x^7 - 53*a^4*x^5 + 8*a^2*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (40*a^{11}*x^{12} - 144*a^9*x^{10} + 197*a^7*x^8 - 125*a^5*x^6 + 35*a^3*x^4 - 3*a*x^2)*(a*x + 1)*(a*x - 1) + (20*a^{12}*x^{13} - 86*a^{10}*x^{11} + 145*a^8*x^9 - 119*a^6*x^7 + 47*a^4*x^5 - 7*a^2*x^3)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^{13}*x^{10} - 5*a^{11}*x^8 + (a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)}*a^8*x^5 + 10*a^9*x^6 - 10*a^7*x^4 + 5*a^5*x^2 + 5*(a^9*x^6 - a^7*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 10*(a^{10}*x^7 - 2*a^8*x^5 + a^6*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 10*(a^{11}*x^8 - 3*a^9*x^6 + 3*a^7*x^4 - a^5*x^2)*(a*x + 1)*(a*x - 1) - a^3 + 5*(a^{12}*x^9 - 4*a^{10}*x^7 + 6*a^8*x^5 - 4*a^6*x^3 + a^4*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3 + integrate(1/6*(64*a^{15}*x^{15} - 384*a^{13}*x^{13} + 960*a^{11}*x^{11} - 1280*a^9*x^9 + 960*a^7*x^7 - 384*a^5*x^5 + 8*(8*a^9*x^9 - 7*a^7*x^7)*(a*x + 1)^3*(a*x - 1)^3 + (384*a^{10}*x^{10} - 664*a^8*x^8 + 308*a^6*x^6 - 12*a^4*x^4 - 9*a^2*x^2)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 64*a^3*x^3 + 2*(480*a^{11}*x^{11} - 1240*a^9*x^9 + 1096*a^7*x^7 - 360*a^5*x^5 + 15*a^3*x^3 + 9*a*x)*(a*x + 1)^2*(a*x - 1)^2 + 2*(640*a^{12}*x^{12} - 2200*a^{10}*x^{10} + 2844*a^8*x^8 - 1684*a^6*x^6 + 433*a^4*x^4 - 36*a^2*x^2 + 3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(480*a^{13}*x^{13} - 2060*a^{11}*x^{11} + 3496*a^9*x^9 - 2952*a^7*x^7 + 1283*a^5*x^5 - 274*a^3*x^3 + 27*a*x)*(a*x + 1)*(a*x - 1) + (384*a^{14}*x^{14} - 1976*a^{12}*x^{12} + 4148*a^{10}*x^{10} - 4524*a^8*x^8 + 2699*a^6*x^6 - 842*a^4*x^4 + 111*a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))/((a^{15}*x^{12} - 6*a^{13}*x^{10} + (a*x + 1)^3*(a*x - 1)^3*a^9*x^6 + 15*a^{11}*x^8 - 20*a^9*x^6 + 15*a^7*x^4 - 6*a^5*x^2 + 6*(a^{10}*x^7 - a^8*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 15*(a^{11}*x^8 - 2*a^9*x^6 + a^7*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^{12}*x^9 - 3*a^{10}*x^7 + 3*a^8*x^5 - a^6*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{13}*x^{10} - 4*a^{11}*x^8 + 6*a^9*x^6 - 4*a^7*x^4 + a^5*x^2)*(a*x + 1)*(a*x - 1) + a^3 + 6*(a^{14}*x^{11} - 5*a^{12}*x^9 + 10*a^{10}*x^7 - 10*a^8*x^5 + 5*a^6*x^3 - a^4*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)$$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^3}{\text{arcosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x)^4,x, algorithm="fricas")

[Out] integral(x^3/arccosh(a*x)^4, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\text{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3/acosh(a*x)**4,x)

[Out] Integral(x**3/acosh(a*x)**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\text{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3/arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(x^3/arccosh(a*x)^4, x)

$$3.67 \quad \int \frac{x^2}{\cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=153

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{24a^3} + \frac{9\text{Chi}(3\cosh^{-1}(ax))}{8a^3} + \frac{x}{3a^2 \cosh^{-1}(ax)^2} + \frac{\sqrt{ax-1}\sqrt{ax+1}}{3a^3 \cosh^{-1}(ax)} - \frac{x^3}{2 \cosh^{-1}(ax)^2} - \frac{3x^2\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)}$$

[Out] $-(x^2\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[a*x]^3) + x/(3a^2\text{ArcCosh}[a*x]^2) - x^3/(2\text{ArcCosh}[a*x]^2) + (\sqrt{-1+ax}\sqrt{1+ax})/(3a^3\text{ArcCosh}[a*x]) - (3x^2\sqrt{-1+ax}\sqrt{1+ax})/(2a\text{ArcCosh}[a*x]) + \text{CoshIntegral}[\text{ArcCosh}[a*x]]/(24a^3) + (9\text{CoshIntegral}[3\text{ArcCosh}[a*x]])/(8a^3)$

Rubi [A] time = 0.675705, antiderivative size = 153, normalized size of antiderivative = 1., number of steps used = 10, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.6$, Rules used = {5668, 5775, 5666, 3301, 5656, 5781}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{24a^3} + \frac{9\text{Chi}(3\cosh^{-1}(ax))}{8a^3} + \frac{x}{3a^2 \cosh^{-1}(ax)^2} + \frac{\sqrt{ax-1}\sqrt{ax+1}}{3a^3 \cosh^{-1}(ax)} - \frac{x^3}{2 \cosh^{-1}(ax)^2} - \frac{3x^2\sqrt{ax-1}\sqrt{ax+1}}{2a \cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^2/ArcCosh[a*x]^4, x]

[Out] $-(x^2\sqrt{-1+ax}\sqrt{1+ax})/(3a\text{ArcCosh}[a*x]^3) + x/(3a^2\text{ArcCosh}[a*x]^2) - x^3/(2\text{ArcCosh}[a*x]^2) + (\sqrt{-1+ax}\sqrt{1+ax})/(3a^3\text{ArcCosh}[a*x]) - (3x^2\sqrt{-1+ax}\sqrt{1+ax})/(2a\text{ArcCosh}[a*x]) + \text{CoshIntegral}[\text{ArcCosh}[a*x]]/(24a^3) + (9\text{CoshIntegral}[3\text{ArcCosh}[a*x]])/(8a^3)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*((f_.)*(x_))^(m_.))/(sqrt[(d1_) + (e1_.)*(x_)]*sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + Dist[1/(b*c^(m+1)*(n+1)), Subst[Int[ExpandTrigReduce[(a+b*x)^(n+1)*Cosh[x]^(m-1)*(m-(m+1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

```
Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol]
:> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}, x]
&& EqQ[d*(e - Pi/2) - c*f*fz*I, 0]
```

Rule 5656

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_, x_Symbol] :> Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]
```

Rule 5781

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_.*(x_)^m_.*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol]
:> Dist[(-d1*d2))^(p/c^(m + 1)), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])
```

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\cosh^{-1}(ax)^4} dx &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a\cosh^{-1}(ax)^3} - \frac{2\int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3} dx}{3a} + a \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax}\cosh^{-1}(ax)^3} dx \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a\cosh^{-1}(ax)^3} + \frac{x}{3a^2\cosh^{-1}(ax)^2} - \frac{x^3}{2\cosh^{-1}(ax)^2} + \frac{3}{2} \int \frac{x^2}{\cosh^{-1}(ax)^2} dx - \frac{\int \frac{1}{\cosh^{-1}(ax)}}{3a^2} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a\cosh^{-1}(ax)^3} + \frac{x}{3a^2\cosh^{-1}(ax)^2} - \frac{x^3}{2\cosh^{-1}(ax)^2} + \frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a^3\cosh^{-1}(ax)} - \frac{3x^2\sqrt{-1+ax}}{2a\cosh^{-1}(ax)} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a\cosh^{-1}(ax)^3} + \frac{x}{3a^2\cosh^{-1}(ax)^2} - \frac{x^3}{2\cosh^{-1}(ax)^2} + \frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a^3\cosh^{-1}(ax)} - \frac{3x^2\sqrt{-1+ax}}{2a\cosh^{-1}(ax)} \\ &= -\frac{x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a\cosh^{-1}(ax)^3} + \frac{x}{3a^2\cosh^{-1}(ax)^2} - \frac{x^3}{2\cosh^{-1}(ax)^2} + \frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a^3\cosh^{-1}(ax)} - \frac{3x^2\sqrt{-1+ax}}{2a\cosh^{-1}(ax)} \end{aligned}$$

Mathematica [A] time = 0.364899, size = 183, normalized size = 1.2

$$\frac{\sqrt{ax-1} \left(-4\sqrt{\frac{ax-1}{ax+1}} (2a^2x^2(a^2x^2-1) + ax\sqrt{ax-1}\sqrt{ax+1} (3a^2x^2-2) \cosh^{-1}(ax) + (9a^4x^4 - 11a^2x^2 + 2) \cosh^{-1}(ax)) \right)}{24a^3 \left(\frac{ax-1}{ax+1} \right)^{3/2} (ax+1)^{3/2} \cosh^{-1}(ax)}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/ArcCosh[a*x]^4, x]

[Out] (Sqrt[-1 + a*x]*(-4*Sqrt[(-1 + a*x)/(1 + a*x)]*(2*a^2*x^2*(-1 + a^2*x^2) + a*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(-2 + 3*a^2*x^2)*ArcCosh[a*x] + (2 - 11*a^2*x^2 + 9*a^4*x^4)*ArcCosh[a*x]^2) + (-1 + a*x)*ArcCosh[a*x]^3*CoshIntegral[ArcCosh[a*x]] + 27*(-1 + a*x)*ArcCosh[a*x]^3*CoshIntegral[3*ArcCosh[a*x]])/(24*a^3*((-1 + a*x)/(1 + a*x))^(3/2)*(1 + a*x)^(3/2)*ArcCosh[a*x]^3)

Maple [A] time = 0.035, size = 121, normalized size = 0.8

$$\frac{1}{a^3} \left(-\frac{1}{12 (\operatorname{arccosh}(ax))^3} \sqrt{ax-1} \sqrt{ax+1} - \frac{ax}{24 (\operatorname{arccosh}(ax))^2} - \frac{1}{24 \operatorname{arccosh}(ax)} \sqrt{ax-1} \sqrt{ax+1} + \frac{\operatorname{Chi}(\operatorname{arccosh}(ax))}{24} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x)^4,x)

[Out] 1/a^3*(-1/12/arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/24*a*x/arccosh(a*x)^2-1/24/arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+1/24*Chi(arccosh(a*x))-1/12/arccosh(a*x)^3*sinh(3*arccosh(a*x))-1/8/arccosh(a*x)^2*cosh(3*arccosh(a*x))-3/8/arccosh(a*x)*sinh(3*arccosh(a*x))+9/8*Chi(3*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^4,x, algorithm="maxima")

[Out] -1/6*(2*a^13*x^13 - 10*a^11*x^11 + 20*a^9*x^9 - 20*a^7*x^7 + 10*a^5*x^5 + 2*(a^8*x^8 - a^6*x^6)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) - 2*a^3*x^3 + 2*(5*a^9*x^9 - 9*a^7*x^7 + 4*a^5*x^5)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^10*x^10 - 13*a^8*x^8 + 11*a^6*x^6 - 3*a^4*x^4)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 4*(5*a^11*x^11 - 17*a^9*x^9 + 21*a^7*x^7 - 11*a^5*x^5 + 2*a^3*x^3)*(a*x + 1)*(a*x - 1) + (9*a^13*x^13 - 45*a^11*x^11 + 90*a^9*x^9 - 90*a^7*x^7 + 45*a^5*x^5 + (9*a^8*x^8 - 13*a^6*x^6 + 3*a^4*x^4 + a^2*x^2)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) - 9*a^3*x^3 + (45*a^9*x^9 - 97*a^7*x^7 + 64*a^5*x^5 - 10*a^3*x^3 - 2*a*x)*(a*x + 1)^2*(a*x - 1)^2 + (90*a^10*x^10 - 258*a^8*x^8 + 264*a^6*x^6 - 113*a^4*x^4 + 19*a^2*x^2 - 2)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 2*(45*a^11*x^11 - 161*a^9*x^9 + 219*a^7*x^7 - 141*a^5*x^5 + 44*a^3*x^3 - 6*a*x)*(a*x + 1)*(a*x - 1) + (45*a^12*x^12 - 193*a^10*x^10 + 325*a^8*x^8 - 270*a^6*x^6 + 112*a^4*x^4 - 19*a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^12*x^12 - 21*a^10*x^10 + 34*a^8*x^8 - 26*a^6*x^6 + 9*a^4*x^4 - a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1) + (3*a^13*x^13 - 15*a^11*x^11 + 30*a^9*x^9 - 30*a^7*x^7 + 15*a^5*x^5 + (3*a^8*x^8 - 4*a^6*x^6 + a^4*x^4)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) - 3*a^3*x^3 + (15*a^9*x^9 - 31*a^7*x^7 + 20*a^5*x^5 - 4*a^3*x^3)*(a*x + 1)^2*(a*x - 1)^2 + (30*a^10*x^10 - 84*a^8*x^8 + 84*a^6*x^6 - 35*a^4*x^4 + 5*a^2*x^2)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 2*(15*a^11*x^11 - 53*a^9*x^9 + 71*a^7*x^7 - 44*a^5*x^5 + 12*a^3*x^3 - a*x)*(a*x + 1)*(a*x - 1) + (15*a^12*x^12 - 64*a^10*x^10 + 107*a^8*x^8 - 87*a^6*x^6 + 34*a^4*x^4 - 5*a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^13*x^10 - 5*a^11*x^8 + (a*x + 1)^(5/2)*(a*x - 1)^(5/2)*a^8*x^5 + 10*a^9*x^6 - 10*a^7*x^4 + 5*a^5*x^2 + 5*(a^9*x^6 - a^7*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 10*(a^10*x^7 - 2*a^8*x^5 + a^6*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 10*(a^11*x^8 - 3*a^9*x^6 + 3*a^7*x^4 - a^5*x^2)*(a*x + 1)*(a*x - 1) - a^3 + 5*(a^12*x^9 - 4*a^10*x^7 + 6*a^8*x^5 - 4*a^6*x^3 + a^4*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3) + integrate(1/6*(27*a^14*x^14 - 162*a^12*x^12 + 405*a^10*x^10 - 540*a^8*x^8 + 405*a^6*x^6 - 162*a^4*x^4 + (27*a^8*x^8 - 13*a^6*x^6 - 3*a^4*x^4 - 3*a^2*x^2)*(a*x + 1)^3*(a*x - 1)^3 + (162*a^9*x^9 - 227*a^7*x^7 + 63*a^5*x^5 + 3*a^3*x^3 + 6*a*x)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + (405*a^10*x^10 - 940*a^8*x^8 + 687*a^6*x^6 - 143*a^4*x^4 - 21*a^2*x^2 + 12)*(a*x + 1)^

$$2*(a*x - 1)^2 + (540*a^{11}*x^{11} - 1750*a^9*x^9 + 2058*a^7*x^7 - 1017*a^5*x^5 + 145*a^3*x^3 + 24*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 27*a^2*x^2 + (405*a^{12}*x^{12} - 1685*a^{10}*x^{10} + 2727*a^8*x^8 - 2118*a^6*x^6 + 782*a^4*x^4 - 123*a^2*x^2 + 12)*(a*x + 1)*(a*x - 1) + (162*a^{13}*x^{13} - 823*a^{11}*x^{11} + 1695*a^9*x^9 - 1790*a^7*x^7 + 1015*a^5*x^5 - 297*a^3*x^3 + 38*a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}/((a^{14}*x^{12} - 6*a^{12}*x^{10} + (a*x + 1)^3*(a*x - 1)^3*a^8*x^6 + 15*a^{10}*x^8 - 20*a^8*x^6 + 15*a^6*x^4 + 6*(a^9*x^7 - a^7*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} - 6*a^4*x^2 + 15*(a^{10}*x^8 - 2*a^8*x^6 + a^6*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^{11}*x^9 - 3*a^9*x^7 + 3*a^7*x^5 - a^5*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{12}*x^{10} - 4*a^{10}*x^8 + 6*a^8*x^6 - 4*a^6*x^4 + a^4*x^2)*(a*x + 1)*(a*x - 1) + 6*(a^{13}*x^{11} - 5*a^{11}*x^9 + 10*a^9*x^7 - 10*a^7*x^5 + 5*a^5*x^3 - a^3*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1} + a^2)*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})), x$$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^2}{\text{arcosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^4,x, algorithm="fricas")

[Out] integral(x^2/arccosh(a*x)^4, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\text{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2/acosh(a*x)**4,x)

[Out] Integral(x**2/acosh(a*x)**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\text{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(x^2/arccosh(a*x)^4, x)

$$3.68 \quad \int \frac{x}{\cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=105

$$\frac{2\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{3a^2} + \frac{1}{6a^2 \cosh^{-1}(ax)^2} - \frac{x^2}{3 \cosh^{-1}(ax)^2} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)^3}$$

[Out] $-(x\sqrt{-1+ax})\sqrt{1+ax}/(3a\text{ArcCosh}[ax]^3) + 1/(6a^2\text{ArcCosh}[ax]^2) - x^2/(3\text{ArcCosh}[ax]^2) - (2x\sqrt{-1+ax})\sqrt{1+ax}/(3a\text{ArcCosh}[ax]) + (2\text{CoshIntegral}[2\text{ArcCosh}[ax]])/(3a^2)$

Rubi [A] time = 0.396025, antiderivative size = 105, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5668, 5775, 5666, 3301, 5676}

$$\frac{2\text{Chi}\left(2 \cosh^{-1}(ax)\right)}{3a^2} + \frac{1}{6a^2 \cosh^{-1}(ax)^2} - \frac{x^2}{3 \cosh^{-1}(ax)^2} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)} - \frac{x\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)^3}$$

Antiderivative was successfully verified.

[In] Int[x/ArcCosh[a*x]^4,x]

[Out] $-(x\sqrt{-1+ax})\sqrt{1+ax}/(3a\text{ArcCosh}[ax]^3) + 1/(6a^2\text{ArcCosh}[ax]^2) - x^2/(3\text{ArcCosh}[ax]^2) - (2x\sqrt{-1+ax})\sqrt{1+ax}/(3a\text{ArcCosh}[ax]) + (2\text{CoshIntegral}[2\text{ArcCosh}[ax]])/(3a^2)$

Rule 5668

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + (-Dist[(c*(m+1))/(b*(n+1)), Int[(x^(m+1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x] + Dist[m/(b*c*(n+1)), Int[(x^(m-1)*(a+b*ArcCosh[c*x])^(n+1))/(sqrt[-1+c*x]*sqrt[1+c*x]), x], x]) /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && LtQ[n, -2]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_)*((f_.)*(x_)^(m_.))/(sqrt[(d1_) + (e1_.)*(x_)]*sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[((f*x)^m*(a+b*ArcCosh[c*x])^(n+1))/(b*c*sqrt[-(d1*d2)]*(n+1)), x] - Dist[(f*m)/(b*c*sqrt[-(d1*d2)]*(n+1)), Int[(f*x)^(m-1)*(a+b*ArcCosh[c*x])^(n+1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*sqrt[-1+c*x]*sqrt[1+c*x]*(a+b*ArcCosh[c*x])^(n+1))/(b*c*(n+1)), x] + Dist[1/(b*c^(m+1)*(n+1)), Subst[Int[ExpandTrigReduce[(a+b*x)^(n+1)*Cosh[x]^(m-1)*(m-(m+1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}

}, x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rubi steps

$$\begin{aligned} \int \frac{x}{\cosh^{-1}(ax)^4} dx &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{\int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3} dx}{3a} + \frac{1}{3}(2a) \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{1}{6a^2 \cosh^{-1}(ax)^2} - \frac{x^2}{3 \cosh^{-1}(ax)^2} + \frac{2}{3} \int \frac{x}{\cosh^{-1}(ax)^2} dx \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{1}{6a^2 \cosh^{-1}(ax)^2} - \frac{x^2}{3 \cosh^{-1}(ax)^2} - \frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)} + \frac{2 \text{Subst}\left(\int \frac{1}{\cosh^{-1}(ax)} dx\right)}{3a^2} \\ &= -\frac{x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{1}{6a^2 \cosh^{-1}(ax)^2} - \frac{x^2}{3 \cosh^{-1}(ax)^2} - \frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)} + \frac{2 \text{Chi}\left(2 \cosh^{-1}(ax)\right)}{3a^2} \end{aligned}$$

Mathematica [A] time = 0.29365, size = 131, normalized size = 1.25

$$\frac{-2a^3x^3 + (4ax - 4a^3x^3) \cosh^{-1}(ax)^2 - \sqrt{ax-1}\sqrt{ax+1}(2a^2x^2-1) \cosh^{-1}(ax) + 2ax}{\cosh^{-1}(ax)^3} + 4\sqrt{\frac{ax-1}{ax+1}}(ax+1)\text{Chi}\left(2 \cosh^{-1}(ax)\right)$$

$$6a^2\sqrt{ax-1}\sqrt{ax+1}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/ArcCosh[a*x]^4, x]

[Out] ((2*a*x - 2*a^3*x^3 - Sqrt[-1 + a*x]*Sqrt[1 + a*x]*(-1 + 2*a^2*x^2)*ArcCosh[a*x] + (4*a*x - 4*a^3*x^3)*ArcCosh[a*x]^2)/ArcCosh[a*x]^3 + 4*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x)*CoshIntegral[2*ArcCosh[a*x]])/(6*a^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x])

Maple [A] time = 0.026, size = 60, normalized size = 0.6

$$\frac{1}{a^2} \left(-\frac{\sinh(2 \operatorname{arccosh}(ax))}{6 (\operatorname{arccosh}(ax))^3} - \frac{\cosh(2 \operatorname{arccosh}(ax))}{6 (\operatorname{arccosh}(ax))^2} - \frac{\sinh(2 \operatorname{arccosh}(ax))}{3 \operatorname{arccosh}(ax)} + \frac{2 \operatorname{Chi}(2 \operatorname{arccosh}(ax))}{3} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^4, x)

[Out] 1/a^2*(-1/6/arccosh(a*x)^3*sinh(2*arccosh(a*x))-1/6/arccosh(a*x)^2*cosh(2*arccosh(a*x))-1/3/arccosh(a*x)*sinh(2*arccosh(a*x))+2/3*Chi(2*arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^4,x, algorithm="maxima")

[Out]
$$-1/6*(2*a^{12}*x^{12} - 10*a^{10}*x^{10} + 20*a^8*x^8 - 20*a^6*x^6 + 10*a^4*x^4 + 2*(a^7*x^7 - a^5*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 2*(5*a^8*x^8 - 9*a^6*x^6 + 4*a^4*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^9*x^9 - 13*a^7*x^7 + 11*a^5*x^5 - 3*a^3*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} - 2*a^2*x^2 + 4*(5*a^{10}*x^{10} - 17*a^8*x^8 + 21*a^6*x^6 - 11*a^4*x^4 + 2*a^2*x^2)*(a*x + 1)*(a*x - 1) + (4*a^{12}*x^{12} - 20*a^{10}*x^{10} + 40*a^8*x^8 - 40*a^6*x^6 + 20*a^4*x^4 + 4*(a^7*x^7 - a^5*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (20*a^8*x^8 - 36*a^6*x^6 + 16*a^4*x^4 + 3*a^2*x^2 - 3)*(a*x + 1)^2*(a*x - 1)^2 + (40*a^9*x^9 - 104*a^7*x^7 + 88*a^5*x^5 - 21*a^3*x^3 - 3*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} - 4*a^2*x^2 + (40*a^{10}*x^{10} - 136*a^8*x^8 + 168*a^6*x^6 - 91*a^4*x^4 + 22*a^2*x^2 - 3)*(a*x + 1)*(a*x - 1) + (20*a^{11}*x^{11} - 84*a^9*x^9 + 136*a^7*x^7 - 107*a^5*x^5 + 42*a^3*x^3 - 7*a*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^{11}*x^{11} - 21*a^9*x^9 + 34*a^7*x^7 - 26*a^5*x^5 + 9*a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + (2*a^{12}*x^{12} - 10*a^{10}*x^{10} + 20*a^8*x^8 - 20*a^6*x^6 + 10*a^4*x^4 + 2*(a^7*x^7 - a^5*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (10*a^8*x^8 - 18*a^6*x^6 + 9*a^4*x^4 - a^2*x^2)*(a*x + 1)^2*(a*x - 1)^2 + (20*a^9*x^9 - 52*a^7*x^7 + 47*a^5*x^5 - 17*a^3*x^3 + 2*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} - 2*a^2*x^2 + (20*a^{10}*x^{10} - 68*a^8*x^8 + 87*a^6*x^6 - 51*a^4*x^4 + 13*a^2*x^2 - 1)*(a*x + 1)*(a*x - 1) + (10*a^{11}*x^{11} - 42*a^9*x^9 + 69*a^7*x^7 - 55*a^5*x^5 + 21*a^3*x^3 - 3*a*x)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^{12}*x^{10} - 5*a^{10}*x^8 + (a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)}*a^7*x^5 + 10*a^8*x^6 - 10*a^6*x^4 + 5*a^4*x^2 + 5*(a^8*x^6 - a^6*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 10*(a^9*x^7 - 2*a^7*x^5 + a^5*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 10*(a^{10}*x^8 - 3*a^8*x^6 + 3*a^6*x^4 - a^4*x^2)*(a*x + 1)*(a*x - 1) + 5*(a^{11}*x^9 - 4*a^9*x^7 + 6*a^7*x^5 - 4*a^5*x^3 + a^3*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a^2)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3) + integrate(1/6*(8*a^{13}*x^{13} - 48*a^{11}*x^{11} + 8*(a*x + 1)^3*(a*x - 1)^3*a^7*x^7 + 120*a^9*x^9 - 160*a^7*x^7 + 120*a^5*x^5 + (48*a^8*x^8 - 48*a^6*x^6 + 4*a^4*x^4 - 12*a^2*x^2 + 15)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} - 48*a^3*x^3 + 8*(15*a^9*x^9 - 30*a^7*x^7 + 17*a^5*x^5 - 5*a^3*x^3 + 3*a*x)*(a*x + 1)^2*(a*x - 1)^2 + 2*(80*a^{10}*x^{10} - 240*a^8*x^8 + 252*a^6*x^6 - 104*a^4*x^4 + 3*a^2*x^2 + 9)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 8*(15*a^{11}*x^{11} - 60*a^9*x^9 + 92*a^7*x^7 - 63*a^5*x^5 + 15*a^3*x^3 + a*x)*(a*x + 1)*(a*x - 1) + (48*a^{12}*x^{12} - 240*a^{10}*x^{10} + 484*a^8*x^8 - 484*a^6*x^6 + 243*a^4*x^4 - 58*a^2*x^2 + 7)*sqrt(a*x + 1)*sqrt(a*x - 1) + 8*a*x)/((a^{13}*x^{12} - 6*a^{11}*x^{10} + (a*x + 1)^3*(a*x - 1)^3*a^7*x^6 + 15*a^9*x^8 - 20*a^7*x^6 + 15*a^5*x^4 + 6*(a^8*x^7 - a^6*x^5)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 15*(a^9*x^8 - 2*a^7*x^6 + a^5*x^4)*(a*x + 1)^2*(a*x - 1)^2 - 6*a^3*x^2 + 20*(a^{10}*x^9 - 3*a^8*x^7 + 3*a^6*x^5 - a^4*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{11}*x^{10} - 4*a^9*x^8 + 6*a^7*x^6 - 4*a^5*x^4 + a^3*x^2)*(a*x + 1)*(a*x - 1) + 6*(a^{12}*x^{11} - 5*a^{10}*x^9 + 10*a^8*x^7 - 10*a^6*x^5 + 5*a^4*x^3 - a^2*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)$$

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x}{\text{arccosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/arccosh(a*x)^4,x, algorithm="fricas")
```

```
[Out] integral(x/arccosh(a*x)^4, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/acosh(a*x)**4,x)
```

```
[Out] Integral(x/acosh(a*x)**4, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x/arccosh(a*x)^4,x, algorithm="giac")
```

```
[Out] integrate(x/arccosh(a*x)^4, x)
```

$$3.69 \quad \int \frac{1}{\cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=86

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{6a} - \frac{x}{6 \cosh^{-1}(ax)^2} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{6a \cosh^{-1}(ax)} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)^3}$$

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(3*a*ArcCosh[a*x]^3) - x/(6*ArcCosh[a*x]^2) - (Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*a*ArcCosh[a*x]) + CoshIntegral[ArcCosh[a*x]]/(6*a)

Rubi [A] time = 0.377686, antiderivative size = 86, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 4, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.667$, Rules used = {5656, 5775, 5781, 3301}

$$\frac{\text{Chi}(\cosh^{-1}(ax))}{6a} - \frac{x}{6 \cosh^{-1}(ax)^2} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{6a \cosh^{-1}(ax)} - \frac{\sqrt{ax-1}\sqrt{ax+1}}{3a \cosh^{-1}(ax)^3}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^(-4), x]

[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(3*a*ArcCosh[a*x]^3) - x/(6*ArcCosh[a*x]^2) - (Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(6*a*ArcCosh[a*x]) + CoshIntegral[ArcCosh[a*x]]/(6*a)

Rule 5656

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_), x_Symbol] :> Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_)*((f_.)*(x_))^(m_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[((f*x)^m*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n + 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^ (n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(p_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3301

Int[sin[(e_.) + (Complex[0, fz_])*(f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CoshIntegral[(c*f*fz)/d + f*fz*x]/d, x] /; FreeQ[{c, d, e, f, fz}

} , x] && EqQ[d*(e - Pi/2) - c*f*fz*I, 0]

Rubi steps

$$\begin{aligned}
 \int \frac{1}{\cosh^{-1}(ax)^4} dx &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} + \frac{1}{3}a \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^3} dx \\
 &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{x}{6 \cosh^{-1}(ax)^2} + \frac{1}{6} \int \frac{1}{\cosh^{-1}(ax)^2} dx \\
 &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{x}{6 \cosh^{-1}(ax)^2} - \frac{\sqrt{-1+ax}\sqrt{1+ax}}{6a \cosh^{-1}(ax)} + \frac{1}{6}a \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} dx \\
 &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{x}{6 \cosh^{-1}(ax)^2} - \frac{\sqrt{-1+ax}\sqrt{1+ax}}{6a \cosh^{-1}(ax)} + \frac{\text{Subst}\left(\int \frac{\cosh(x)}{x} dx, x, \cosh^{-1}(ax)\right)}{6a} \\
 &= -\frac{\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^3} - \frac{x}{6 \cosh^{-1}(ax)^2} - \frac{\sqrt{-1+ax}\sqrt{1+ax}}{6a \cosh^{-1}(ax)} + \frac{\text{Chi}\left(\cosh^{-1}(ax)\right)}{6a}
 \end{aligned}$$

Mathematica [A] time = 0.179326, size = 116, normalized size = 1.35

$$\frac{\sqrt{\frac{ax-1}{ax+1}} \sqrt{ax+1} \cosh^{-1}(ax)^3 \text{Chi}\left(\cosh^{-1}(ax)\right) - 2(ax-1)\sqrt{ax+1} - (ax-1)\sqrt{ax+1} \cosh^{-1}(ax)^2 - ax\sqrt{ax-1} \cosh^{-1}(ax)}{6a\sqrt{ax-1} \cosh^{-1}(ax)^3}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^(-4), x]

[Out] (-2*(-1 + a*x)*Sqrt[1 + a*x] - a*x*Sqrt[-1 + a*x]*ArcCosh[a*x] - (-1 + a*x)*Sqrt[1 + a*x]*ArcCosh[a*x]^2 + Sqrt[(-1 + a*x)/(1 + a*x)]*Sqrt[1 + a*x]*ArcCosh[a*x]^3*CoshIntegral[ArcCosh[a*x]])/(6*a*Sqrt[-1 + a*x]*ArcCosh[a*x]^3)

Maple [A] time = 0.027, size = 67, normalized size = 0.8

$$\frac{1}{a} \left(-\frac{1}{3 (\text{arccosh}(ax))^3} \sqrt{ax-1} \sqrt{ax+1} - \frac{ax}{6 (\text{arccosh}(ax))^2} - \frac{1}{6 \text{arccosh}(ax)} \sqrt{ax-1} \sqrt{ax+1} + \frac{\text{Chi}(\text{arccosh}(ax))}{6} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^4, x)

[Out] 1/a*(-1/3/arccosh(a*x)^3*(a*x-1)^(1/2)*(a*x+1)^(1/2)-1/6*a*x/arccosh(a*x)^2-1/6/arccosh(a*x)*(a*x-1)^(1/2)*(a*x+1)^(1/2)+1/6*Chi(arccosh(a*x)))

Maxima [F] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^4, x, algorithm="maxima")

```
[Out] -1/6*(2*a^11*x^11 - 10*a^9*x^9 + 20*a^7*x^7 - 20*a^5*x^5 + 2*(a^6*x^6 - a^4*x^4)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + 10*a^3*x^3 + 2*(5*a^7*x^7 - 9*a^5*x^5 + 4*a^3*x^3)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^8*x^8 - 13*a^6*x^6 + 11*a^4*x^4 - 3*a^2*x^2)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 4*(5*a^9*x^9 - 17*a^7*x^7 + 21*a^5*x^5 - 11*a^3*x^3 + 2*a*x)*(a*x + 1)*(a*x - 1) + (a^11*x^11 - 5*a^9*x^9 + 10*a^7*x^7 - 10*a^5*x^5 + (a^6*x^6 - a^4*x^4 + 3*a^2*x^2 - 3)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + 5*a^3*x^3 + (5*a^7*x^7 - 9*a^5*x^5 + 10*a^3*x^3 - 6*a*x)*(a*x + 1)^2*(a*x - 1)^2 + (10*a^8*x^8 - 26*a^6*x^6 + 22*a^4*x^4 - 3*a^2*x^2 - 3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 2*(5*a^9*x^9 - 17*a^7*x^7 + 18*a^5*x^5 - 5*a^3*x^3 - a*x)*(a*x + 1)*(a*x - 1) + (5*a^10*x^10 - 21*a^8*x^8 + 31*a^6*x^6 - 20*a^4*x^4 + 6*a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^10*x^10 - 21*a^8*x^8 + 34*a^6*x^6 - 26*a^4*x^4 + 9*a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - 2*a*x + (a^11*x^11 - 5*a^9*x^9 + 10*a^7*x^7 - 10*a^5*x^5 + (a^6*x^6 - a^2*x^2)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + 5*a^3*x^3 + (5*a^7*x^7 - 5*a^5*x^5 - 2*a^3*x^3 + 2*a*x)*(a*x + 1)^2*(a*x - 1)^2 + (10*a^8*x^8 - 20*a^6*x^6 + 10*a^4*x^4 + a^2*x^2 - 1)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 2*(5*a^9*x^9 - 15*a^7*x^7 + 16*a^5*x^5 - 7*a^3*x^3 + a*x)*(a*x + 1)*(a*x - 1) + (5*a^10*x^10 - 20*a^8*x^8 + 31*a^6*x^6 - 23*a^4*x^4 + 8*a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1) - a*x)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^11*x^10 - 5*a^9*x^8 + (a*x + 1)^(5/2)*(a*x - 1)^(5/2)*a^6*x^5 + 10*a^7*x^6 - 10*a^5*x^4 + 5*(a^7*x^6 - a^5*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 5*a^3*x^2 + 10*(a^8*x^7 - 2*a^6*x^5 + a^4*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) + 10*(a^9*x^8 - 3*a^7*x^6 + 3*a^5*x^4 - a^3*x^2)*(a*x + 1)*(a*x - 1) + 5*(a^10*x^9 - 4*a^8*x^7 + 6*a^6*x^5 - 4*a^4*x^3 + a^2*x)*sqrt(a*x + 1)*sqrt(a*x - 1) - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3) + integrate(1/6*(a^12*x^12 - 6*a^10*x^10 + 15*a^8*x^8 - 20*a^6*x^6 + 15*a^4*x^4 + (a^6*x^6 + a^4*x^4 - 9*a^2*x^2 + 15)*(a*x + 1)^3*(a*x - 1)^3 + (6*a^7*x^7 - a^5*x^5 - 31*a^3*x^3 + 33*a*x)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + (15*a^8*x^8 - 20*a^6*x^6 - 19*a^4*x^4 + 3*a^2*x^2 + 21)*(a*x + 1)^2*(a*x - 1)^2 + (20*a^9*x^9 - 50*a^7*x^7 + 54*a^5*x^5 - 59*a^3*x^3 + 35*a*x)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) - 6*a^2*x^2 + (15*a^10*x^10 - 55*a^8*x^8 + 101*a^6*x^6 - 90*a^4*x^4 + 22*a^2*x^2 + 7)*(a*x + 1)*(a*x - 1) + (6*a^11*x^11 - 29*a^9*x^9 + 65*a^7*x^7 - 66*a^5*x^5 + 23*a^3*x^3 + a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + 1)/((a^12*x^12 - 6*a^10*x^10 + (a*x + 1)^3*(a*x - 1)^3*a^6*x^6 + 15*a^8*x^8 - 20*a^6*x^6 + 15*a^4*x^4 + 6*(a^7*x^7 - a^5*x^5)*(a*x + 1)^(5/2)*(a*x - 1)^(5/2) + 15*(a^8*x^8 - 2*a^6*x^6 + a^4*x^4)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^9*x^9 - 3*a^7*x^7 + 3*a^5*x^5 - a^3*x^3)*(a*x + 1)^(3/2)*(a*x - 1)^(3/2) - 6*a^2*x^2 + 15*(a^10*x^10 - 4*a^8*x^8 + 6*a^6*x^6 - 4*a^4*x^4 + a^2*x^2)*(a*x + 1)*(a*x - 1) + 6*(a^11*x^11 - 5*a^9*x^9 + 10*a^7*x^7 - 10*a^5*x^5 + 5*a^3*x^3 - a*x)*sqrt(a*x + 1)*sqrt(a*x - 1) + 1)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)
```

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{\text{arcosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/arcosh(a*x)^4,x, algorithm="fricas")
```

```
[Out] integral(arcosh(a*x)^(-4), x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/acosh(a*x)**4,x)

[Out] Integral(acosh(a*x)**(-4), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(arccosh(a*x)^(-4), x)

$$3.70 \quad \int \frac{1}{x \cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^4}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^4), x]

Rubi [A] time = 0.0136799, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^4} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^4), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^4), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^4} dx = \int \frac{1}{x \cosh^{-1}(ax)^4} dx$$

Mathematica [A] time = 9.82626, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^4} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^4), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^4), x]

Maple [A] time = 0.069, size = 0, normalized size = 0.

$$\int \frac{1}{x (\operatorname{arccosh}(ax))^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^4, x)

[Out] int(1/x/arccosh(a*x)^4, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(ax)^4,x, algorithm="maxima")

[Out]
$$-1/6*(2*a^{13}*x^{13} - 10*a^{11}*x^{11} + 20*a^9*x^9 - 20*a^7*x^7 + 10*a^5*x^5 + 2*(a^8*x^8 - a^6*x^6)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} - 2*a^3*x^3 + 2*(5*a^9*x^9 - 9*a^7*x^7 + 4*a^5*x^5)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^{10}*x^{10} - 13*a^8*x^8 + 11*a^6*x^6 - 3*a^4*x^4)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 4*(5*a^{11}*x^{11} - 17*a^9*x^9 + 21*a^7*x^7 - 11*a^5*x^5 + 2*a^3*x^3)*(a*x + 1)*(a*x - 1) - (4*(a^6*x^6 - 3*a^4*x^4 + 2*a^2*x^2)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (16*a^7*x^7 - 46*a^5*x^5 + 37*a^3*x^3 - 7*a*x)*(a*x + 1)^2*(a*x - 1)^2 + (24*a^8*x^8 - 66*a^6*x^6 + 59*a^4*x^4 - 19*a^2*x^2 + 2)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (16*a^9*x^9 - 42*a^7*x^7 + 39*a^5*x^5 - 16*a^3*x^3 + 3*a*x)*(a*x + 1)*(a*x - 1) + (4*a^{10}*x^{10} - 10*a^8*x^8 + 9*a^6*x^6 - 4*a^4*x^4 + a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^2 + 2*(5*a^{12}*x^{12} - 21*a^{10}*x^{10} + 34*a^8*x^8 - 26*a^6*x^6 + 9*a^4*x^4 - a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1) + (2*(a^6*x^6 - a^4*x^4)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + (8*a^7*x^7 - 13*a^5*x^5 + 5*a^3*x^3)*(a*x + 1)^2*(a*x - 1)^2 + (12*a^8*x^8 - 27*a^6*x^6 + 19*a^4*x^4 - 4*a^2*x^2)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + (8*a^9*x^9 - 23*a^7*x^7 + 23*a^5*x^5 - 9*a^3*x^3 + a*x)*(a*x + 1)*(a*x - 1) + (2*a^{10}*x^{10} - 7*a^8*x^8 + 9*a^6*x^6 - 5*a^4*x^4 + a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1)))/((a^{13}*x^{13} - 5*a^{11}*x^{11} + (a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)}*a^8*x^8 + 10*a^9*x^9 - 10*a^7*x^7 + 5*a^5*x^5 - a^3*x^3 + 5*(a^9*x^9 - a^7*x^7)*(a*x + 1)^2*(a*x - 1)^2 + 10*(a^{10}*x^{10} - 2*a^8*x^8 + a^6*x^6)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 10*(a^{11}*x^{11} - 3*a^9*x^9 + 3*a^7*x^7 - a^5*x^5)*(a*x + 1)*(a*x - 1) + 5*(a^{12}*x^{12} - 4*a^{10}*x^{10} + 6*a^8*x^8 - 4*a^6*x^6 + a^4*x^4)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3 + integrate(1/6*(8*(a^7*x^7 - 6*a^5*x^5 + 6*a^3*x^3)*(a*x + 1)^3*(a*x - 1)^3 + (40*a^8*x^8 - 204*a^6*x^6 + 228*a^4*x^4 - 57*a^2*x^2)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 2*(40*a^9*x^9 - 168*a^7*x^7 + 200*a^5*x^5 - 87*a^3*x^3 + 15*a*x)*(a*x + 1)^2*(a*x - 1)^2 + 2*(40*a^{10}*x^{10} - 132*a^8*x^8 + 156*a^6*x^6 - 91*a^4*x^4 + 30*a^2*x^2 - 3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(20*a^{11}*x^{11} - 48*a^9*x^9 + 48*a^7*x^7 - 35*a^5*x^5 + 18*a^3*x^3 - 3*a*x)*(a*x + 1)*(a*x - 1) + (8*a^{12}*x^{12} - 12*a^{10}*x^{10} + 4*a^8*x^8 - 5*a^6*x^6 + 6*a^4*x^4 - a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))/((a^{15}*x^{16} - 6*a^{13}*x^{14} + (a*x + 1)^3*(a*x - 1)^3*a^9*x^{10} + 15*a^{11}*x^{12} - 20*a^9*x^{10} + 15*a^7*x^8 - 6*a^5*x^6 + a^3*x^4 + 6*(a^{10}*x^{11} - a^8*x^9)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 15*(a^{11}*x^{12} - 2*a^9*x^{10} + a^7*x^8)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^{12}*x^{13} - 3*a^{10}*x^{11} + 3*a^8*x^9 - a^6*x^7)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{13}*x^{14} - 4*a^{11}*x^{12} + 6*a^9*x^{10} - 4*a^7*x^8 + a^5*x^6)*(a*x + 1)*(a*x - 1) + 6*(a^{14}*x^{15} - 5*a^{12}*x^{13} + 10*a^{10}*x^{11} - 10*a^8*x^9 + 5*a^6*x^7 - a^4*x^5)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)$$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{x \operatorname{arccosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/x/arccosh(a*x)^4,x, algorithm="fricas")
```

```
[Out] integral(1/(x*arccosh(a*x)^4), x)
```

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/x/acosh(a*x)**4,x)
```

```
[Out] Integral(1/(x*acosh(a*x)**4), x)
```

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/x/arccosh(a*x)^4,x, algorithm="giac")
```

```
[Out] integrate(1/(x*arccosh(a*x)^4), x)
```

$$3.71 \quad \int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{1}{x^2 \cosh^{-1}(ax)^4}, x\right)$$

[Out] Unintegrable[1/(x^2*ArcCosh[a*x]^4), x]

Rubi [A] time = 0.014538, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x^2*ArcCosh[a*x]^4), x]

[Out] Defer[Int][1/(x^2*ArcCosh[a*x]^4), x]

Rubi steps

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx = \int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx$$

Mathematica [A] time = 11.9407, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \cosh^{-1}(ax)^4} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x^2*ArcCosh[a*x]^4), x]

[Out] Integrate[1/(x^2*ArcCosh[a*x]^4), x]

Maple [A] time = 0.093, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 (\operatorname{arccosh}(ax))^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x^2/arccosh(a*x)^4, x)

[Out] int(1/x^2/arccosh(a*x)^4, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^4,x, algorithm="maxima")

[Out]
$$\begin{aligned} & -1/6*(2*a^{13}*x^{13} - 10*a^{11}*x^{11} + 20*a^9*x^9 - 20*a^7*x^7 + 10*a^5*x^5 + 2 \\ & *(a^8*x^8 - a^6*x^6)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} - 2*a^3*x^3 + 2*(5*a^9 \\ & *x^9 - 9*a^7*x^7 + 4*a^5*x^5)*(a*x + 1)^2*(a*x - 1)^2 + 4*(5*a^{10}*x^{10} - 13 \\ & *a^8*x^8 + 11*a^6*x^6 - 3*a^4*x^4)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 4*(5*a \\ & ^{11}*x^{11} - 17*a^9*x^9 + 21*a^7*x^7 - 11*a^5*x^5 + 2*a^3*x^3)*(a*x + 1)*(a*x \\ & - 1) + (a^{13}*x^{13} - 5*a^{11}*x^{11} + 10*a^9*x^9 - 10*a^7*x^7 + 5*a^5*x^5 + (a \\ & ^8*x^8 - 13*a^6*x^6 + 27*a^4*x^4 - 15*a^2*x^2)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5 \\ & /2)} - a^3*x^3 + (5*a^9*x^9 - 57*a^7*x^7 + 124*a^5*x^5 - 90*a^3*x^3 + 18*a*x \\ &)*(a*x + 1)^2*(a*x - 1)^2 + (10*a^{10}*x^{10} - 98*a^8*x^8 + 220*a^6*x^6 - 189* \\ & a^4*x^4 + 63*a^2*x^2 - 6)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(5*a^{11}*x^{11} \\ & - 41*a^9*x^9 + 93*a^7*x^7 - 89*a^5*x^5 + 38*a^3*x^3 - 6*a*x)*(a*x + 1)*(a*x \\ & - 1) + (5*a^{12}*x^{12} - 33*a^{10}*x^{10} + 73*a^8*x^8 - 74*a^6*x^6 + 36*a^4*x^4 \\ & - 7*a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x \\ & - 1))^2 + 2*(5*a^{12}*x^{12} - 21*a^{10}*x^{10} + 34*a^8*x^8 - 26*a^6*x^6 + 9*a^4*x \\ & ^4 - a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1) - (a^{13}*x^{13} - 5*a^{11}*x^{11} + 10*a \\ & ^9*x^9 - 10*a^7*x^7 + 5*a^5*x^5 + (a^8*x^8 - 4*a^6*x^6 + 3*a^4*x^4)*(a*x + \\ & 1)^{(5/2)}*(a*x - 1)^{(5/2)} - a^3*x^3 + (5*a^9*x^9 - 21*a^7*x^7 + 24*a^5*x^5 - \\ & 8*a^3*x^3)*(a*x + 1)^2*(a*x - 1)^2 + (10*a^{10}*x^{10} - 44*a^8*x^8 + 64*a^6*x \\ & ^6 - 37*a^4*x^4 + 7*a^2*x^2)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 2*(5*a^{11}*x^{11} \\ & - 23*a^9*x^9 + 39*a^7*x^7 - 30*a^5*x^5 + 10*a^3*x^3 - a*x)*(a*x + 1)*(a* \\ & x - 1) + (5*a^{12}*x^{12} - 24*a^{10}*x^{10} + 45*a^8*x^8 - 41*a^6*x^6 + 18*a^4*x^4 \\ & - 3*a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x \\ & - 1))))/((a^{13}*x^{14} - 5*a^{11}*x^{12} + (a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)}*a^8*x^9 \\ & + 10*a^9*x^{10} - 10*a^7*x^8 + 5*a^5*x^6 - a^3*x^4 + 5*(a^9*x^{10} - a^7*x^8)* \\ & (a*x + 1)^2*(a*x - 1)^2 + 10*(a^{10}*x^{11} - 2*a^8*x^9 + a^6*x^7)*(a*x + 1)^{(3 \\ & /2)}*(a*x - 1)^{(3/2)} + 10*(a^{11}*x^{12} - 3*a^9*x^{10} + 3*a^7*x^8 - a^5*x^6)*(a* \\ & x + 1)*(a*x - 1) + 5*(a^{12}*x^{13} - 4*a^{10}*x^{11} + 6*a^8*x^9 - 4*a^6*x^7 + a^4 \\ & *x^5)*sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))^3 \\ &) - integrate(1/6*(a^{15}*x^{15} - 6*a^{13}*x^{13} + 15*a^{11}*x^{11} - 20*a^9*x^9 + 15 \\ & *a^7*x^7 - 6*a^5*x^5 + (a^9*x^9 - 39*a^7*x^7 + 135*a^5*x^5 - 105*a^3*x^3)*(\\ & a*x + 1)^3*(a*x - 1)^3 + (6*a^{10}*x^{10} - 201*a^8*x^8 + 677*a^6*x^6 - 663*a^4 \\ & *x^4 + 174*a^2*x^2)*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + a^3*x^3 + (15*a^{11}*x^{11} \\ & - 420*a^9*x^9 + 1373*a^7*x^7 - 1565*a^5*x^5 + 705*a^3*x^3 - 108*a*x)*(a* \\ & x + 1)^2*(a*x - 1)^2 + (20*a^{12}*x^{12} - 450*a^{10}*x^{10} + 1422*a^8*x^8 - 1787* \\ & a^6*x^6 + 1059*a^4*x^4 - 288*a^2*x^2 + 24)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} \\ & + (15*a^{13}*x^{13} - 255*a^{11}*x^{11} + 773*a^9*x^9 - 1026*a^7*x^7 + 714*a^5*x^5 \\ & - 257*a^3*x^3 + 36*a*x)*(a*x + 1)*(a*x - 1) + (6*a^{14}*x^{14} - 69*a^{12}*x^{12} + \\ & 197*a^{10}*x^{10} - 266*a^8*x^8 + 201*a^6*x^6 - 83*a^4*x^4 + 14*a^2*x^2)*sqrt(\\ & a*x + 1)*sqrt(a*x - 1))/((a^{15}*x^{17} - 6*a^{13}*x^{15} + (a*x + 1)^3*(a*x - 1)^3 \\ & *a^9*x^{11} + 15*a^{11}*x^{13} - 20*a^9*x^{11} + 15*a^7*x^9 - 6*a^5*x^7 + a^3*x^5 + \\ & 6*(a^{10}*x^{12} - a^8*x^{10})*(a*x + 1)^{(5/2)}*(a*x - 1)^{(5/2)} + 15*(a^{11}*x^{13} - \\ & 2*a^9*x^{11} + a^7*x^9)*(a*x + 1)^2*(a*x - 1)^2 + 20*(a^{12}*x^{14} - 3*a^{10}*x^{12} \\ & + 3*a^8*x^{10} - a^6*x^8)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + 15*(a^{13}*x^{15} - \\ & 4*a^{11}*x^{13} + 6*a^9*x^{11} - 4*a^7*x^9 + a^5*x^7)*(a*x + 1)*(a*x - 1) + 6*(a \\ & ^{14}*x^{16} - 5*a^{12}*x^{14} + 10*a^{10}*x^{12} - 10*a^8*x^{10} + 5*a^6*x^8 - a^4*x^6)* \\ & sqrt(a*x + 1)*sqrt(a*x - 1))*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x) \end{aligned}$$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{1}{x^2 \operatorname{arcosh}(ax)^4}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^4,x, algorithm="fricas")

[Out] integral(1/(x^2*arccosh(a*x)^4), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{acosh}^4(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x**2/acosh(a*x)**4,x)

[Out] Integral(1/(x**2*acosh(a*x)**4), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \operatorname{arcosh}(ax)^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x^2/arccosh(a*x)^4,x, algorithm="giac")

[Out] integrate(1/(x^2*arccosh(a*x)^4), x)

3.72 $\int x^4 \sqrt{\cosh^{-1}(ax)} dx$

Optimal. Leaf size=182

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{\sqrt{\frac{\pi}{5}} \operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{320a^5} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{\sqrt{\frac{\pi}{5}} \operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{320a^5}$$

[Out] (x^5*Sqrt[ArcCosh[a*x]])/5 - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(320*a^5) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(320*a^5)

Rubi [A] time = 0.475392, antiderivative size = 182, normalized size of antiderivative = 1., number of steps used = 19, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{\sqrt{\frac{\pi}{5}} \operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{320a^5} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{\sqrt{\frac{\pi}{5}} \operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{320a^5}$$

Antiderivative was successfully verified.

[In] Int[x^4*Sqrt[ArcCosh[a*x]],x]

[Out] (x^5*Sqrt[ArcCosh[a*x]])/5 - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(320*a^5) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(320*a^5)

Rule 5664

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Simp[(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)^(m_.)*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3312

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol]
] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x^4 \sqrt{\cosh^{-1}(ax)} dx &= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{1}{10} a \int \frac{x^5}{\sqrt{-1 + ax} \sqrt{1 + ax} \sqrt{\cosh^{-1}(ax)}} dx \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh^5(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{10a^5} \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \left(\frac{5 \cosh(x)}{8\sqrt{x}} + \frac{5 \cosh(3x)}{16\sqrt{x}} + \frac{\cosh(5x)}{16\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{10a^5} \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh(5x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{160a^5} - \frac{\text{Subst}\left(\int \frac{\cosh(3x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{32a^5} \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{e^{-5x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{320a^5} - \frac{\text{Subst}\left(\int \frac{e^{5x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{320a^5} - \frac{\text{Subst}\left(\int \frac{e^{15x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{320a^5} \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int e^{-5x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{160a^5} - \frac{\text{Subst}\left(\int e^{5x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{160a^5} \\
&= \frac{1}{5} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{\sqrt{\pi} \text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{3}} \text{erf}\left(\sqrt{3} \sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{\sqrt{\frac{\pi}{5}} \text{erf}\left(\sqrt{5} \sqrt{\cosh^{-1}(ax)}\right)}{320a^5}
\end{aligned}$$

Mathematica [A] time = 0.0947883, size = 162, normalized size = 0.89

$$\frac{3\sqrt{5}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{3}{2}, -5\cosh^{-1}(ax)\right) + 25\sqrt{3}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{3}{2}, -3\cosh^{-1}(ax)\right) + 150\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{3}{2}, -\cosh^{-1}(ax)\right)}{320a^5}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[x^4*Sqrt[ArcCosh[a*x]], x]
```

```
[Out] (3*Sqrt[5]*Sqrt[ArcCosh[a*x]]*Gamma[3/2, -5*ArcCosh[a*x]] + 25*Sqrt[3]*Sqrt
[ArcCosh[a*x]]*Gamma[3/2, -3*ArcCosh[a*x]] + 150*Sqrt[ArcCosh[a*x]]*Gamma[3
/2, -ArcCosh[a*x]] + 150*Sqrt[-ArcCosh[a*x]]*Gamma[3/2, ArcCosh[a*x]] + 25*
Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[3/2, 3*ArcCosh[a*x]] + 3*Sqrt[5]*Sqrt[-Ar
cCosh[a*x]]*Gamma[3/2, 5*ArcCosh[a*x]])/(2400*a^5*Sqrt[-ArcCosh[a*x]])
```

Maple [F] time = 0.183, size = 0, normalized size = 0.

$$\int x^4 \sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^4*arccosh(a*x)^(1/2),x)
```

```
[Out] int(x^4*arccosh(a*x)^(1/2),x)
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \sqrt{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*arccosh(a*x)^(1/2),x, algorithm="maxima")
```

```
[Out] integrate(x^4*sqrt(arccosh(a*x)), x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*arccosh(a*x)^(1/2),x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**4*acosh(a*x)**(1/2),x)
```

```
[Out] Integral(x**4*sqrt(acosh(a*x)), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x⁴*arccosh(a*x)^(1/2),x, algorithm="giac")

[Out] sage₀*x

3.73 $\int x^3 \sqrt{\cosh^{-1}(ax)} dx$

Optimal. Leaf size=139

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{256a^4} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{256a^4} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{3\sqrt{\cosh^{-1}(ax)}}{4a^4}$$

[Out] $(-3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4) + (x^4*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/4 - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erf}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(256*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erfi}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(256*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4)$

Rubi [A] time = 0.403064, antiderivative size = 139, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{256a^4} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{256a^4} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{3\sqrt{\cosh^{-1}(ax)}}{4a^4}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]], x]$

[Out] $(-3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4) + (x^4*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/4 - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erf}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(256*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erfi}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(256*a^4) - (\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a^4)$

Rule 5664

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^n*(x_.)^m, x_Symbol] \rightarrow \operatorname{Simp}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n)/(m+1), x] - \operatorname{Dist}[(b*c^n)/(m+1), \operatorname{Int}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ \operatorname{GtQ}[n, 0]$

Rule 5781

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^n*(x_.)^m*((d1_.) + (e1_.)*(x_.))^p*((d2_.) + (e2_.)*(x_.))^q, x_Symbol] \rightarrow \operatorname{Dist}[(-d1*d2)^p/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x]^{2*p+1}], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, n\}, x \ \&\& \ \operatorname{EqQ}[e1 - c*d1, 0] \ \&\& \ \operatorname{EqQ}[e2 + c*d2, 0] \ \&\& \ \operatorname{IntegerQ}[p + 1/2] \ \&\& \ \operatorname{GtQ}[p, -1] \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ (\operatorname{GtQ}[d1, 0] \ \&\& \ \operatorname{LtQ}[d2, 0])$

Rule 3312

$\operatorname{Int}[(c_. + (d_.)*(x_.))^m*\sin[(e_.) + (f_.)*(x_.)]^n, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sin}[e + f*x]^n, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \ \&\& \ \operatorname{IGtQ}[n, 1] \ \&\& \ (!\operatorname{RationalQ}[m] \ \|\ (\operatorname{GeQ}[m, -1] \ \&\& \ \operatorname{LtQ}[m, 1]))$

Rule 3307

$\operatorname{Int}[(c_. + (d_.)*(x_.))^m*\sin[(e_.) + \operatorname{Pi}*(k_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/(E^{I*k*Pi}*E^{I*(e + f*x)}), x], x] - \operatorname{Dist}[-I/2, \operatorname{Int}[(c + d*x)^m/(E^{-I*k*Pi}*E^{I*(e + f*x)}), x], x]$

$I/2, \text{Int}[(c + d*x)^m * E^{(I*k*Pi)} * E^{(I*(e + f*x))}, x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x] \&\& \text{IntegerQ}[2*k]$

Rule 2180

$\text{Int}[(F_)^{((g_.) * ((e_.) + (f_.) * (x_)))} / \text{Sqrt}[(c_.) + (d_.) * (x_)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x] \&\& !\$UseGamma == True$

Rule 2204

$\text{Int}[(F_)^{((a_.) + (b_.) * ((c_.) + (d_.) * (x_)) ^ 2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erfi}[(c + d*x) * \text{Rt}[b * \text{Log}[F], 2]]) / (2 * d * \text{Rt}[b * \text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^{((a_.) + (b_.) * ((c_.) + (d_.) * (x_)) ^ 2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erf}[(c + d*x) * \text{Rt}[-(b * \text{Log}[F]), 2]]) / (2 * d * \text{Rt}[-(b * \text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int x^3 \sqrt{\cosh^{-1}(ax)} dx &= \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{1}{8} a \int \frac{x^4}{\sqrt{-1 + ax} \sqrt{1 + ax} \sqrt{\cosh^{-1}(ax)}} dx \\ &= \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh^4(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^4} \\ &= \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \left(\frac{3}{8\sqrt{x}} + \frac{\cosh(2x)}{2\sqrt{x}} + \frac{\cosh(4x)}{8\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{8a^4} \\ &= -\frac{3\sqrt{\cosh^{-1}(ax)}}{32a^4} + \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh(4x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{64a^4} - \frac{\text{Subst}\left(\int \frac{\cosh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{128a^4} \\ &= -\frac{3\sqrt{\cosh^{-1}(ax)}}{32a^4} + \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{e^{-4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{128a^4} - \frac{\text{Subst}\left(\int \frac{e^{4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{128a^4} \\ &= -\frac{3\sqrt{\cosh^{-1}(ax)}}{32a^4} + \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int e^{-4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{64a^4} - \frac{\text{Subst}\left(\int e^{4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{64a^4} \\ &= -\frac{3\sqrt{\cosh^{-1}(ax)}}{32a^4} + \frac{1}{4} x^4 \sqrt{\cosh^{-1}(ax)} - \frac{\sqrt{\pi} \text{erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{256a^4} - \frac{\sqrt{\frac{\pi}{2}} \text{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} \end{aligned}$$

Mathematica [A] time = 0.0839095, size = 101, normalized size = 0.73

$$\frac{\sqrt{\cosh^{-1}(ax)} \text{Gamma}\left(\frac{3}{2}, -4 \cosh^{-1}(ax)\right) + 4\sqrt{2}\sqrt{\cosh^{-1}(ax)} \text{Gamma}\left(\frac{3}{2}, -2 \cosh^{-1}(ax)\right) + \sqrt{-\cosh^{-1}(ax)} \left(4\sqrt{2}\text{Gamma}\left(\frac{3}{2}, -\cosh^{-1}(ax)\right) + \sqrt{2}\text{Gamma}\left(\frac{3}{2}, \cosh^{-1}(ax)\right)\right)}{128a^4 \sqrt{-\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3*Sqrt[ArcCosh[a*x]], x]

[Out] (Sqrt[ArcCosh[a*x]]*Gamma[3/2, -4*ArcCosh[a*x]] + 4*Sqrt[2]*Sqrt[ArcCosh[a*x]]*Gamma[3/2, -2*ArcCosh[a*x]] + Sqrt[-ArcCosh[a*x]]*(4*Sqrt[2]*Gamma[3/2,

```
2*ArcCosh[a*x]] + Gamma[3/2, 4*ArcCosh[a*x]]))/(128*a^4*Sqrt[-ArcCosh[a*x]
])
```

Maple [F] time = 0.103, size = 0, normalized size = 0.

$$\int x^3 \sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*arccosh(a*x)^(1/2),x)
```

```
[Out] int(x^3*arccosh(a*x)^(1/2),x)
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \sqrt{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*arccosh(a*x)^(1/2),x, algorithm="maxima")
```

```
[Out] integrate(x^3*sqrt(arccosh(a*x)), x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*arccosh(a*x)^(1/2),x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*acosh(a*x)**(1/2),x)
```

```
[Out] Integral(x**3*sqrt(acosh(a*x)), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*arccosh(a*x)^(1/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.74 $\int x^2 \sqrt{\cosh^{-1}(ax)} dx$

Optimal. Leaf size=120

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{48a^3} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{48a^3} + \frac{1}{3}x^3\sqrt{\cosh^{-1}(ax)}$$

[Out] (x^3*Sqrt[ArcCosh[a*x]])/3 - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(48*a^3) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a^3) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(48*a^3)

Rubi [A] time = 0.397389, antiderivative size = 120, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{48a^3} - \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} - \frac{\sqrt{\frac{\pi}{3}} \operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{48a^3} + \frac{1}{3}x^3\sqrt{\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[x^2*Sqrt[ArcCosh[a*x]], x]

[Out] (x^3*Sqrt[ArcCosh[a*x]])/3 - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(48*a^3) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a^3) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(48*a^3)

Rule 5664

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Simp[(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.)*((d1_.) + (e1_.)*(x_.))^ (p_.)*((d2_.) + (e2_.)*(x_.))^ (q_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3312

Int[((c_.) + (d_.)*(x_)^(m_.)*sin[(e_.) + (f_.)*(x_)])^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))

Rule 3307

Int[((c_.) + (d_.)*(x_)^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)])^(n_.), x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[

$I/2, \text{Int}[(c + d*x)^m * E^{(I*k*Pi)*E^{(I*(e + f*x))}}, x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x] \&\& \text{IntegerQ}[2*k]$

Rule 2180

$\text{Int}[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/\text{Sqrt}[(c_.) + (d_.)*(x_)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x] \&\& !\$UseGamma == True$

Rule 2204

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erfi}[(c + d*x)*\text{Rt}[b*\text{Log}[F], 2]])/(2*d*\text{Rt}[b*\text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erf}[(c + d*x)*\text{Rt}[-(b*\text{Log}[F]), 2]])/(2*d*\text{Rt}[-(b*\text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int x^2 \sqrt{\cosh^{-1}(ax)} dx &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{1}{6} a \int \frac{x^3}{\sqrt{-1 + ax} \sqrt{1 + ax} \sqrt{\cosh^{-1}(ax)}} dx \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh^3(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{6a^3} \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \left(\frac{3 \cosh(x)}{4\sqrt{x}} + \frac{\cosh(3x)}{4\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{6a^3} \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh(3x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{24a^3} - \frac{\text{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^3} \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{e^{-3x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{48a^3} - \frac{\text{Subst}\left(\int \frac{e^{3x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{48a^3} \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int e^{-3x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{24a^3} - \frac{\text{Subst}\left(\int e^{3x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{24a^3} \\ &= \frac{1}{3} x^3 \sqrt{\cosh^{-1}(ax)} - \frac{\sqrt{\pi} \text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} - \frac{\sqrt{\frac{\pi}{3}} \text{erf}\left(\sqrt{3} \sqrt{\cosh^{-1}(ax)}\right)}{48a^3} - \frac{\sqrt{\pi} \text{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^3} \end{aligned}$$

Mathematica [A] time = 0.0830565, size = 100, normalized size = 0.83

$$\frac{\sqrt{3} \sqrt{\cosh^{-1}(ax)} \Gamma\left(\frac{3}{2}, -3 \cosh^{-1}(ax)\right) + 9 \sqrt{\cosh^{-1}(ax)} \Gamma\left(\frac{3}{2}, -\cosh^{-1}(ax)\right) + \sqrt{-\cosh^{-1}(ax)} \left(9 \Gamma\left(\frac{3}{2}, \cosh^{-1}(ax)\right) + 9 \Gamma\left(\frac{3}{2}, \cosh^{-1}(ax)\right)\right)}{72a^3 \sqrt{-\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*Sqrt[ArcCosh[a*x]], x]

[Out] (Sqrt[3]*Sqrt[ArcCosh[a*x]]*Gamma[3/2, -3*ArcCosh[a*x]] + 9*Sqrt[ArcCosh[a*x]]*Gamma[3/2, -ArcCosh[a*x]] + Sqrt[-ArcCosh[a*x]]*(9*Gamma[3/2, ArcCosh[a*x]] + 9*Gamma[3/2, ArcCosh[a*x]])) / (72*a^3*Sqrt[-ArcCosh[a*x]])

*x]] + Sqrt[3]*Gamma[3/2, 3*ArcCosh[a*x]]))/(72*a^3*Sqrt[-ArcCosh[a*x]])

Maple [F] time = 0.089, size = 0, normalized size = 0.

$$\int x^2 \sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^(1/2),x)

[Out] int(x^2*arccosh(a*x)^(1/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \sqrt{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(1/2),x, algorithm="maxima")

[Out] integrate(x^2*sqrt(arccosh(a*x)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**(1/2),x)

[Out] Integral(x**2*sqrt(acosh(a*x)), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*arccosh(a*x)^(1/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.75 $\int x\sqrt{\cosh^{-1}(ax)} dx$

Optimal. Leaf size=93

$$-\frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{16a^2}-\frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{16a^2}-\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2}+\frac{1}{2}x^2\sqrt{\cosh^{-1}(ax)}$$

[Out] $-\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]/(4*a^2) + (x^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/2 - (\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(16*a^2) - (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(16*a^2)$

Rubi [A] time = 0.350346, antiderivative size = 93, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$-\frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{16a^2}-\frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{16a^2}-\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2}+\frac{1}{2}x^2\sqrt{\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]], x]$

[Out] $-\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]/(4*a^2) + (x^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/2 - (\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(16*a^2) - (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(16*a^2)$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b + x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n)/(m+1), x] - \operatorname{Dist}[(b*c*n)/(m+1), \operatorname{Int}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /;$ $\operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{GtQ}[n, 0]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b + x)^n*(x)^m*((d_1) + (e_1)*(x)^p)^q, x_Symbol] \rightarrow \operatorname{Dist}[(-d_1*d_2)^p/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x]^{(2*p+1)}], x], x, \operatorname{ArcCosh}[c*x]] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, n\}, x \&\& \operatorname{EqQ}[e_1 - c*d_1, 0] \&\& \operatorname{EqQ}[e_2 + c*d_2, 0] \&\& \operatorname{IntegerQ}[p + 1/2] \&\& \operatorname{GtQ}[p, -1] \&\& \operatorname{IGtQ}[m, 0] \&\& (\operatorname{GtQ}[d_1, 0] \&\& \operatorname{LtQ}[d_2, 0])$

Rule 3312

$\operatorname{Int}[(c + d*x)^m*\sin[(e + f*x)^n], x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sin}[e + f*x]^n, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \&\& \operatorname{IGtQ}[n, 1] \&\& (!\operatorname{RationalQ}[m] \mid\mid (\operatorname{GeQ}[m, -1] \&\& \operatorname{LtQ}[m, 1]))$

Rule 3307

$\operatorname{Int}[(c + d*x)^m*\sin[(e + \pi*k) + (f*x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/(E^{I*k*\pi}*E^{I*(e + f*x)})], x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m*E^{I*k*\pi}*E^{I*(e + f*x)}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e,$

f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]]/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned}
 \int x \sqrt{\cosh^{-1}(ax)} dx &= \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{1}{4} a \int \frac{x^2}{\sqrt{-1+ax} \sqrt{1+ax} \sqrt{\cosh^{-1}(ax)}} dx \\
 &= \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh^2(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^2} \\
 &= \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \left(\frac{1}{2\sqrt{x}} + \frac{\cosh(2x)}{2\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{4a^2} \\
 &= -\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2} + \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^2} \\
 &= -\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2} + \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^2} - \frac{\text{Subst}\left(\int \frac{e^{2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^2} \\
 &= -\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2} + \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{8a^2} - \frac{\text{Subst}\left(\int e^{2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{8a^2} \\
 &= -\frac{\sqrt{\cosh^{-1}(ax)}}{4a^2} + \frac{1}{2} x^2 \sqrt{\cosh^{-1}(ax)} - \frac{\sqrt{\frac{\pi}{2}} \text{erf}\left(\sqrt{2} \sqrt{\cosh^{-1}(ax)}\right)}{16a^2} - \frac{\sqrt{\frac{\pi}{2}} \text{erfi}\left(\sqrt{2} \sqrt{\cosh^{-1}(ax)}\right)}{16a^2}
 \end{aligned}$$

Mathematica [A] time = 0.0746745, size = 65, normalized size = 0.7

$$\frac{8\sqrt{\cosh^{-1}(ax)} \cosh\left(2 \cosh^{-1}(ax)\right) - \sqrt{2\pi} \left(\text{Erf}\left(\sqrt{2} \sqrt{\cosh^{-1}(ax)}\right) + \text{Erfi}\left(\sqrt{2} \sqrt{\cosh^{-1}(ax)}\right)\right)}{32a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x*Sqrt[ArcCosh[a*x]], x]

[Out] (8*Sqrt[ArcCosh[a*x]]*Cosh[2*ArcCosh[a*x]] - Sqrt[2*Pi]*(Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] + Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]))/(32*a^2)

Maple [A] time = 0.089, size = 73, normalized size = 0.8

$$-\frac{\sqrt{2}}{32\sqrt{\pi a^2}} \left(-8\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\sqrt{\pi x^2 a^2} + 4\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\sqrt{\pi} + \pi \operatorname{Erf}\left(\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\right) + \pi \operatorname{erfi}\left(\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x*arccosh(a*x)^(1/2),x)`

[Out] `-1/32*2^(1/2)*(-8*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)*x^2*a^2+4*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)+Pi*erf(2^(1/2)*arccosh(a*x)^(1/2))+Pi*erfi(2^(1/2)*arccosh(a*x)^(1/2)))/Pi^(1/2)/a^2`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x\sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(x*sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x\sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*acosh(a*x)**(1/2),x)`

[Out] `Integral(x*sqrt(acosh(a*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage_0x`

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*arccosh(a*x)^(1/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.76 $\int \sqrt{\cosh^{-1}(ax)} dx$

Optimal. Leaf size=53

$$-\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} - \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} + x\sqrt{\cosh^{-1}(ax)}$$

[Out] x*Sqrt[ArcCosh[a*x]] - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(4*a) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(4*a)

Rubi [A] time = 0.218892, antiderivative size = 53, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 6, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5654, 5781, 3307, 2180, 2204, 2205}

$$-\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} - \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} + x\sqrt{\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[Sqrt[ArcCosh[a*x]], x]

[Out] x*Sqrt[ArcCosh[a*x]] - (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(4*a) - (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(4*a)

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c^n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.)*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]]/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \int \sqrt{\cosh^{-1}(ax)} dx &= x\sqrt{\cosh^{-1}(ax)} - \frac{1}{2}a \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}} dx \\ &= x\sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a} \\ &= x\sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a} - \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a} \\ &= x\sqrt{\cosh^{-1}(ax)} - \frac{\text{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a} - \frac{\text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a} \\ &= x\sqrt{\cosh^{-1}(ax)} - \frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} - \frac{\sqrt{\pi}\text{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a} \end{aligned}$$

Mathematica [A] time = 0.0355784, size = 45, normalized size = 0.85

$$\frac{\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{3}{2}, -\cosh^{-1}(ax)\right)}{\sqrt{-\cosh^{-1}(ax)}} + \frac{\Gamma\left(\frac{3}{2}, \cosh^{-1}(ax)\right)}{2a}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[Sqrt[ArcCosh[a*x]], x]
```

```
[Out] ((Sqrt[ArcCosh[a*x]]*Gamma[3/2, -ArcCosh[a*x]])/Sqrt[-ArcCosh[a*x]] + Gamma
[3/2, ArcCosh[a*x]])/(2*a)
```

Maple [A] time = 0.074, size = 41, normalized size = 0.8

$$-\frac{1}{4\sqrt{\pi a}} \left(-4\sqrt{\text{arccosh}(ax)}\sqrt{\pi a} + \pi \text{Erf}\left(\sqrt{\text{arccosh}(ax)}\right) + \pi \text{erfi}\left(\sqrt{\text{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(arccosh(a*x)^(1/2), x)
```

```
[Out] -1/4*(-4*arccosh(a*x)^(1/2)*Pi^(1/2)*x*a+Pi*erf(arccosh(a*x)^(1/2))+Pi*erfi
(arccosh(a*x)^(1/2)))/Pi^(1/2)/a
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(arccosh(a*x)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**(1/2),x)

[Out] Integral(sqrt(acosh(a*x)), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(1/2),x, algorithm="giac")

[Out] sage0*x

$$3.77 \quad \int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable} \left(\frac{\sqrt{\cosh^{-1}(ax)}}{x}, x \right)$$

[Out] Unintegrable[Sqrt[ArcCosh[a*x]]/x, x]

Rubi [A] time = 0.0131443, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx$$

Verification is Not applicable to the result.

[In] Int[Sqrt[ArcCosh[a*x]]/x, x]

[Out] Defer[Int][Sqrt[ArcCosh[a*x]]/x, x]

Rubi steps

$$\int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx = \int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx$$

Mathematica [A] time = 0.283121, size = 0, normalized size = 0.

$$\int \frac{\sqrt{\cosh^{-1}(ax)}}{x} dx$$

Verification is Not applicable to the result.

[In] Integrate[Sqrt[ArcCosh[a*x]]/x, x]

[Out] Integrate[Sqrt[ArcCosh[a*x]]/x, x]

Maple [A] time = 0.07, size = 0, normalized size = 0.

$$\int \frac{1}{x} \sqrt{\text{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^(1/2)/x, x)

[Out] `int(arccosh(a*x)^(1/2)/x,x)`

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\sqrt{\operatorname{arccosh}(ax)}}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^(1/2)/x,x, algorithm="maxima")`

[Out] `integrate(sqrt(arccosh(a*x))/x, x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^(1/2)/x,x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\sqrt{\operatorname{acosh}(ax)}}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(acosh(a*x)**(1/2)/x,x)`

[Out] `Integral(sqrt(acosh(a*x))/x, x)`

Giac [A] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^(1/2)/x,x, algorithm="giac")`

[Out] `sage0*x`

3.78 $\int x^4 \cosh^{-1}(ax)^{3/2} dx$

Optimal. Leaf size=345

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{3200a^5} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{200a^5} - \frac{3\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{3200a^5}$$

```
[Out] (-4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(25*a^5) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(25*a^3) - (3*x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(50*a) + (x^5*ArcCosh[a*x]^(3/2))/5 - (3*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(200*a^5) - (3*Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) - (3*Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) + (3*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(64*a^5) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(200*a^5) + (3*Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) + (3*Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(3200*a^5)
```

Rubi [A] time = 1.1148, antiderivative size = 345, normalized size of antiderivative = 1., number of steps used = 41, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {5664, 5759, 5718, 5658, 3308, 2180, 2204, 2205, 5670, 5448}

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^5} - \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{3200a^5} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{200a^5} - \frac{3\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{3200a^5}$$

Antiderivative was successfully verified.

```
[In] Int[x^4*ArcCosh[a*x]^(3/2), x]
```

```
[Out] (-4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(25*a^5) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(25*a^3) - (3*x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(50*a) + (x^5*ArcCosh[a*x]^(3/2))/5 - (3*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(64*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(200*a^5) - (3*Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) - (3*Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) + (3*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(64*a^5) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(200*a^5) + (3*Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(3200*a^5) + (3*Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(3200*a^5)
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_)*(x_)^(m_), x_Symbol] := Simp[(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((f_.)*(x_)^(m_.))/(Sqrt[(d1_.) + (e1_.)*(x_)])*Sqrt[(d2_.) + (e2_.)*(x_)]), x_Symbol] := Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*
```

$a + b \operatorname{ArcCosh}[c*x]^{(n-1)}, x, x) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)*((d1_.) + (e1_.)*(x_.))^(p_.)*((d2_.) + (e2_.)*(x_.))^(q_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(IntPart[p])*((d1 + e1*x)^(FracPart[p])*(d2 + e2*x)^(FracPart[p])))/(2*c*(p + 1)*(1 + c*x)^(FracPart[p]*(-1 + c*x)^(FracPart[p])), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_), x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rubi steps

$$\begin{aligned}
\int x^4 \cosh^{-1}(ax)^{3/2} dx &= \frac{1}{5}x^5 \cosh^{-1}(ax)^{3/2} - \frac{1}{10}(3a) \int \frac{x^5 \sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} + \frac{1}{5}x^5 \cosh^{-1}(ax)^{3/2} + \frac{3}{100} \int \frac{x^4}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{6}{5} \int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx \\
&= -\frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} + \frac{1}{5}x^5 \cosh^{-1}(ax)^{3/2} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a} \\
&= -\frac{4\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{25a^3} - \frac{3x^4 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{50a}
\end{aligned}$$

Mathematica [A] time = 0.111888, size = 152, normalized size = 0.44

$$\frac{9\sqrt{5}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -5\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \frac{125\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -3\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \frac{2250\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \frac{36000a^5}{36000a^5}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^4*ArcCosh[a*x]^(3/2), x]

[Out] ((9*Sqrt[5]*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -5*ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + (125*Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -3*ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + (2250*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + 2250*Gamma[5/2, ArcCosh[a*x]] + 125*Sqrt[3]*Gamma[5/2, 3*ArcCosh[a*x]] + 9*Sqrt[5]*Gamma[5/2, 5*ArcCosh[a*x]])/(36000*a^5)

Maple [F] time = 0.187, size = 0, normalized size = 0.

$$\int x^4 (\operatorname{arccosh}(ax))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^(3/2), x)

[Out] `int(x^4*arccosh(a*x)^(3/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \operatorname{arccosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x)^(3/2),x, algorithm="maxima")`

[Out] `integrate(x^4*arccosh(a*x)^(3/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x)^(3/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4*acosh(a*x)**(3/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4*arccosh(a*x)^(3/2),x, algorithm="giac")`

[Out] `sage0*x`

3.79 $\int x^3 \cosh^{-1}(ax)^{3/2} dx$

Optimal. Leaf size=209

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{2048a^4} - \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{128a^4} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{2048a^4} + \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{128a^4}$$

[Out] $(-9*x*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(64*a^3) - (3*x^3*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a) - (3*\operatorname{ArcCosh}[a*x]^{(3/2)})/(32*a^4) + (x^4*\operatorname{ArcCosh}[a*x]^{(3/2)})/4 - (3*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(2048*a^4) - (3*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(128*a^4) + (3*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(2048*a^4) + (3*\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(128*a^4)$

Rubi [A] time = 0.874247, antiderivative size = 209, normalized size of antiderivative = 1., number of steps used = 25, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {5664, 5759, 5676, 5670, 5448, 12, 3308, 2180, 2204, 2205}

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{2048a^4} - \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{128a^4} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{2048a^4} + \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{128a^4}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^3*\operatorname{ArcCosh}[a*x]^{(3/2)}, x]$

[Out] $(-9*x*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(64*a^3) - (3*x^3*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(32*a) - (3*\operatorname{ArcCosh}[a*x]^{(3/2)})/(32*a^4) + (x^4*\operatorname{ArcCosh}[a*x]^{(3/2)})/4 - (3*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(2048*a^4) - (3*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(128*a^4) + (3*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(2048*a^4) + (3*\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(128*a^4)$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (x)^m, x] \rightarrow \operatorname{Simp}[(x^{m+1} * (a + b*\operatorname{ArcCosh}[c*x])^n) / (m+1), x] - \operatorname{Dist}[(b*c^n) / (m+1), \operatorname{Int}[(x^{m+1} * (a + b*\operatorname{ArcCosh}[c*x])^{n-1}) / (\operatorname{Sqrt}[-1 + c*x] * \operatorname{Sqrt}[1 + c*x]), x], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5759

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (f*x)^m / (\operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]), x] \rightarrow \operatorname{Simp}[(f*(f*x)^{m-1} * \operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x] * (a + b*\operatorname{ArcCosh}[c*x])^n) / (e1*e2^m), x] + (\operatorname{Dist}[(f^2*(m-1)) / (c^2*m), \operatorname{Int}[(f*x)^{m-2} * (a + b*\operatorname{ArcCosh}[c*x])^n / (\operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]), x], x] + \operatorname{Dist}[(b*f^n * \operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]) / (c*d1*d2*m * \operatorname{Sqrt}[1 + c*x] * \operatorname{Sqrt}[-1 + c*x]), \operatorname{Int}[(f*x)^{m-1} * (a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x]) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n / (\operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]), x] \rightarrow \operatorname{Simp}[(a + b*\operatorname{ArcCosh}[c*x])^{n+1} / ($

```
*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] &&
EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1
]
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[
1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) +
(b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a +
b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &
& IGtQ[p, 0]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x^3 \cosh^{-1}(ax)^{3/2} dx &= \frac{1}{4}x^4 \cosh^{-1}(ax)^{3/2} - \frac{1}{8}(3a) \int \frac{x^4 \sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^{3/2} + \frac{3}{64} \int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{9}{64} \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^{3/2} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4} \\
&= -\frac{9x \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{64a^3} - \frac{3x^3 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{32a} - \frac{3 \cosh^{-1}(ax)^{3/2}}{32a^4}
\end{aligned}$$

Mathematica [A] time = 0.0851511, size = 101, normalized size = 0.48

$$\frac{\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -4 \cosh^{-1}(ax)\right) + 8\sqrt{2}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -2 \cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\left(8\sqrt{2}\Gamma\left(\frac{5}{2}, 2 \cosh^{-1}(ax)\right) + \Gamma\left(\frac{5}{2}, 4 \cosh^{-1}(ax)\right)\right)}{512a^4 \sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3*ArcCosh[a*x]^(3/2), x]

[Out] (Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -4*ArcCosh[a*x]] + 8*Sqrt[2]*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -2*ArcCosh[a*x]] + Sqrt[ArcCosh[a*x]]*(8*Sqrt[2]*Gamma[5/2, 2*ArcCosh[a*x]] + Gamma[5/2, 4*ArcCosh[a*x]]))/(512*a^4*Sqrt[ArcCosh[a*x]])

Maple [F] time = 0.097, size = 0, normalized size = 0.

$$\int x^3 (\operatorname{arccosh}(ax))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^(3/2), x)

[Out] int(x^3*arccosh(a*x)^(3/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{arccosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(x^3*arccosh(a*x)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x)**(3/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

3.80 $\int x^2 \cosh^{-1}(ax)^{3/2} dx$

Optimal. Leaf size=189

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^3} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{96a^3} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^3} + \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{96a^3}$$

```
[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(3*a^3) - (x^2*Sqrt[-1 +
a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(6*a) + (x^3*ArcCosh[a*x]^(3/2))/3
- (3*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(32*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*S
qrt[ArcCosh[a*x]]])/(96*a^3) + (3*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(32*a^
3) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(96*a^3)
```

Rubi [A] time = 0.639637, antiderivative size = 189, normalized size of antiderivative = 1., number of steps used = 22, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {5664, 5759, 5718, 5658, 3308, 2180, 2204, 2205, 5670, 5448}

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^3} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{96a^3} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{32a^3} + \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{96a^3}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*ArcCosh[a*x]^(3/2), x]
```

```
[Out] -(Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(3*a^3) - (x^2*Sqrt[-1 +
a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(6*a) + (x^3*ArcCosh[a*x]^(3/2))/3
- (3*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(32*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*S
qrt[ArcCosh[a*x]]])/(96*a^3) + (3*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(32*a^
3) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(96*a^3)
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] :> Simp[
(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[
(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x]
, x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*((f_.)*(x_)^(m_.))/(Sqrt[(d1
_) + (e1_.)*(x_)])*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqr
t[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```

Rule 5718

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)*((d1_) + (e1_.)*(x_)^(p
_.))*((d2_) + (e2_.)*(x_)^(p_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2
+ e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*
(-d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c
```

$(p + 1)(1 + cx)^{\text{FracPart}[p]}(-1 + cx)^{\text{FracPart}[p]}$, $\text{Int}[(-1 + c^2x^2)^{(p + 1/2)}(a + b\text{ArcCosh}[cx])^{(n - 1)}, x]$, x /; $\text{FreeQ}\{a, b, c, d1, e1, d2, e2, p\}, x$ && $\text{EqQ}[e1 - cd1, 0]$ && $\text{EqQ}[e2 + cd2, 0]$ && $\text{GtQ}[n, 0]$ && $\text{NeQ}[p, -1]$ && $\text{IntegerQ}[p + 1/2]$

Rule 5658

$\text{Int}[(a + \text{ArcCosh}[c \cdot x]) \cdot b]^{(n)}, x_{\text{Symbol}}$ $\rightarrow -\text{Dist}[(bc)^{-1}$, $\text{Subst}[\text{Int}[x^n \cdot \text{Sinh}[a/b - x/b], x], x, a + b \cdot \text{ArcCosh}[cx], x]$ /; $\text{FreeQ}\{a, b, c, n\}, x]$

Rule 3308

$\text{Int}[(c + d \cdot x)^{(m)} \cdot \sin[e + f \cdot x], x_{\text{Symbol}}$ $\rightarrow \text{Dist}[I/2, \text{Int}[(c + d \cdot x)^m / E^{(I \cdot (e + f \cdot x))}, x], x] - \text{Dist}[I/2, \text{Int}[(c + d \cdot x)^m \cdot E^{(I \cdot (e + f \cdot x))}, x], x]$ /; $\text{FreeQ}\{c, d, e, f, m\}, x]$

Rule 2180

$\text{Int}[(F)^{(g + (e + f \cdot x) / \sqrt{c + d \cdot x})}], x_{\text{Symbol}}$ $\rightarrow \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g \cdot (e - (c \cdot f)/d) + (f \cdot g \cdot x^2)/d)}, x], x, \sqrt{c + d \cdot x}], x]$ /; $\text{FreeQ}\{F, c, d, e, f, g\}, x$ && $! \$\text{UseGamma} == \text{True}$

Rule 2204

$\text{Int}[(F)^{(a + b \cdot (c + d \cdot x)^2)}, x_{\text{Symbol}}$ $\rightarrow \text{Simp}[(F^a \cdot \text{Sqrt}[\text{Pi}] \cdot \text{Erfi}[(c + d \cdot x) \cdot \text{Rt}[b \cdot \text{Log}[F], 2]]) / (2 \cdot d \cdot \text{Rt}[b \cdot \text{Log}[F], 2]), x]$ /; $\text{FreeQ}\{F, a, b, c, d\}, x$ && $\text{PosQ}[b]$

Rule 2205

$\text{Int}[(F)^{(a + b \cdot (c + d \cdot x)^2)}, x_{\text{Symbol}}$ $\rightarrow \text{Simp}[(F^a \cdot \text{Sqrt}[\text{Pi}] \cdot \text{Erf}[(c + d \cdot x) \cdot \text{Rt}[-(b \cdot \text{Log}[F]), 2]]) / (2 \cdot d \cdot \text{Rt}[-(b \cdot \text{Log}[F]), 2]), x]$ /; $\text{FreeQ}\{F, a, b, c, d\}, x$ && $\text{NegQ}[b]$

Rule 5670

$\text{Int}[(a + \text{ArcCosh}[c \cdot x]) \cdot b]^{(n)} \cdot x^{(m)}, x_{\text{Symbol}}$ $\rightarrow \text{Dist}[1/c^{(m + 1)}, \text{Subst}[\text{Int}[(a + b \cdot x)^n \cdot \text{Cosh}[x]^m \cdot \text{Sinh}[x], x], x, \text{ArcCosh}[cx], x]$ /; $\text{FreeQ}\{a, b, c, n\}, x$ && $\text{IGtQ}[m, 0]$

Rule 5448

$\text{Int}[\text{Cosh}[a + b \cdot x]^{(p)} \cdot (c + d \cdot x)^{(m)} \cdot \text{Sinh}[a + b \cdot x]^{(n)}, x_{\text{Symbol}}$ $\rightarrow \text{Int}[\text{ExpandTrigReduce}[(c + d \cdot x)^m, \text{Sinh}[a + b \cdot x]^{(n)} \cdot \text{Cosh}[a + b \cdot x]^{(p)}, x], x]$ /; $\text{FreeQ}\{a, b, c, d, m\}, x$ && $\text{IGtQ}[n, 0]$ & $\text{IGtQ}[p, 0]$

Rubi steps

$$\begin{aligned}
\int x^2 \cosh^{-1}(ax)^{3/2} dx &= \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} - \frac{1}{2}a \int \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \frac{1}{12} \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx - \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx \\
&= -\frac{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{3a^3} - \frac{x^2 \sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{6a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{3/2} + \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx
\end{aligned}$$

Mathematica [A] time = 0.0873498, size = 100, normalized size = 0.53

$$\frac{\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -3\cosh^{-1}(ax)\right) + 27\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -\cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\left(27\Gamma\left(\frac{5}{2}, \cosh^{-1}(ax)\right) + \Gamma\left(\frac{5}{2}, 3\cosh^{-1}(ax)\right)\right)}{216a^3\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*ArcCosh[a*x]^(3/2), x]

[Out] (Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -3*ArcCosh[a*x]] + 27*Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -ArcCosh[a*x]] + Sqrt[ArcCosh[a*x]]*(27*Gamma[5/2, ArcCosh[a*x]] + Gamma[5/2, 3*ArcCosh[a*x]]))/(216*a^3*Sqrt[ArcCosh[a*x]])

Maple [F] time = 0.091, size = 0, normalized size = 0.

$$\int x^2 (\operatorname{arccosh}(ax))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^(3/2), x)

[Out] int(x^2*arccosh(a*x)^(3/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \operatorname{arcosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(x^2*arccosh(a*x)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \operatorname{acosh}^{\frac{3}{2}}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**(3/2),x)

[Out] Integral(x**2*acosh(a*x)**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage0*x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

3.81 $\int x \cosh^{-1}(ax)^{3/2} dx$

Optimal. Leaf size=127

$$\frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{64a^2} + \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{64a^2} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{3x\sqrt{ax-1}\sqrt{ax}}{8a^2}$$

```
[Out] (-3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(8*a) - ArcCosh[a*x]
^(3/2)/(4*a^2) + (x^2*ArcCosh[a*x]^(3/2))/2 - (3*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqr
t[ArcCosh[a*x]]])/(64*a^2) + (3*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]
)/(64*a^2)
```

Rubi [A] time = 0.437723, antiderivative size = 127, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 10, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.$, Rules used = {5664, 5759, 5676, 5670, 5448, 12, 3308, 2180, 2204, 2205}

$$\frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{64a^2} + \frac{3\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{64a^2} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{3x\sqrt{ax-1}\sqrt{ax}}{8a^2}$$

Antiderivative was successfully verified.

```
[In] Int[x*ArcCosh[a*x]^(3/2), x]
```

```
[Out] (-3*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*Sqrt[ArcCosh[a*x]])/(8*a) - ArcCosh[a*x]
^(3/2)/(4*a^2) + (x^2*ArcCosh[a*x]^(3/2))/2 - (3*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqr
t[ArcCosh[a*x]]])/(64*a^2) + (3*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]
)/(64*a^2)
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] :> Simp[
(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[
(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x]
, x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((f_.)*(x_.)^(m_.))/(Sqrt[(d1
_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqr
t[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(Sqrt[(d1_) + (e1_.)*(x_.)]*Sq
rt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b
*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] &&
EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1
]
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[
1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) +
(b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a +
b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &
& IGtQ[p, 0]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x \cosh^{-1}(ax)^{3/2} dx &= \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{1}{4}(3a) \int \frac{x^2 \sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} + \frac{3}{16} \int \frac{x}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{3 \int \frac{\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}} dx}{16} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} + \frac{3 \operatorname{Subst}\left(\int \frac{\cosh^{-1}(ax)}{\sqrt{-1+ax}} dx\right)}{16} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} + \frac{3 \operatorname{Subst}\left(\int \frac{\sinh(2\sqrt{x})}{2\sqrt{x}} dx\right)}{16} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} + \frac{3 \operatorname{Subst}\left(\int \frac{\sinh(2\sqrt{x})}{\sqrt{x}} dx\right)}{32} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{3 \operatorname{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx\right)}{64} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{3 \operatorname{Subst}\left(\int e^{-2x^2} dx\right)}{32} \\
&= -\frac{3x\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{8a} - \frac{\cosh^{-1}(ax)^{3/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{3/2} - \frac{3\sqrt{\frac{\pi}{2}} \operatorname{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{64a^2}
\end{aligned}$$

Mathematica [A] time = 0.125301, size = 84, normalized size = 0.66

$$\frac{3\sqrt{2\pi} \left(\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) - \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) \right) + 32 \cosh\left(2 \cosh^{-1}(ax)\right) \cosh^{-1}(ax)^{3/2} - 24\sqrt{\cosh^{-1}(ax)} \operatorname{Si}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{128a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x*ArcCosh[a*x]^(3/2),x]

[Out] (32*ArcCosh[a*x]^(3/2)*Cosh[2*ArcCosh[a*x]] + 3*Sqrt[2*Pi]*(-Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] + Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]) - 24*Sqrt[ArcCosh[a*x]]*Sinh[2*ArcCosh[a*x]])/(128*a^2)

Maple [A] time = 0.112, size = 105, normalized size = 0.8

$$-\frac{\sqrt{2}}{128\sqrt{\pi}a^2} \left(-32 (\operatorname{arccosh}(ax))^{3/2} \sqrt{2}\sqrt{\pi}x^2a^2 + 24 \sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\sqrt{\pi}\sqrt{ax+1}\sqrt{ax-1}xa + 16 (\operatorname{arccosh}(ax))^{3/2} \operatorname{Si}\left(\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x)^(3/2),x)

[Out] -1/128*2^(1/2)*(-32*arccosh(a*x)^(3/2)*2^(1/2)*Pi^(1/2)*x^2*a^2+24*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2)*x*a+16*arccosh(a*x)^(3/2)*2^(1/2)*Pi^(1/2)+3*Pi*erf(2^(1/2)*arccosh(a*x)^(1/2))-3*Pi*erfi(2^(1/2)*arccosh(a*x)^(1/2)))/Pi^(1/2)/a^2

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{arcosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(x*arccosh(a*x)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{acosh}^{\frac{3}{2}}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**(3/2),x)

[Out] Integral(x*acosh(a*x)**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

3.82 $\int \cosh^{-1}(ax)^{3/2} dx$

Optimal. Leaf size=86

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a} + x \cosh^{-1}(ax)^{3/2} - \frac{3\sqrt{ax-1}\sqrt{ax+1}\sqrt{\cosh^{-1}(ax)}}{2a}$$

[Out] $(-3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\operatorname{ArcCosh}[ax]})/(2a) + x\operatorname{ArcCosh}[ax]^{3/2} - (3\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(8a) + (3\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(8a)$

Rubi [A] time = 0.220478, antiderivative size = 86, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {5654, 5718, 5658, 3308, 2180, 2204, 2205}

$$\frac{3\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a} + \frac{3\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a} + x \cosh^{-1}(ax)^{3/2} - \frac{3\sqrt{ax-1}\sqrt{ax+1}\sqrt{\cosh^{-1}(ax)}}{2a}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[\operatorname{ArcCosh}[ax]^{3/2}, x]$

[Out] $(-3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\operatorname{ArcCosh}[ax]})/(2a) + x\operatorname{ArcCosh}[ax]^{3/2} - (3\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(8a) + (3\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(8a)$

Rule 5654

$\operatorname{Int}[(a + \operatorname{ArcCosh}(cx))^{n-1}, x] := \operatorname{Simp}[x(a + b\operatorname{ArcCosh}[cx])^n, x] - \operatorname{Dist}[b^n, \operatorname{Int}[(x(a + b\operatorname{ArcCosh}[cx]))^{n-1}], x] /; \operatorname{FreeQ}\{a, b, c, x\} \ \&\& \operatorname{GtQ}[n, 0]$

Rule 5718

$\operatorname{Int}[(a + \operatorname{ArcCosh}(cx))^n (d + e\operatorname{ArcCosh}(cx))^p, x] := \operatorname{Simp}[(d + e\operatorname{ArcCosh}[cx])^{p+1} (a + b\operatorname{ArcCosh}[cx])^n / (2e(d + e\operatorname{ArcCosh}[cx])^{p+1}), x] - \operatorname{Dist}[b^n (-d^2)^{\operatorname{IntPart}[p]} (d + e\operatorname{ArcCosh}[cx])^{\operatorname{FracPart}[p]} (d + e\operatorname{ArcCosh}[cx])^{\operatorname{FracPart}[p]} / (2c^{p+1/2} (1 + cx)^{\operatorname{FracPart}[p]} (-1 + cx)^{\operatorname{FracPart}[p]}), \operatorname{Int}[(d + e\operatorname{ArcCosh}[cx])^{p+1/2} (a + b\operatorname{ArcCosh}[cx])^{n-1}], x] /; \operatorname{FreeQ}\{a, b, c, d, e, d^2, e^2, p\}, x \ \&\& \operatorname{EqQ}[e - cd, 0] \ \&\& \operatorname{EqQ}[e + cd, 0] \ \&\& \operatorname{GtQ}[n, 0] \ \&\& \operatorname{NeQ}[p, -1] \ \&\& \operatorname{IntegerQ}[p + 1/2]$

Rule 5658

$\operatorname{Int}[(a + \operatorname{ArcCosh}(cx))^{n-1}, x] := -\operatorname{Dist}[(bc)^{-1}, \operatorname{Subst}[\operatorname{Int}[x^n \operatorname{Sinh}[a/b - x/b], x], x, a + b\operatorname{ArcCosh}[cx]], x] /; \operatorname{FreeQ}\{a, b, c, n\}, x$

Rule 3308

$\operatorname{Int}[(c + d\operatorname{ArcCosh}(ex))^m \sin[efx], x] := \operatorname{Dist}[I/2, \operatorname{Int}[(c + d\operatorname{ArcCosh}(ex))^m / E^{I(efx)}, x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d\operatorname{ArcCosh}(ex))^m E^{I(efx)}, x], x] /; \operatorname{FreeQ}\{c, d, e, f, m\}, x$

Rule 2180

```
Int[(F_)^((g_.)*(e_.) + (f_.)*(x_))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int \cosh^{-1}(ax)^{3/2} dx &= x \cosh^{-1}(ax)^{3/2} - \frac{1}{2}(3a) \int \frac{x\sqrt{\cosh^{-1}(ax)}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{2a} + x \cosh^{-1}(ax)^{3/2} + \frac{3}{4} \int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{2a} + x \cosh^{-1}(ax)^{3/2} + \frac{3 \operatorname{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a} \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{2a} + x \cosh^{-1}(ax)^{3/2} - \frac{3 \operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a} + \frac{3 \operatorname{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a} \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{2a} + x \cosh^{-1}(ax)^{3/2} - \frac{3 \operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a} + \frac{3 \operatorname{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a} \\
&= -\frac{3\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}}{2a} + x \cosh^{-1}(ax)^{3/2} - \frac{3\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a} + \frac{3\sqrt{\pi}\operatorname{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a}
\end{aligned}$$

Mathematica [A] time = 0.0287667, size = 45, normalized size = 0.52

$$\frac{\frac{\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{5}{2}, -\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \Gamma\left(\frac{5}{2}, \cosh^{-1}(ax)\right)}{2a}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^(3/2), x]

[Out] ((Sqrt[-ArcCosh[a*x]]*Gamma[5/2, -ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + Gamma[5/2, ArcCosh[a*x]])/(2*a)

Maple [A] time = 0.095, size = 68, normalized size = 0.8

$$-\frac{1}{8\sqrt{\pi a}} \left(-8 (\operatorname{arccosh}(ax))^{3/2} \sqrt{\pi} xa + 12 \sqrt{\operatorname{arccosh}(ax)} \sqrt{\pi} \sqrt{ax+1} \sqrt{ax-1} + 3\pi \operatorname{Erf}\left(\sqrt{\operatorname{arccosh}(ax)}\right) - 3\pi \operatorname{erfi}\left(\sqrt{\operatorname{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(arccosh(a*x)^(3/2),x)
```

```
[Out] -1/8*(-8*arccosh(a*x)^(3/2)*Pi^(1/2)*x*a+12*arccosh(a*x)^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2)+3*Pi*erf(arccosh(a*x)^(1/2))-3*Pi*erfi(arccosh(a*x)^(1/2)))/Pi^(1/2)/a
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \operatorname{arcosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^(3/2),x, algorithm="maxima")
```

```
[Out] integrate(arccosh(a*x)^(3/2), x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^(3/2),x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \operatorname{acosh}^{\frac{3}{2}}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(acosh(a*x)**(3/2),x)
```

```
[Out] Integral(acosh(a*x)**(3/2), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^(3/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.83 \quad \int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{\cosh^{-1}(ax)^{3/2}}{x}, x\right)$$

[Out] Unintegrable[ArcCosh[a*x]^(3/2)/x, x]

Rubi [A] time = 0.0132645, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx$$

Verification is Not applicable to the result.

[In] Int[ArcCosh[a*x]^(3/2)/x, x]

[Out] Defer[Int][ArcCosh[a*x]^(3/2)/x, x]

Rubi steps

$$\int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx = \int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx$$

Mathematica [A] time = 0.289235, size = 0, normalized size = 0.

$$\int \frac{\cosh^{-1}(ax)^{3/2}}{x} dx$$

Verification is Not applicable to the result.

[In] Integrate[ArcCosh[a*x]^(3/2)/x, x]

[Out] Integrate[ArcCosh[a*x]^(3/2)/x, x]

Maple [A] time = 0.069, size = 0, normalized size = 0.

$$\int \frac{1}{x} (\operatorname{arccosh}(ax))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^(3/2)/x, x)

[Out] int(arccosh(a*x)^(3/2)/x, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^{\frac{3}{2}}}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(3/2)/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^(3/2)/x, x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(3/2)/x,x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^{\frac{3}{2}}(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**(3/2)/x,x)

[Out] Integral(acosh(a*x)**(3/2)/x, x)

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(3/2)/x,x, algorithm="giac")

[Out] sage0*x

3.84 $\int x^4 \cosh^{-1}(ax)^{5/2} dx$

Optimal. Leaf size=394

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{128a^5} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{1280a^5} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{240a^5} - \frac{3\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{6400a^5}$$

```
[Out] (2*x*Sqrt[ArcCosh[a*x]])/(5*a^4) + (x^3*Sqrt[ArcCosh[a*x]])/(15*a^2) + (3*x^5*Sqrt[ArcCosh[a*x]])/100 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(15*a^5) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(15*a^3) - (x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(10*a) + (x^5*ArcCosh[a*x]^(5/2))/5 - (15*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(128*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(240*a^5) - (Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(1280*a^5) - (3*Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(6400*a^5) - (15*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(128*a^5) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(240*a^5) - (Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(1280*a^5) - (3*Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(6400*a^5)
```

Rubi [A] time = 1.82197, antiderivative size = 394, normalized size of antiderivative = 1., number of steps used = 44, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {5664, 5759, 5718, 5654, 5781, 3307, 2180, 2204, 2205, 3312}

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{128a^5} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{1280a^5} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{240a^5} - \frac{3\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{6400a^5}$$

Antiderivative was successfully verified.

```
[In] Int[x^4*ArcCosh[a*x]^(5/2), x]
```

```
[Out] (2*x*Sqrt[ArcCosh[a*x]])/(5*a^4) + (x^3*Sqrt[ArcCosh[a*x]])/(15*a^2) + (3*x^5*Sqrt[ArcCosh[a*x]])/100 - (4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(15*a^5) - (2*x^2*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(15*a^3) - (x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(10*a) + (x^5*ArcCosh[a*x]^(5/2))/5 - (15*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(128*a^5) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(240*a^5) - (Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(1280*a^5) - (3*Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(6400*a^5) - (15*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(128*a^5) - (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(240*a^5) - (Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(1280*a^5) - (3*Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(6400*a^5)
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_*(x_)^(m_.), x_Symbol] :> Simp[(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c^n)/(m + 1), Int[(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_)*((f_.)*(x_)^(m_))/(Sqrt[(d1_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[(f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n]/
```

$(\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x]), x, x] + \text{Dist}[(b*f*n*\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x])/(c*d1*d2*m*\text{Sqrt}[1 + c*x]*\text{Sqrt}[-1 + c*x]), \text{Int}[(f*x)^(m - 1)*(a + b*\text{ArcCosh}[c*x])^(n - 1), x], x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

$\text{Int}[(a_. + \text{ArcCosh}[c_.*(x_.)]*(b_.))^(n_.)*(x_.)*((d1_. + (e1_.)*(x_.))^(p_.)*((d2_. + (e2_.)*(x_.))^(p_.)), x_Symbol] :> \text{Simp}[(d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*\text{ArcCosh}[c*x])^n]/(2*e1*e2*(p + 1)), x] - \text{Dist}[(b*n*(-(d1*d2))^\text{IntPart}[p]*(d1 + e1*x)^\text{FracPart}[p]*(d2 + e2*x)^\text{FracPart}[p])/(2*c*(p + 1)*(1 + c*x)^\text{FracPart}[p]*(-1 + c*x)^\text{FracPart}[p]), \text{Int}[(-1 + c^2*x^2)^(p + 1/2)*(a + b*\text{ArcCosh}[c*x])^(n - 1), x], x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 5654

$\text{Int}[(a_. + \text{ArcCosh}[c_.*(x_.)]*(b_.))^(n_.), x_Symbol] :> \text{Simp}[x*(a + b*\text{ArcCosh}[c*x])^n, x] - \text{Dist}[b*c*n, \text{Int}[(x*(a + b*\text{ArcCosh}[c*x])^(n - 1))/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /;$ FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5781

$\text{Int}[(a_. + \text{ArcCosh}[c_.*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.)*((d1_. + (e1_.)*(x_.))^(p_.)*((d2_. + (e2_.)*(x_.))^(p_.)), x_Symbol] :> \text{Dist}[(-(d1*d2))^\text{p}/c^\text{(m + 1)}, \text{Subst}[\text{Int}[(a + b*x)^n*\text{Cosh}[x]^m*\text{Sinh}[x]^(2*p + 1), x], x, \text{ArcCosh}[c*x]], x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

$\text{Int}[(c_. + (d_.)*(x_.))^(m_.)*\sin[(e_.) + \text{Pi}*(k_.) + (f_.)*(x_.)], x_Symbol] :> \text{Dist}[I/2, \text{Int}[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - \text{Dist}[I/2, \text{Int}[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /;$ FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

$\text{Int}[(F_)^\text{(g_.)*((e_.) + (f_.)*(x_.))}/\text{Sqrt}[(c_.) + (d_.)*(x_.)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^\text{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /;$ FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

$\text{Int}[(F_)^\text{(a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2}, x_Symbol] :> \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erfi}[(c + d*x)*\text{Rt}[b*\text{Log}[F], 2]])/(2*d*\text{Rt}[b*\text{Log}[F], 2]), x] /;$ FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

$\text{Int}[(F_)^\text{(a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2}, x_Symbol] :> \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erf}[(c + d*x)*\text{Rt}[-(b*\text{Log}[F]), 2]])/(2*d*\text{Rt}[-(b*\text{Log}[F]), 2]), x] /;$ FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 3312

```
Int[((c_.) + (d_.)*(x_)^(m_))*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rubi steps

$$\begin{aligned}
 \int x^4 \cosh^{-1}(ax)^{5/2} dx &= \frac{1}{5} x^5 \cosh^{-1}(ax)^{5/2} - \frac{1}{2} a \int \frac{x^5 \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= -\frac{x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{10a} + \frac{1}{5} x^5 \cosh^{-1}(ax)^{5/2} + \frac{3}{20} \int x^4 \sqrt{\cosh^{-1}(ax)} dx - \frac{2 \int \frac{x^3 \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{15a^2} \\
 &= \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^3} - \frac{x^4 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{10a} \\
 &= \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} - \frac{2x^2 \sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^3} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5} \\
 &= \frac{2x \sqrt{\cosh^{-1}(ax)}}{5a^4} + \frac{x^3 \sqrt{\cosh^{-1}(ax)}}{15a^2} + \frac{3}{100} x^5 \sqrt{\cosh^{-1}(ax)} - \frac{4\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{15a^5}
 \end{aligned}$$

Mathematica [A] time = 0.0973618, size = 162, normalized size = 0.41

$$\frac{27\sqrt{5}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -5\cosh^{-1}(ax)\right) + 625\sqrt{3}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -3\cosh^{-1}(ax)\right) + 33750\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -\cosh^{-1}(ax)\right) + 33750\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, \cosh^{-1}(ax)\right) + 625\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, 3\cosh^{-1}(ax)\right) + 27\sqrt{5}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, 5\cosh^{-1}(ax)\right)}{(540000a^5\sqrt{-\cosh^{-1}(ax)})}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[x^4*ArcCosh[a*x]^(5/2), x]
```

```
[Out] (27*Sqrt[5]*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -5*ArcCosh[a*x]] + 625*Sqrt[3]*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -3*ArcCosh[a*x]] + 33750*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -ArcCosh[a*x]] + 33750*Sqrt[-ArcCosh[a*x]]*Gamma[7/2, ArcCosh[a*x]] + 625*Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[7/2, 3*ArcCosh[a*x]] + 27*Sqrt[5]*Sqrt[-ArcCosh[a*x]]*Gamma[7/2, 5*ArcCosh[a*x]])/(540000*a^5*Sqrt[-ArcCosh[a*x]])
```

Maple [F] time = 0.191, size = 0, normalized size = 0.

$$\int x^4 (\operatorname{arccosh}(ax))^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^(5/2),x)

[Out] int(x^4*arccosh(a*x)^(5/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \operatorname{arccosh}(ax)^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^(5/2),x, algorithm="maxima")

[Out] integrate(x^4*arccosh(a*x)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4*acosh(a*x)**(5/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

3.85 $\int x^3 \cosh^{-1}(ax)^{5/2} dx$

Optimal. Leaf size=257

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{16384a^4} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{512a^4} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{16384a^4} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{512a^4}$$

```
[Out] (-225*Sqrt[ArcCosh[a*x]])/(2048*a^4) + (45*x^2*Sqrt[ArcCosh[a*x]])/(256*a^2)
+ (15*x^4*Sqrt[ArcCosh[a*x]])/256 - (15*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(64*a^3)
- (5*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(32*a) - (3*ArcCosh[a*x]^(5/2))/(32*a^4)
+ (x^4*ArcCosh[a*x]^(5/2))/4 - (15*Sqrt[Pi]*Erf[2*Sqrt[ArcCosh[a*x]]])/(16384*a^4) - (15*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(512*a^4)
- (15*Sqrt[Pi]*Erfi[2*Sqrt[ArcCosh[a*x]]])/(16384*a^4) - (15*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(512*a^4)
```

Rubi [A] time = 1.37528, antiderivative size = 257, normalized size of antiderivative = 1., number of steps used = 27, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5664, 5759, 5676, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{16384a^4} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{512a^4} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{16384a^4} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{512a^4}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*ArcCosh[a*x]^(5/2), x]
```

```
[Out] (-225*Sqrt[ArcCosh[a*x]])/(2048*a^4) + (45*x^2*Sqrt[ArcCosh[a*x]])/(256*a^2)
+ (15*x^4*Sqrt[ArcCosh[a*x]])/256 - (15*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(64*a^3)
- (5*x^3*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(32*a) - (3*ArcCosh[a*x]^(5/2))/(32*a^4)
+ (x^4*ArcCosh[a*x]^(5/2))/4 - (15*Sqrt[Pi]*Erf[2*Sqrt[ArcCosh[a*x]]])/(16384*a^4) - (15*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(512*a^4)
- (15*Sqrt[Pi]*Erfi[2*Sqrt[ArcCosh[a*x]]])/(16384*a^4) - (15*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(512*a^4)
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_)^(m_.), x_Symbol] :> Simp[
(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c*n)/(m + 1), Int[
(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x]
, x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((f_.)*(x_)^(m_)))/(Sqrt[(d1_
) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2*m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f*n*Sqrt[d1 + e1*x]*Sqr
t[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```


Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
```

Rule 5781

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(p_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])
```

Rule 3312

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x^3 \cosh^{-1}(ax)^{5/2} dx &= \frac{1}{4}x^4 \cosh^{-1}(ax)^{5/2} - \frac{1}{8}(5a) \int \frac{x^4 \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{5x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{32a} + \frac{1}{4}x^4 \cosh^{-1}(ax)^{5/2} + \frac{15}{64} \int x^3 \sqrt{\cosh^{-1}(ax)} dx - \frac{15}{64} \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx \\
&= \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} - \frac{5x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{32a} \\
&= \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} - \frac{5x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{32a} \\
&= \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} - \frac{5x^3\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{32a} \\
&= -\frac{45\sqrt{\cosh^{-1}(ax)}}{2048a^4} + \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} \\
&= -\frac{225\sqrt{\cosh^{-1}(ax)}}{2048a^4} + \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} \\
&= -\frac{225\sqrt{\cosh^{-1}(ax)}}{2048a^4} + \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} \\
&= -\frac{225\sqrt{\cosh^{-1}(ax)}}{2048a^4} + \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3} \\
&= -\frac{225\sqrt{\cosh^{-1}(ax)}}{2048a^4} + \frac{45x^2\sqrt{\cosh^{-1}(ax)}}{256a^2} + \frac{15}{256}x^4 \sqrt{\cosh^{-1}(ax)} - \frac{15x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{64a^3}
\end{aligned}$$

Mathematica [A] time = 0.0827625, size = 101, normalized size = 0.39

$$\frac{\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -4 \cosh^{-1}(ax)\right) + 16\sqrt{2}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -2 \cosh^{-1}(ax)\right) + \sqrt{-\cosh^{-1}(ax)}\left(16\sqrt{2}\Gamma\left(\frac{7}{2}, 2 \cosh^{-1}(ax)\right) + \Gamma\left(\frac{7}{2}, 4 \cosh^{-1}(ax)\right)\right)}{2048a^4\sqrt{-\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3*ArcCosh[a*x]^(5/2), x]

[Out] (Sqrt[ArcCosh[a*x]]*Gamma[7/2, -4*ArcCosh[a*x]] + 16*Sqrt[2]*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -2*ArcCosh[a*x]] + Sqrt[-ArcCosh[a*x]]*(16*Sqrt[2]*Gamma[7/2, 2*ArcCosh[a*x]] + Gamma[7/2, 4*ArcCosh[a*x]]))/(2048*a^4*Sqrt[-ArcCosh[a*x]])

Maple [F] time = 0.109, size = 0, normalized size = 0.

$$\int x^3 (\operatorname{arccosh}(ax))^{5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^(5/2), x)

[Out] `int(x^3*arccosh(a*x)^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{arccosh}(ax)^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3*arccosh(a*x)^(5/2),x, algorithm="maxima")`

[Out] `integrate(x^3*arccosh(a*x)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3*arccosh(a*x)^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**3*acosh(a*x)**(5/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3*arccosh(a*x)^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

3.86 $\int x^2 \cosh^{-1}(ax)^{5/2} dx$

Optimal. Leaf size=220

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^3} - \frac{5\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{576a^3} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^3} - \frac{5\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{576a^3}$$

[Out] $(5*x*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(6*a^2) + (5*x^3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/36 - (5*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{ArcCosh}[a*x]^{(3/2)})/(9*a^3) - (5*x^2*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{ArcCosh}[a*x]^{(3/2)})/(18*a) + (x^3*\operatorname{ArcCosh}[a*x]^{(5/2)})/3 - (15*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(64*a^3) - (5*\operatorname{Sqrt}[\pi/3]*\operatorname{Erf}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(576*a^3) - (15*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(64*a^3) - (5*\operatorname{Sqrt}[\pi/3]*\operatorname{Erfi}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(576*a^3)$

Rubi [A] time = 1.05463, antiderivative size = 220, normalized size of antiderivative = 1., number of steps used = 24, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {5664, 5759, 5718, 5654, 5781, 3307, 2180, 2204, 2205, 3312}

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^3} - \frac{5\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{576a^3} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{64a^3} - \frac{5\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{576a^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2*\operatorname{ArcCosh}[a*x]^{(5/2)}, x]$

[Out] $(5*x*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/(6*a^2) + (5*x^3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])/36 - (5*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{ArcCosh}[a*x]^{(3/2)})/(9*a^3) - (5*x^2*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x]*\operatorname{ArcCosh}[a*x]^{(3/2)})/(18*a) + (x^3*\operatorname{ArcCosh}[a*x]^{(5/2)})/3 - (15*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(64*a^3) - (5*\operatorname{Sqrt}[\pi/3]*\operatorname{Erf}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(576*a^3) - (15*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(64*a^3) - (5*\operatorname{Sqrt}[\pi/3]*\operatorname{Erfi}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]])]/(576*a^3)$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n)/(m+1), x] - \operatorname{Dist}[(b*c^n)/(m+1), \operatorname{Int}[x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1}/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x] /; \operatorname{FreeQ}\{a, b, c\}, x] \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{GtQ}[n, 0]$

Rule 5759

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*((f*x)^m)/(\operatorname{Sqrt}[(d_1 + (e_1*x)*\operatorname{Sqrt}[d_2 + (e_2*x)])]), x_Symbol] \rightarrow \operatorname{Simp}[(f*(f*x)^{m-1}*\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x]*(a + b*\operatorname{ArcCosh}[c*x])^n)/(e_1*e_2^m), x] + (\operatorname{Dist}[(f^2*(m-1))/(c^2*m), \operatorname{Int}[(f*x)^{m-2}*(a + b*\operatorname{ArcCosh}[c*x])^n]/(\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x]), x], x] + \operatorname{Dist}[(b*f^n*\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x])/(c*d_1*d_2*m*\operatorname{Sqrt}[1 + c*x]*\operatorname{Sqrt}[-1 + c*x]), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x] /; \operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f\}, x] \&\& \operatorname{EqQ}[e_1 - c*d_1, 0] \&\& \operatorname{EqQ}[e_2 + c*d_2, 0] \&\& \operatorname{GtQ}[n, 0] \&\& \operatorname{GtQ}[m, 1] \&\& \operatorname{IntegerQ}[m]$

Rule 5718

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)*((d_1 + (e_1*x))^p*(d_2 + (e_2*x))^q), x_Symbol] \rightarrow \operatorname{Simp}[(d_1 + e_1*x)^{p+1}*(d_2 + (e_2*x))^q]$

```

+ e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n/(2*e1*e2*(p + 1)), x] - Dist[(b*n*
(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p]))/(2*c
*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^
(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d
2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ
[p, -1] && IntegerQ[p + 1/2]

```

Rule 5654

```

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n, x_Symbol] := Simp[x*(a + b*A
rcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt
[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

```

Rule 5781

```

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^(m_)*((d1_) + (e1_.)*(x
_))^(p_)*((d2_) + (e2_.)*(x_))^(p_), x_Symbol] := Dist[(-(d1*d2))^(p/c^(m
+ 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x
]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && Eq
Q[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1
, 0] && LtQ[d2, 0])

```

Rule 3307

```

Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol
] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]

```

Rule 2180

```

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x
]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True

```

Rule 2204

```

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]

```

Rule 2205

```

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]

```

Rule 3312

```

Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] := In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))

```

Rubi steps

$$\begin{aligned}
\int x^2 \cosh^{-1}(ax)^{5/2} dx &= \frac{1}{3}x^3 \cosh^{-1}(ax)^{5/2} - \frac{1}{6}(5a) \int \frac{x^3 \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{1}{3}x^3 \cosh^{-1}(ax)^{5/2} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= \frac{5x\sqrt{\cosh^{-1}(ax)}}{6a^2} + \frac{5}{36}x^3 \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{9a^3} - \frac{5x^2\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{18a} + \frac{5}{12} \int x^2 \sqrt{\cosh^{-1}(ax)} dx - \frac{5}{12} \int \frac{x \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx
\end{aligned}$$

Mathematica [A] time = 0.0818516, size = 100, normalized size = 0.45

$$\frac{\sqrt{3}\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -3\cosh^{-1}(ax)\right) + 81\sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{7}{2}, -\cosh^{-1}(ax)\right) + \sqrt{-\cosh^{-1}(ax)}\left(81\Gamma\left(\frac{7}{2}, \cosh^{-1}(ax)\right) + 81\Gamma\left(\frac{7}{2}, 3\cosh^{-1}(ax)\right)\right)}{648a^3\sqrt{-\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*ArcCosh[a*x]^(5/2), x]

[Out] (Sqrt[3]*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -3*ArcCosh[a*x]] + 81*Sqrt[ArcCosh[a*x]]*Gamma[7/2, -ArcCosh[a*x]] + Sqrt[-ArcCosh[a*x]]*(81*Gamma[7/2, ArcCosh[a*x]] + Sqrt[3]*Gamma[7/2, 3*ArcCosh[a*x]]))/(648*a^3*Sqrt[-ArcCosh[a*x]])

Maple [F] time = 0.088, size = 0, normalized size = 0.

$$\int x^2 (\operatorname{arccosh}(ax))^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^(5/2), x)

[Out] int(x^2*arccosh(a*x)^(5/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \operatorname{arcosh}(ax)^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(5/2),x, algorithm="maxima")

[Out] integrate(x^2*arccosh(a*x)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*acosh(a*x)**(5/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

3.87 $\int x \cosh^{-1}(ax)^{5/2} dx$

Optimal. Leaf size=157

$$\frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{256a^2} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{256a^2} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} - \frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2}$$

[Out] (-15*Sqrt[ArcCosh[a*x]])/(64*a^2) + (15*x^2*Sqrt[ArcCosh[a*x]]/32 - (5*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(8*a) - ArcCosh[a*x]^(5/2)/(4*a^2) + (x^2*ArcCosh[a*x]^(5/2))/2 - (15*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(256*a^2) - (15*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(256*a^2)

Rubi [A] time = 0.708933, antiderivative size = 157, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 9, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.9$, Rules used = {5664, 5759, 5676, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{256a^2} - \frac{15\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{256a^2} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} - \frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x]^(5/2),x]

[Out] (-15*Sqrt[ArcCosh[a*x]])/(64*a^2) + (15*x^2*Sqrt[ArcCosh[a*x]]/32 - (5*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(8*a) - ArcCosh[a*x]^(5/2)/(4*a^2) + (x^2*ArcCosh[a*x]^(5/2))/2 - (15*Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(256*a^2) - (15*Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/(256*a^2)

Rule 5664

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_.*(x_)^(m_.), x_Symbol] :> Simp[(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c^n)/(m + 1), Int[(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5759

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_.)*((f_.)*(x_.))^(m_.)/(Sqrt[(d1_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m - 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x] + (Dist[(f^2*(m - 1))/(c^2*m), Int[(f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n]/(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_./(Sqrt[(d1_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

]

Rule 5781

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(p_.), x_Symbol] := Dist[(-d1*d2)^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])
```

Rule 3312

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x \cosh^{-1}(ax)^{5/2} dx &= \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2} - \frac{1}{4}(5a) \int \frac{x^2 \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2} + \frac{15}{16} \int x\sqrt{\cosh^{-1}(ax)} dx - \frac{5 \int \frac{\cosh^{-1}(ax)}{\sqrt{-1+ax}} dx}{8a} \\
&= \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2} - \\
&= \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2} - \\
&= \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \frac{1}{2}x^2 \cosh^{-1}(ax)^{5/2} - \\
&= -\frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \\
&= -\frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \\
&= -\frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} + \\
&= -\frac{15\sqrt{\cosh^{-1}(ax)}}{64a^2} + \frac{15}{32}x^2\sqrt{\cosh^{-1}(ax)} - \frac{5x\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{8a} - \frac{\cosh^{-1}(ax)^{5/2}}{4a^2} +
\end{aligned}$$

Mathematica [A] time = 0.164887, size = 92, normalized size = 0.59

$$\frac{-15\sqrt{2\pi} \left(\operatorname{Erf} \left(\sqrt{2}\sqrt{\cosh^{-1}(ax)} \right) + \operatorname{Erfi} \left(\sqrt{2}\sqrt{\cosh^{-1}(ax)} \right) \right) + 8(16 \cosh^{-1}(ax)^2 + 15) \cosh(2 \cosh^{-1}(ax)) \sqrt{\cosh^{-1}(ax)}}{512a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x*ArcCosh[a*x]^(5/2), x]

[Out] (8*Sqrt[ArcCosh[a*x]]*(15 + 16*ArcCosh[a*x]^2)*Cosh[2*ArcCosh[a*x]] - 15*Sqrt[2*Pi]*(Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] + Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]) - 160*ArcCosh[a*x]^(3/2)*Sinh[2*ArcCosh[a*x]])/(512*a^2)

Maple [A] time = 0.115, size = 139, normalized size = 0.9

$$-\frac{\sqrt{2}}{512\sqrt{\pi}a^2} \left(-128 (\operatorname{arccosh}(ax))^{5/2} \sqrt{2}\sqrt{\pi}x^2a^2 + 160 (\operatorname{arccosh}(ax))^{3/2} \sqrt{2}\sqrt{\pi}\sqrt{ax+1}\sqrt{ax-1}xa - 120 \sqrt{2}\sqrt{\operatorname{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x)^(5/2), x)

[Out] -1/512*2^(1/2)*(-128*arccosh(a*x)^(5/2)*2^(1/2)*Pi^(1/2)*x^2*a^2+160*arccosh(a*x)^(3/2)*2^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2)*x*a-120*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)*x^2*a^2+64*arccosh(a*x)^(5/2)*2^(1/2)*Pi^(1/2)+60*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)+15*Pi*erf(2^(1/2)*arccosh(a*x)^(1/2))

+15*Pi*erfi(2^(1/2)*arccosh(a*x)^(1/2))/Pi^(1/2)/a^2

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{arccosh}(ax)^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(5/2),x, algorithm="maxima")

[Out] integrate(x*arccosh(a*x)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**(5/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

3.88 $\int \cosh^{-1}(ax)^{5/2} dx$

Optimal. Leaf size=99

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a} + x \cosh^{-1}(ax)^{5/2} - \frac{5\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^{3/2}}{2a} + \frac{15}{4}x\sqrt{\cosh^{-1}(ax)}$$

[Out] (15*x*Sqrt[ArcCosh[a*x]])/4 - (5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(2*a) + x*ArcCosh[a*x]^(5/2) - (15*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a) - (15*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a)

Rubi [A] time = 0.395465, antiderivative size = 99, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {5654, 5718, 5781, 3307, 2180, 2204, 2205}

$$\frac{15\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a} - \frac{15\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a} + x \cosh^{-1}(ax)^{5/2} - \frac{5\sqrt{ax-1}\sqrt{ax+1} \cosh^{-1}(ax)^{3/2}}{2a} + \frac{15}{4}x\sqrt{\cosh^{-1}(ax)}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^(5/2), x]

[Out] (15*x*Sqrt[ArcCosh[a*x]])/4 - (5*Sqrt[-1 + a*x]*Sqrt[1 + a*x]*ArcCosh[a*x]^(3/2))/(2*a) + x*ArcCosh[a*x]^(5/2) - (15*Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a) - (15*Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a)

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.), x_Symbol] :> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)*((d1_) + (e1_.)*(x_))^ (p_.)*((d2_) + (e2_.)*(x_))^ (p_.), x_Symbol] :> Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^ (p_.)*((d2_) + (e2_.)*(x_))^ (p_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol]
] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int \cosh^{-1}(ax)^{5/2} dx &= x \cosh^{-1}(ax)^{5/2} - \frac{1}{2}(5a) \int \frac{x \cosh^{-1}(ax)^{3/2}}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
&= -\frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} + \frac{15}{4} \int \sqrt{\cosh^{-1}(ax)} dx \\
&= \frac{15}{4} x \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} - \frac{1}{8}(15a) \int \frac{1}{\sqrt{-1+ax}} dx \\
&= \frac{15}{4} x \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} - \frac{15 \operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x\right)}{8a} \\
&= \frac{15}{4} x \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} - \frac{15 \operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x\right)}{16a} \\
&= \frac{15}{4} x \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} - \frac{15 \operatorname{Subst}\left(\int e^{-x^2} dx, x\right)}{8a} \\
&= \frac{15}{4} x \sqrt{\cosh^{-1}(ax)} - \frac{5\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}}{2a} + x \cosh^{-1}(ax)^{5/2} - \frac{15\sqrt{\pi} \operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a}
\end{aligned}$$

Mathematica [A] time = 0.035386, size = 45, normalized size = 0.45

$$\frac{\frac{\sqrt{\cosh^{-1}(ax)} \operatorname{Gamma}\left(\frac{7}{2}, \cosh^{-1}(ax)\right)}{\sqrt{-\cosh^{-1}(ax)}} + \operatorname{Gamma}\left(\frac{7}{2}, \cosh^{-1}(ax)\right)}{2a}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[ArcCosh[a*x]^(5/2), x]
```

[Out] $((\text{Sqrt}[\text{ArcCosh}[a*x]]*\text{Gamma}[7/2, -\text{ArcCosh}[a*x]])/\text{Sqrt}[-\text{ArcCosh}[a*x]] + \text{Gamma}[7/2, \text{ArcCosh}[a*x]])/(2*a)$

Maple [A] time = 0.098, size = 81, normalized size = 0.8

$$-\frac{1}{16\sqrt{\pi a}} \left(-16 (\operatorname{arccosh}(ax))^{5/2} \sqrt{\pi x a} + 40 (\operatorname{arccosh}(ax))^{3/2} \sqrt{\pi} \sqrt{ax+1} \sqrt{ax-1} - 60 \sqrt{\operatorname{arccosh}(ax)} \sqrt{\pi x a} + 15 \pi \operatorname{Erfi}(\operatorname{arccosh}(ax)) \right) / a$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(arccosh(a*x)^(5/2), x)`

[Out] $-1/16*(-16*\operatorname{arccosh}(a*x)^{(5/2)}*\text{Pi}^{(1/2)}*x*a+40*\operatorname{arccosh}(a*x)^{(3/2)}*\text{Pi}^{(1/2)}*(a*x+1)^{(1/2)}*(a*x-1)^{(1/2)}-60*\operatorname{arccosh}(a*x)^{(1/2)}*\text{Pi}^{(1/2)}*x*a+15*\text{Pi}*\operatorname{erf}(\operatorname{arccosh}(a*x)^{(1/2)}))+15*\text{Pi}*\operatorname{erfi}(\operatorname{arccosh}(a*x)^{(1/2)}))/\text{Pi}^{(1/2)}/a$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \operatorname{arccosh}(ax)^{5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^(5/2), x, algorithm="maxima")`

[Out] `integrate(arccosh(a*x)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(arccosh(a*x)^(5/2), x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(acosch(a*x)**(5/2), x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

$$3.89 \quad \int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{\cosh^{-1}(ax)^{5/2}}{x}, x\right)$$

[Out] Unintegrable[ArcCosh[a*x]^(5/2)/x, x]

Rubi [A] time = 0.0136085, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx$$

Verification is Not applicable to the result.

[In] Int[ArcCosh[a*x]^(5/2)/x, x]

[Out] Defer[Int][ArcCosh[a*x]^(5/2)/x, x]

Rubi steps

$$\int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx = \int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx$$

Mathematica [A] time = 0.293893, size = 0, normalized size = 0.

$$\int \frac{\cosh^{-1}(ax)^{5/2}}{x} dx$$

Verification is Not applicable to the result.

[In] Integrate[ArcCosh[a*x]^(5/2)/x, x]

[Out] Integrate[ArcCosh[a*x]^(5/2)/x, x]

Maple [A] time = 0.071, size = 0, normalized size = 0.

$$\int \frac{1}{x} (\operatorname{arccosh}(ax))^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^(5/2)/x, x)

[Out] int(arccosh(a*x)^(5/2)/x, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^{\frac{5}{2}}}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(5/2)/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^(5/2)/x, x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(5/2)/x,x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**(5/2)/x,x)

[Out] Timed out

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^(5/2)/x,x, algorithm="giac")

[Out] sage0*x

$$3.90 \quad \int \frac{x^4}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=163

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} + \frac{\sqrt{\frac{\pi}{5}}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5}$$

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a^5) - (Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(32*a^5) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(32*a^5) + (Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(32*a^5)

Rubi [A] time = 0.199441, antiderivative size = 163, normalized size of antiderivative = 1., number of steps used = 18, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5670, 5448, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{5}}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} + \frac{\sqrt{\frac{\pi}{5}}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5}$$

Antiderivative was successfully verified.

[In] Int[x^4/Sqrt[ArcCosh[a*x]], x]

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(16*a^5) - (Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(32*a^5) - (Sqrt[Pi/5]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(32*a^5) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(32*a^5) + (Sqrt[Pi/5]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(32*a^5)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^n_*(x_)^m_., x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)]^p_.*((c_.) + (d_.)*(x_))^m_.*Sinh[(a_.) + (b_.)*(x_)]^n_., x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_))^m_.*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]]

x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma === True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x^4}{\sqrt{\cosh^{-1}(ax)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^4(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^5} \\ &= \frac{\text{Subst}\left(\int \left(\frac{\sinh(x)}{8\sqrt{x}} + \frac{3\sinh(3x)}{16\sqrt{x}} + \frac{\sinh(5x)}{16\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(5x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^5} + \frac{\text{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \frac{3 \text{Subst}\left(\int \frac{\sinh(3x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-5x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{32a^5} + \frac{\text{Subst}\left(\int \frac{e^{5x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{32a^5} - \frac{\text{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\ &= -\frac{\text{Subst}\left(\int e^{-5x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\text{Subst}\left(\int e^{5x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{16a^5} - \frac{\text{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{8a^5} \\ &= -\frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} - \frac{\sqrt{3}\pi\text{erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} - \frac{\sqrt{\frac{\pi}{5}}\text{erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{32a^5} + \frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} \end{aligned}$$

Mathematica [A] time = 0.110387, size = 150, normalized size = 0.92

$$\frac{\sqrt{5}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -5\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \frac{5\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -3\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \frac{10\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + 10G$$

$$160a^5$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^4/Sqrt[ArcCosh[a*x]], x]

[Out] ((Sqrt[5]*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -5*ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + (5*Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -3*ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + (10*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + 10*Gamma[1/2, ArcCosh[a*x]] + 5*Sqrt[3]*Gamma[1/2, 3*ArcCosh[a*x]] + Sqrt[5]*Gamma[1/2, 5*ArcCosh[a*x]])/(160*a^5)

Maple [F] time = 0.203, size = 0, normalized size = 0.

$$\int x^4 \frac{1}{\sqrt{\text{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^4/arccosh(a*x)^(1/2),x)`

[Out] `int(x^4/arccosh(a*x)^(1/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(x^4/sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4/acosh(a*x)**(1/2),x)`

[Out] `Integral(x**4/sqrt(acosh(a*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.91 \quad \int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=109

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4}$$

[Out] -(Sqrt [Pi]*Erf [2*Sqrt [ArcCosh [a*x]]])/(32*a^4) - (Sqrt [Pi/2]*Erf [Sqrt [2]*Sqrt [ArcCosh [a*x]]])/(8*a^4) + (Sqrt [Pi]*Erfi [2*Sqrt [ArcCosh [a*x]]])/(32*a^4) + (Sqrt [Pi/2]*Erfi [Sqrt [2]*Sqrt [ArcCosh [a*x]]])/(8*a^4)

Rubi [A] time = 0.146045, antiderivative size = 109, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5670, 5448, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4}$$

Antiderivative was successfully verified.

[In] Int [x^3/Sqrt [ArcCosh [a*x]] , x]

[Out] -(Sqrt [Pi]*Erf [2*Sqrt [ArcCosh [a*x]]])/(32*a^4) - (Sqrt [Pi/2]*Erf [Sqrt [2]*Sqrt [ArcCosh [a*x]]])/(8*a^4) + (Sqrt [Pi]*Erfi [2*Sqrt [ArcCosh [a*x]]])/(32*a^4) + (Sqrt [Pi/2]*Erfi [Sqrt [2]*Sqrt [ArcCosh [a*x]]])/(8*a^4)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_*(x_)^m_., x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^p_.*((c_.) + (d_.)*(x_.))^m_*Sinh[(a_.) + (b_.)*(x_.)]^n_., x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^m_*sin[(e_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^3(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= \frac{\text{Subst}\left(\int \left(\frac{\sinh(2x)}{4\sqrt{x}} + \frac{\sinh(4x)}{8\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(4x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^4} + \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^4} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^4} + \frac{\text{Subst}\left(\int \frac{e^{4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{16a^4} - \frac{\text{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^4} \\ &= -\frac{\text{Subst}\left(\int e^{-4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{8a^4} + \frac{\text{Subst}\left(\int e^{4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{8a^4} - \frac{\text{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^4} \\ &= -\frac{\sqrt{\pi}\text{erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} - \frac{\sqrt{\frac{\pi}{2}}\text{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4} + \frac{\sqrt{\pi}\text{erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{32a^4} + \frac{\sqrt{\frac{\pi}{2}}\text{erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{8a^4} \end{aligned}$$

Mathematica [A] time = 0.0858704, size = 101, normalized size = 0.93

$$\frac{\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -4\cosh^{-1}(ax)\right) + 2\sqrt{2}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -2\cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\left(2\sqrt{2}\Gamma\left(\frac{1}{2}, 2\cosh^{-1}(ax)\right) + \Gamma\left(\frac{1}{2}, 4\cosh^{-1}(ax)\right)\right)}{32a^4\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/Sqrt[ArcCosh[a*x]], x]

[Out] (Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -4*ArcCosh[a*x]] + 2*Sqrt[2]*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -2*ArcCosh[a*x]] + Sqrt[ArcCosh[a*x]]*(2*Sqrt[2]*Gamma[1/2, 2*ArcCosh[a*x]] + Gamma[1/2, 4*ArcCosh[a*x]]))/(32*a^4*Sqrt[ArcCosh[a*x]])

Maple [F] time = 0.113, size = 0, normalized size = 0.

$$\int x^3 \frac{1}{\sqrt{\text{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x)^(1/2), x)

[Out] $\int (x^3/\operatorname{arccosh}(a*x))^{1/2}, x$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\sqrt{\operatorname{arcosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(1/2), x, algorithm="maxima")`

[Out] `integrate(x^3/sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(1/2), x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**3/acosh(a*x)**(1/2), x)`

[Out] `Integral(x**3/sqrt(acosh(a*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(1/2), x, algorithm="giac")`

[Out] `sage0*x`

$$3.92 \quad \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=105

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3}$$

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(8*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(8*a^3) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(8*a^3) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(8*a^3)

Rubi [A] time = 0.139809, antiderivative size = 105, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5670, 5448, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} - \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\frac{\pi}{3}}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3}$$

Antiderivative was successfully verified.

[In] Int[x^2/Sqrt[ArcCosh[a*x]], x]

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(8*a^3) - (Sqrt[Pi/3]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(8*a^3) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(8*a^3) + (Sqrt[Pi/3]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(8*a^3)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_.*(x_)^m_.], x_Symbol] :> Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^p_.*((c_.) + (d_.)*(x_.))^m_.*Sinh[(a_.) + (b_.)*(x_.)]^n_.], x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^m_.*sin[(e_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204


```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]]/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^2(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^3} \\ &= \frac{\text{Subst}\left(\int \left(\frac{\sinh(x)}{4\sqrt{x}} + \frac{\sinh(3x)}{4\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^3} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \frac{\text{Subst}\left(\int \frac{\sinh(3x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^3} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-3x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^3} - \frac{\text{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^3} + \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^3} \\ &= -\frac{\text{Subst}\left(\int e^{-3x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^3} - \frac{\text{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^3} \\ &= -\frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} - \frac{\sqrt{\frac{\pi}{3}}\text{erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\pi}\text{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} + \frac{\sqrt{\frac{\pi}{3}}\text{erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^3} \end{aligned}$$

Mathematica [A] time = 0.083449, size = 100, normalized size = 0.95

$$\frac{\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -3\cosh^{-1}(ax)\right) + 3\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\left(3\Gamma\left(\frac{1}{2}, \cosh^{-1}(ax)\right) + 3\Gamma\left(\frac{1}{2}, 3\cosh^{-1}(ax)\right)\right)}{24a^3\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[x^2/Sqrt[ArcCosh[a*x]], x]
```

```
[Out] (Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -3*ArcCosh[a*x]] + 3*Sqrt[-ArcCosh[
a*x]]*Gamma[1/2, -ArcCosh[a*x]] + Sqrt[ArcCosh[a*x]]*(3*Gamma[1/2, ArcCosh[
a*x]] + Sqrt[3]*Gamma[1/2, 3*ArcCosh[a*x]]))/(24*a^3*Sqrt[ArcCosh[a*x]])
```

Maple [F] time = 0.101, size = 0, normalized size = 0.

$$\int x^2 \frac{1}{\sqrt{\text{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2/arccosh(a*x)^(1/2), x)
```

[Out] `int(x^2/arccosh(a*x)^(1/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(x^2/sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2/acosh(a*x)**(1/2),x)`

[Out] `Integral(x**2/sqrt(acosh(a*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.93 \quad \int \frac{x}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=63

$$\frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2}$$

[Out] $-(\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(4*a^2) + (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(4*a^2)$

Rubi [A] time = 0.0772482, antiderivative size = 63, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.7$, Rules used = {5670, 5448, 12, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2} - \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]], x]$

[Out] $-(\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(4*a^2) + (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(4*a^2)$

Rule 5670

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[(c_.)*(x_.)]*(b_.)]^{(n_.)}(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n \operatorname{Cosh}[x]^m \operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c, n\}, x \ \&\& \ \operatorname{IGtQ}[m, 0]$

Rule 5448

$\operatorname{Int}[\operatorname{Cosh}[(a_.) + (b_.)*(x_.)]^{(p_.)}((c_.) + (d_.)*(x_.))^{(m_.)} \operatorname{Sinh}[(a_.) + (b_.)*(x_.)]^{(n_.)}, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sinh}[a + b*x]^n \operatorname{Cosh}[a + b*x]^p, x], x] /;$ $\operatorname{FreeQ}\{a, b, c, d, m\}, x \ \&\& \ \operatorname{IGtQ}[n, 0] \ \& \ \operatorname{IGtQ}[p, 0]$

Rule 12

$\operatorname{Int}[(a_.)*(u_.), x_Symbol] \rightarrow \operatorname{Dist}[a, \operatorname{Int}[u, x], x] /;$ $\operatorname{FreeQ}[a, x] \ \&\& \ \operatorname{!Match}Q[u, (b_.)*(v_.)] /;$ $\operatorname{FreeQ}[b, x]$

Rule 3308

$\operatorname{Int}[(c_.) + (d_.)*(x_.)]^{(m_.)} \sin[(e_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/E^{(I*(e + f*x))}, x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m * E^{(I*(e + f*x))}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x]$

Rule 2180

$\operatorname{Int}[(F_.)^{((g_.)*((e_.) + (f_.)*(x_.)))/\operatorname{Sqrt}[(c_.) + (d_.)*(x_.)]}, x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \operatorname{Sqrt}[c + d*x]], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x \ \&\& \ \operatorname{!UseGamma} == \operatorname{True}$

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \int \frac{x}{\sqrt{\cosh^{-1}(ax)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{2\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a^2} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^2} + \frac{\text{Subst}\left(\int \frac{e^{2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^2} \\ &= -\frac{\text{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a^2} + \frac{\text{Subst}\left(\int e^{2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a^2} \\ &= -\frac{\sqrt{\frac{\pi}{2}} \text{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2} + \frac{\sqrt{\frac{\pi}{2}} \text{erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{4a^2} \end{aligned}$$

Mathematica [A] time = 0.0357936, size = 49, normalized size = 0.78

$$\frac{\sqrt{\frac{\pi}{2}} \left(\text{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) - \text{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) \right)}{4a^2}$$

Antiderivative was successfully verified.

[In] Integrate[x/Sqrt[ArcCosh[a*x]], x]

[Out] (Sqrt[Pi/2]*(-Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] + Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]))/(4*a^2)

Maple [A] time = 0.053, size = 37, normalized size = 0.6

$$-\frac{\sqrt{\pi}\sqrt{2}}{8a^2} \left(\text{Erf}\left(\sqrt{2}\sqrt{\text{arccosh}(ax)}\right) - \text{erfi}\left(\sqrt{2}\sqrt{\text{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^(1/2), x)

[Out] $-1/8\pi^{1/2}2^{1/2}(\operatorname{erf}(2^{1/2}\operatorname{arccosh}(ax)^{1/2})-\operatorname{erfi}(2^{1/2}\operatorname{arccosh}(ax)^{1/2}))/a^2$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(x/sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/acosh(a*x)**(1/2),x)`

[Out] `Integral(x/sqrt(acosh(a*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.94 \quad \int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=43

$$\frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a} - \frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a}$$

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]])]/(2*a) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]])]/(2*a)

Rubi [A] time = 0.0466218, antiderivative size = 43, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5658, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a} - \frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a}$$

Antiderivative was successfully verified.

[In] Int[1/Sqrt[ArcCosh[a*x]],x]

[Out] -(Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]])]/(2*a) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]])]/(2*a)

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n_], x_Symbol] :> -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3308

Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned}
\int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx &= \frac{\text{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a} \\
&= -\frac{\text{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a} + \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a} \\
&= -\frac{\text{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a} + \frac{\text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a} \\
&= -\frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a} + \frac{\sqrt{\pi}\text{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{2a}
\end{aligned}$$

Mathematica [A] time = 0.0282835, size = 45, normalized size = 1.05

$$\frac{\frac{\sqrt{-\cosh^{-1}(ax)}\text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right)}{\sqrt{\cosh^{-1}(ax)}} + \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right)}{2a}$$

Warning: Unable to verify antiderivative.

[In] Integrate[1/Sqrt[ArcCosh[a*x]], x]

[Out] ((Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + Gamma[1/2, ArcCosh[a*x]])/(2*a)

Maple [A] time = 0.043, size = 26, normalized size = 0.6

$$-\frac{\sqrt{\pi}}{2a} \left(\text{Erf}\left(\sqrt{\text{arccosh}(ax)}\right) - \text{erfi}\left(\sqrt{\text{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^(1/2), x)

[Out] -1/2*Pi^(1/2)*(erf(arccosh(a*x)^(1/2))-erfi(arccosh(a*x)^(1/2)))/a

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\sqrt{\text{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(1/2), x, algorithm="maxima")

[Out] integrate(1/sqrt(arccosh(a*x)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/acosh(a*x)**(1/2),x)

[Out] Integral(1/sqrt(acosh(a*x)), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(1/2),x, algorithm="giac")

[Out] sage₀*x

$$3.95 \quad \int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable} \left(\frac{1}{x\sqrt{\cosh^{-1}(ax)}}, x \right)$$

[Out] Unintegrable[1/(x*Sqrt[ArcCosh[a*x]]), x]

Rubi [A] time = 0.0142105, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*Sqrt[ArcCosh[a*x]]), x]

[Out] Defer[Int][1/(x*Sqrt[ArcCosh[a*x]]), x]

Rubi steps

$$\int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx = \int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx$$

Mathematica [A] time = 0.228137, size = 0, normalized size = 0.

$$\int \frac{1}{x\sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*Sqrt[ArcCosh[a*x]]), x]

[Out] Integrate[1/(x*Sqrt[ArcCosh[a*x]]), x]

Maple [A] time = 0.071, size = 0, normalized size = 0.

$$\int \frac{1}{x\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^(1/2), x)

[Out] `int(1/x/arccosh(a*x)^(1/2),x)`

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(1/(x*sqrt(arccosh(a*x))), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x/acosh(a*x)**(1/2),x)`

[Out] `Integral(1/(x*sqrt(acosh(a*x))), x)`

Giac [A] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.96 \quad \int \frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable} \left(\frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}}, x \right)$$

[Out] Unintegrable[1/(x^2*Sqrt[ArcCosh[a*x]]), x]

Rubi [A] time = 0.0136833, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x^2*Sqrt[ArcCosh[a*x]]), x]

[Out] Defer[Int][1/(x^2*Sqrt[ArcCosh[a*x]]), x]

Rubi steps

$$\int \frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}} dx = \int \frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}} dx$$

Mathematica [A] time = 0.616681, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x^2*Sqrt[ArcCosh[a*x]]), x]

[Out] Integrate[1/(x^2*Sqrt[ArcCosh[a*x]]), x]

Maple [A] time = 0.102, size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x^2/arccosh(a*x)^(1/2), x)

[Out] `int(1/x^2/arccosh(a*x)^(1/2),x)`

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x^2/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(1/(x^2*sqrt(arccosh(a*x))), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x^2/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x^2 \sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x**2/acosh(a*x)**(1/2),x)`

[Out] `Integral(1/(x**2*sqrt(acosh(a*x))), x)`

Giac [A] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(1/x^2/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.97 \quad \int \frac{x^4}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=193

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \dots$$

```
[Out] (-2*x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*Sqrt[ArcCosh[a*x]]) + (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(8*a^5) + (3*Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[5*Pi]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(8*a^5) + (3*Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[5*Pi]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(16*a^5)
```

Rubi [A] time = 0.184238, antiderivative size = 193, normalized size of antiderivative = 1., number of steps used = 17, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \dots$$

Antiderivative was successfully verified.

```
[In] Int[x^4/ArcCosh[a*x]^(3/2), x]
```

```
[Out] (-2*x^4*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*Sqrt[ArcCosh[a*x]]) + (Sqrt[Pi]*Erf[Sqrt[ArcCosh[a*x]]])/(8*a^5) + (3*Sqrt[3*Pi]*Erf[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[5*Pi]*Erf[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[Pi]*Erfi[Sqrt[ArcCosh[a*x]]])/(8*a^5) + (3*Sqrt[3*Pi]*Erfi[Sqrt[3]*Sqrt[ArcCosh[a*x]]])/(16*a^5) + (Sqrt[5*Pi]*Erfi[Sqrt[5]*Sqrt[ArcCosh[a*x]]])/(16*a^5)
```

Rule 5666

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*(x_.)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\int \frac{x^4}{\cosh^{-1}(ax)^{3/2}} dx = -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} - \frac{2 \operatorname{Subst}\left(\int \left(-\frac{\cosh(x)}{8\sqrt{x}} - \frac{9\cosh(3x)}{16\sqrt{x}} - \frac{5\cosh(5x)}{16\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^5} + \frac{5 \operatorname{Subst}\left(\int \frac{\cosh(5x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^5}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \frac{\operatorname{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \dots$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^5} + \frac{\operatorname{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{4a^5}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \frac{3\sqrt{3}\pi\operatorname{erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5} + \frac{\sqrt{5}\pi\operatorname{erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{16a^5}$$

Mathematica [A] time = 0.29186, size = 201, normalized size = 1.04

$$\frac{-\sqrt{5}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -5\cosh^{-1}(ax)\right) - 3\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -3\cosh^{-1}(ax)\right) - 2\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -\cosh^{-1}(ax)\right)}{16a^5}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^4/ArcCosh[a*x]^(3/2), x]

[Out] $-(4\sqrt{-1+ax}/(1+ax))*(1+ax) - \sqrt{5}\sqrt{-\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, -5\operatorname{ArcCosh}[a*x]\right] - 3\sqrt{3}\sqrt{-\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, -3\operatorname{ArcCosh}[a*x]\right] - 2\sqrt{-\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, -\operatorname{ArcCosh}[a*x]\right] + 2\sqrt{\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, \operatorname{ArcCosh}[a*x]\right] + 3\sqrt{3}\sqrt{\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, 3\operatorname{ArcCosh}[a*x]\right] + \sqrt{5}\sqrt{\operatorname{ArcCosh}[a*x]}\Gamma\left[\frac{1}{2}, 5\operatorname{ArcCosh}[a*x]\right] + 6\operatorname{Sinh}[3\operatorname{ArcCosh}[a*x]] + 2\operatorname{Sinh}[5\operatorname{ArcCosh}[a*x]]\right)/(16a^5\sqrt{\operatorname{ArcCosh}[a*x]})$

Maple [F] time = 0.183, size = 0, normalized size = 0.

$$\int x^4 (\operatorname{arccosh}(ax))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^4/arccosh(a*x)^(3/2),x)`

[Out] `int(x^4/arccosh(a*x)^(3/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arccosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(3/2),x, algorithm="maxima")`

[Out] `integrate(x^4/arccosh(a*x)^(3/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(3/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4/acosh(a*x)**(3/2),x)`

[Out] `Integral(x**4/acosh(a*x)**(3/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(3/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.98 \quad \int \frac{x^3}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=143

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{2a^4} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{2a^4} - \frac{2x^3\sqrt{\cosh^{-1}(ax)}}{a\sqrt{1+a^2x^2}}$$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(4a^4) + (\sqrt{\pi/2}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(2a^4) + (\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(4a^4) + (\sqrt{\pi/2}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(2a^4) - \frac{2x^3\sqrt{\cosh^{-1}(ax)}}{a\sqrt{1+a^2x^2}}$

Rubi [A] time = 0.128221, antiderivative size = 143, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{2a^4} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} + \frac{\sqrt{\frac{\pi}{2}}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{2a^4} - \frac{2x^3\sqrt{\cosh^{-1}(ax)}}{a\sqrt{1+a^2x^2}}$$

Antiderivative was successfully verified.

[In] $\int x^3/\operatorname{ArcCosh}[ax]^{3/2}, x$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(4a^4) + (\sqrt{\pi/2}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(2a^4) + (\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(4a^4) + (\sqrt{\pi/2}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(2a^4) - \frac{2x^3\sqrt{\cosh^{-1}(ax)}}{a\sqrt{1+a^2x^2}}$

Rule 5666

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[c_.](x_.)](b_.)^{(n_.)}(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^c(n+1)), x] + \operatorname{Dist}[1/(b^c(m+1)(n+1)), \operatorname{Subst}[\operatorname{Int}[\operatorname{ExpandTrigReduce}[(a+bx)^{(n+1)}\operatorname{Cosh}[x]^{(m-1)}(m-(m+1)\operatorname{Cosh}[x]^2), x], x], x, \operatorname{ArcCosh}[cx]], x] /;$ $\operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{GeQ}[n, -2] \&\& \operatorname{LtQ}[n, -1]$

Rule 3307

$\operatorname{Int}[(c_.) + (d_.)(x_.)]^{(m_.)}\sin[(e_.) + \pi(k_.) + (f_.)(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c+dx)^m/(E^{(Ik\pi)}E^{(e+fx)})], x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c+dx)^mE^{(Ik\pi)}E^{(e+fx)}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \&\& \operatorname{IntegerQ}[2k]$

Rule 2180

$\operatorname{Int}[(F_.)^{(g_.)}((e_.) + (f_.)(x_.))]/\sqrt{(c_.) + (d_.)(x_.)}, x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F^{(g(e-(cf)/d) + (fgx^2)/d)}, x], x], x, \sqrt{c+dx}], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x \&\& !\$UseGamma == True$

Rule 2204

$\operatorname{Int}[(F_.)^{(a_.)}((b_.) + (c_.) + (d_.)(x_.))^2], x_Symbol] \rightarrow \operatorname{Simp}[(F^a\sqrt{\pi}\operatorname{Erfi}[(c+dx)\operatorname{Rt}[b\operatorname{Log}[F], 2]])/(2d\operatorname{Rt}[b\operatorname{Log}[F], 2]), x] /;$ $\operatorname{FreeQ}\{$

F, a, b, c, d, x && PosQ[b]

Rule 2205

$\text{Int}[(F_)^{(a_)} + (b_)*((c_)+ (d_)*(x_))^2], x_Symbol] \rightarrow \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erf}[(c + d*x)*\text{Rt}[-(b*\text{Log}[F]), 2]])/(2*d*\text{Rt}[-(b*\text{Log}[F]), 2]), x] /; \text{FreeQ}[\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int \frac{x^3}{\cosh^{-1}(ax)^{3/2}} dx &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} - \frac{2 \text{Subst}\left(\int\left(-\frac{\cosh(2x)}{2\sqrt{x}} - \frac{\cosh(4x)}{2\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\text{Subst}\left(\int\frac{\cosh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^4} + \frac{\text{Subst}\left(\int\frac{\cosh(4x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\ &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\text{Subst}\left(\int\frac{e^{-4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a^4} + \frac{\text{Subst}\left(\int\frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a^4} \\ &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\text{Subst}\left(\int e^{-4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a^4} + \frac{\text{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a^4} \\ &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\sqrt{\pi}\text{erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} + \frac{\sqrt{\frac{\pi}{2}}\text{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{2a^4} + \frac{\sqrt{\pi}\text{erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{4a^4} \end{aligned}$$

Mathematica [A] time = 0.159266, size = 124, normalized size = 0.87

$$\frac{-\sqrt{-\cosh^{-1}(ax)}\text{Gamma}\left(\frac{1}{2}, -4\cosh^{-1}(ax)\right) - \sqrt{2}\sqrt{-\cosh^{-1}(ax)}\text{Gamma}\left(\frac{1}{2}, -2\cosh^{-1}(ax)\right) + \sqrt{2}\sqrt{\cosh^{-1}(ax)}\text{Gamma}\left(\frac{1}{2}, 2\cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\text{Gamma}\left(\frac{1}{2}, 4\cosh^{-1}(ax)\right)}{4a^4\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/ArcCosh[a*x]^(3/2), x]

[Out] $-\left(-\left(\text{Sqrt}[-\text{ArcCosh}[a*x]]*\text{Gamma}\left[\frac{1}{2}, -4*\text{ArcCosh}[a*x]\right]\right) - \text{Sqrt}[2]*\text{Sqrt}[-\text{ArcCosh}[a*x]]*\text{Gamma}\left[\frac{1}{2}, -2*\text{ArcCosh}[a*x]\right] + \text{Sqrt}[2]*\text{Sqrt}[\text{ArcCosh}[a*x]]*\text{Gamma}\left[\frac{1}{2}, 2*\text{ArcCosh}[a*x]\right] + \text{Sqrt}[\text{ArcCosh}[a*x]]*\text{Gamma}\left[\frac{1}{2}, 4*\text{ArcCosh}[a*x]\right] + 2*\text{Sinh}[2*\text{ArcCosh}[a*x]] + \text{Sinh}[4*\text{ArcCosh}[a*x]]\right)/(4*a^4*\text{Sqrt}[\text{ArcCosh}[a*x]])$

Maple [F] time = 0.092, size = 0, normalized size = 0.

$$\int x^3 (\text{arccosh}(ax))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x)^(3/2), x)

[Out] `int(x^3/arccosh(a*x)^(3/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arcosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(3/2),x, algorithm="maxima")`

[Out] `integrate(x^3/arccosh(a*x)^(3/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(3/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**3/acosh(a*x)**(3/2),x)`

[Out] `Integral(x**3/acosh(a*x)**(3/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(3/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.99 \quad \int \frac{x^2}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=135

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} - \frac{2x}{\cosh^{-1}(ax)^{3/2}}$$

[Out] $(-2*x^2*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(a*\sqrt{\operatorname{ArcCosh}[a*x]}) + (\sqrt{\pi}*\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{3*\pi}*\operatorname{Erf}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{3*\pi}*\operatorname{Erfi}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3)$

Rubi [A] time = 0.124145, antiderivative size = 135, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} - \frac{2x}{\cosh^{-1}(ax)^{3/2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/\operatorname{ArcCosh}[a*x]^{(3/2)}, x]$

[Out] $(-2*x^2*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(a*\sqrt{\operatorname{ArcCosh}[a*x]}) + (\sqrt{\pi}*\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{3*\pi}*\operatorname{Erf}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3) + (\sqrt{3*\pi}*\operatorname{Erfi}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(4*a^3)$

Rule 5666

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[(c_.)*(x_.)]*(b_.)]^{(n_.)}(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(b*c*(n + 1)), x] + \operatorname{Dist}[1/(b*c^{(m + 1)}*(n + 1)), \operatorname{Subst}[\operatorname{Int}[\operatorname{ExpandTrigReduce}[(a + b*x)^{(n + 1)}*\operatorname{Cosh}[x]^{(m - 1)}*(m - (m + 1)*\operatorname{Cosh}[x]^2), x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{GeQ}[n, -2] \&\& \operatorname{LtQ}[n, -1]$

Rule 3307

$\operatorname{Int}[(c_.) + (d_.)*(x_.)]^{(m_.)}*\sin[(e_.) + \pi*(k_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/(E^{(I*k*\pi)}*E^{(I*(e + f*x)})), x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m*E^{(I*k*\pi)}*E^{(I*(e + f*x))}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \&\& \operatorname{IntegerQ}[2*k]$

Rule 2180

$\operatorname{Int}[(F_)^{((g_.)*((e_.) + (f_.)*(x_.)))/\sqrt{(c_.) + (d_.)*(x_.)}], x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \sqrt{c + d*x}], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x \&\& !\$UseGamma == True$

Rule 2204

$\operatorname{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2)}, x_Symbol] \rightarrow \operatorname{Simp}[(F^a*\sqrt{\pi}*\operatorname{Erfi}[(c + d*x)*\operatorname{Rt}[b*\operatorname{Log}[F], 2]])/(2*d*\operatorname{Rt}[b*\operatorname{Log}[F], 2]), x] /;$ $\operatorname{FreeQ}\{$

F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))²), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\int \frac{x^2}{\cosh^{-1}(ax)^{3/2}} dx = -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} - \frac{2 \operatorname{Subst}\left(\int \left(-\frac{\cosh(x)}{4\sqrt{x}} - \frac{3\cosh(3x)}{4\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^3}$$

$$= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a^3} + \frac{3 \operatorname{Subst}\left(\int \frac{\cosh(3x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{2a^3}$$

$$= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \frac{\operatorname{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \dots$$

$$= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a^3} + \frac{\operatorname{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{2a^3}$$

$$= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{3}\pi\operatorname{erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{4a^3} + \frac{\sqrt{\pi}\operatorname{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{4a^3}$$

Mathematica [A] time = 0.166039, size = 139, normalized size = 1.03

$$\frac{-\sqrt{3}\sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -3\cosh^{-1}(ax)\right) - \sqrt{-\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) + \sqrt{\cosh^{-1}(ax)}\Gamma\left(\frac{1}{2}, \cosh^{-1}(ax)\right)}{4a^3\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/ArcCosh[a*x]^(3/2), x]

[Out] -(2*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x) - Sqrt[3]*Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -3*ArcCosh[a*x]] - Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -ArcCosh[a*x]] + Sqrt[ArcCosh[a*x]]*Gamma[1/2, ArcCosh[a*x]] + Sqrt[3]*Sqrt[ArcCosh[a*x]]*Gamma[1/2, 3*ArcCosh[a*x]] + 2*Sinh[3*ArcCosh[a*x]])/(4*a^3*Sqrt[ArcCosh[a*x]])

Maple [F] time = 0.086, size = 0, normalized size = 0.

$$\int x^2 (\operatorname{arccosh}(ax))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x)^(3/2), x)

[Out] `int(x^2/arccosh(a*x)^(3/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arccosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(3/2),x, algorithm="maxima")`

[Out] `integrate(x^2/arccosh(a*x)^(3/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(3/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2/acosh(a*x)**(3/2),x)`

[Out] `Integral(x**2/acosh(a*x)**(3/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(3/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.100 \quad \int \frac{x}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=89

$$\frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} + \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{a\sqrt{\cosh^{-1}(ax)}}$$

[Out] (-2*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*Sqrt[ArcCosh[a*x]]) + (Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/a^2 + (Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/a^2

Rubi [A] time = 0.0658254, antiderivative size = 89, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\frac{\pi}{2}} \operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} + \frac{\sqrt{\frac{\pi}{2}} \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{a\sqrt{\cosh^{-1}(ax)}}$$

Antiderivative was successfully verified.

[In] Int[x/ArcCosh[a*x]^(3/2), x]

[Out] (-2*x*Sqrt[-1 + a*x]*Sqrt[1 + a*x])/(a*Sqrt[ArcCosh[a*x]]) + (Sqrt[Pi/2]*Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/a^2 + (Sqrt[Pi/2]*Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]])/a^2

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3307

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))²), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x}{\cosh^{-1}(ax)^{3/2}} dx &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{2 \operatorname{Subst}\left(\int \frac{\cosh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^2} + \frac{\operatorname{Subst}\left(\int \frac{e^{2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^2} \\ &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{2 \operatorname{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a^2} + \frac{2 \operatorname{Subst}\left(\int e^{2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a^2} \\ &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\sqrt{\frac{\pi}{2}} \operatorname{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} + \frac{\sqrt{\frac{\pi}{2}} \operatorname{erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{a^2} \end{aligned}$$

Mathematica [A] time = 0.10018, size = 63, normalized size = 0.71

$$\frac{\sqrt{\frac{\pi}{2}} \left(\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) + \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) \right) - \frac{\sinh(2 \cosh^{-1}(ax))}{\sqrt{\cosh^{-1}(ax)}}}{a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/ArcCosh[a*x]^(3/2), x]

[Out] (Sqrt[Pi/2]*(Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] + Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]) - Sinh[2*ArcCosh[a*x]]/Sqrt[ArcCosh[a*x]])/a^2

Maple [A] time = 0.111, size = 83, normalized size = 0.9

$$\frac{\sqrt{2}}{2\sqrt{\pi}a^2 \operatorname{arccosh}(ax)} \left(-2\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\sqrt{\pi}\sqrt{ax+1}\sqrt{ax-1}xa + \operatorname{arccosh}(ax)\pi \operatorname{Erf}\left(\sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\right) + \operatorname{arccosh}(ax) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^(3/2), x)

[Out] 1/2*2^(1/2)*(-2*2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2)*x*a+arccosh(a*x)*Pi*erf(2^(1/2)*arccosh(a*x)^(1/2))+arccosh(a*x)*Pi*erfi(2^(1/2)*arccosh(a*x)^(1/2)))/Pi^(1/2)/a^2/arccosh(a*x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(x/arccosh(a*x)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/acosh(a*x)**(3/2),x)

[Out] Integral(x/acosh(a*x)**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

$$3.101 \quad \int \frac{1}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=68

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} + \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{a\sqrt{\cosh^{-1}(ax)}}$$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/a + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/a$

Rubi [A] time = 0.217745, antiderivative size = 68, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 6, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5656, 5781, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi} \operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} + \frac{\sqrt{\pi} \operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{a\sqrt{\cosh^{-1}(ax)}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[\operatorname{ArcCosh}[ax]^{-3/2}, x]$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/a + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/a$

Rule 5656

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b + \operatorname{ArcCosh}[c \cdot x])^n, x_Symbol] \rightarrow \operatorname{Simp}[(\sqrt{-1+cx} \cdot \sqrt{1+cx} \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}) / (b \cdot c \cdot (n+1)), x] - \operatorname{Dist}[c / (b \cdot (n+1)), \operatorname{Int}[(x \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}) / (\sqrt{-1+cx} \cdot \sqrt{1+cx})], x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{LtQ}[n, -1]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b + \operatorname{ArcCosh}[c \cdot x])^n \cdot (d + e \cdot x)^m \cdot ((d_1 + (e_1 \cdot x)^{p_1}) \cdot (d_2 + (e_2 \cdot x)^{p_2}))^p, x_Symbol] \rightarrow \operatorname{Dist}[(d_1 \cdot d_2)^p / c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b \cdot x)^n \cdot \operatorname{Cosh}[x]^m \cdot \operatorname{Sinh}[x]^{2p+1}, x], x, \operatorname{ArcCosh}[cx]], x] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, n\}, x] \ \&\& \ \operatorname{EqQ}[e_1 - c \cdot d_1, 0] \ \&\& \ \operatorname{EqQ}[e_2 + c \cdot d_2, 0] \ \&\& \ \operatorname{IntegerQ}[p + 1/2] \ \&\& \ \operatorname{GtQ}[p, -1] \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ (\operatorname{GtQ}[d_1, 0] \ \&\& \ \operatorname{LtQ}[d_2, 0])$

Rule 3307

$\operatorname{Int}[(c + (d \cdot x)^m) \cdot \sin[(e + \pi \cdot k) + (f \cdot x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d \cdot x)^m / (E^{I \cdot k \cdot \pi} \cdot E^{I \cdot (e + f \cdot x)})], x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d \cdot x)^m \cdot E^{I \cdot k \cdot \pi} \cdot E^{I \cdot (e + f \cdot x)}], x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x] \ \&\& \ \operatorname{IntegerQ}[2 \cdot k]$

Rule 2180

$\operatorname{Int}[(F + (g \cdot (e + (f \cdot x))) / \sqrt{(c + (d \cdot x))}, x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F \cdot (g \cdot (e - (c \cdot f)/d) + (f \cdot g \cdot x^2)/d), x], x, \sqrt{c + d \cdot x}], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x] \ \&\& \ \operatorname{!} \$UseGamma == \operatorname{True}$

Rule 2204

`Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]`

Rule 2205

`Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]`

Rubi steps

$$\begin{aligned} \int \frac{1}{\cosh^{-1}(ax)^{3/2}} dx &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + (2a) \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}\sqrt{\cosh^{-1}(ax)}} dx \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{2 \operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a} + \frac{\operatorname{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{2 \operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a} + \frac{2 \operatorname{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{a\sqrt{\cosh^{-1}(ax)}} + \frac{\sqrt{\pi} \operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} + \frac{\sqrt{\pi} \operatorname{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{a} \end{aligned}$$

Mathematica [A] time = 0.0604272, size = 76, normalized size = 1.12

$$\frac{\sqrt{-\cosh^{-1}(ax)} \operatorname{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - \sqrt{\cosh^{-1}(ax)} \operatorname{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) - 2\sqrt{\frac{ax-1}{ax+1}}(ax+1)}{a\sqrt{\cosh^{-1}(ax)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^(-3/2), x]

[Out] (-2*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x) + Sqrt[-ArcCosh[a*x]]*Gamma[1/2, -
ArcCosh[a*x]] - Sqrt[ArcCosh[a*x]]*Gamma[1/2, ArcCosh[a*x]])/(a*Sqrt[ArcCos
h[a*x]])

Maple [A] time = 0.095, size = 66, normalized size = 1.

$$\frac{1}{\sqrt{\pi a \operatorname{arccosh}(ax)}} \left(-2\sqrt{\operatorname{arccosh}(ax)} \sqrt{\pi} \sqrt{ax+1} \sqrt{ax-1} + \operatorname{arccosh}(ax) \pi \operatorname{Erf}\left(\sqrt{\operatorname{arccosh}(ax)}\right) + \operatorname{arccosh}(ax) \pi \operatorname{erfi}\left(\sqrt{\operatorname{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^(3/2),x)

[Out] $(-2*\operatorname{arccosh}(a*x)^{(1/2)}*\pi^{(1/2)}*(a*x+1)^{(1/2)}*(a*x-1)^{(1/2)}+\operatorname{arccosh}(a*x)*\pi*\operatorname{erf}(\operatorname{arccosh}(a*x)^{(1/2)})+\operatorname{arccosh}(a*x)*\pi*\operatorname{erfi}(\operatorname{arccosh}(a*x)^{(1/2)}))/\pi^{(1/2)}/a/\operatorname{arccosh}(a*x)$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{arccosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^(-3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/acosh(a*x)**(3/2),x)

[Out] Integral(acosh(a*x)**(-3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

$$3.102 \quad \int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^{3/2}}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^(3/2)), x]

Rubi [A] time = 0.0136584, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^(3/2)), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^(3/2)), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx = \int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx$$

Mathematica [A] time = 0.340927, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^{3/2}} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^(3/2)), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^(3/2)), x]

Maple [A] time = 0.066, size = 0, normalized size = 0.

$$\int \frac{1}{x} (\operatorname{arccosh}(ax))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^(3/2), x)

[Out] int(1/x/arccosh(a*x)^(3/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(1/(x*arccosh(a*x)^(3/2)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x)**(3/2),x)

[Out] Integral(1/(x*acosh(a*x)**(3/2)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

$$3.103 \quad \int \frac{x^4}{\cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=228

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} - \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} - \frac{5\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{24a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \frac{5\sqrt{5\pi}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{24a^5}$$

[Out] $(-2*x^4*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + (16*x^3)/(3*a^2*\sqrt{\operatorname{ArcCosh}[a*x]}) - (20*x^5)/(3*\sqrt{\operatorname{ArcCosh}[a*x]}) - (\sqrt{\pi}*\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(12*a^5) - (3*\sqrt{3\pi}*\operatorname{Erf}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(8*a^5) - (5*\sqrt{5\pi}*\operatorname{Erf}[\sqrt{5}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(24*a^5) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(12*a^5) + (3*\sqrt{3\pi}*\operatorname{Erfi}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(8*a^5) + (5*\sqrt{5\pi}*\operatorname{Erfi}[\sqrt{5}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(24*a^5)$

Rubi [A] time = 0.864105, antiderivative size = 228, normalized size of antiderivative = 1., number of steps used = 34, number of rules used = 8, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.667$, Rules used = {5668, 5775, 5670, 5448, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} - \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} - \frac{5\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{24a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{8a^5} + \frac{5\sqrt{5\pi}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{24a^5}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^4/\operatorname{ArcCosh}[a*x]^{(5/2)}, x]$

[Out] $(-2*x^4*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + (16*x^3)/(3*a^2*\sqrt{\operatorname{ArcCosh}[a*x]}) - (20*x^5)/(3*\sqrt{\operatorname{ArcCosh}[a*x]}) - (\sqrt{\pi}*\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(12*a^5) - (3*\sqrt{3\pi}*\operatorname{Erf}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(8*a^5) - (5*\sqrt{5\pi}*\operatorname{Erf}[\sqrt{5}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(24*a^5) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[a*x]}])/(12*a^5) + (3*\sqrt{3\pi}*\operatorname{Erfi}[\sqrt{3}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(8*a^5) + (5*\sqrt{5\pi}*\operatorname{Erfi}[\sqrt{5}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(24*a^5)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^{(n)}*(x)^{(m)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x^{(m+1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\sqrt{-1 + c*x}*\sqrt{1 + c*x}], x], x) + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x^{(m-1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\sqrt{-1 + c*x}*\sqrt{1 + c*x}], x], x) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^{(n)}*((f*x)^{(m)}), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\sqrt{-(d1*d2)}*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\sqrt{-(d1*d2)}*(n+1)), \operatorname{Int}[(f*x)^{(m-1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}], x], x) /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[
1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) +
(b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a +
b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &
& IGtQ[p, 0]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int \frac{x^4}{\cosh^{-1}(ax)^{5/2}} dx &= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{8 \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx}{3a} + \frac{1}{3}(10a) \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} dx \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} + \frac{100}{3} \int \frac{x^4}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{16 \int \frac{x^5}{\sqrt{\cosh^{-1}(ax)}} dx}{3} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} - \frac{16 \text{Subst}\left(\int \frac{\cosh^2(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} - \frac{16 \text{Subst}\left(\int \left(\frac{\sinh(x)}{4\sqrt{x}} + \frac{\sinh(3x)}{4\sqrt{x}}\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} + \frac{25 \text{Subst}\left(\int \frac{\sinh(5x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{12a^5} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} - \frac{25 \text{Subst}\left(\int \frac{e^{-5x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{24a^5} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} - \frac{25 \text{Subst}\left(\int e^{-5x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{12a^5} \\
&= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{16x^3}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{20x^5}{3\sqrt{\cosh^{-1}(ax)}} - \frac{\sqrt{\pi}\text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} - \frac{3\sqrt{3\pi}\text{erf}\left(\sqrt{3\cosh^{-1}(ax)}\right)}{12a^5}
\end{aligned}$$

Mathematica [A] time = 1.5425, size = 278, normalized size = 1.22

$$2(-\cosh^{-1}(ax))^{3/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - 2 \cosh^{-1}(ax)^{3/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) + 5 \cosh^{-1}(ax) \left(-\sqrt{5}\sqrt{-\cosh^{-1}(ax)}\right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^4/ArcCosh[a*x]^(5/2), x]

[Out] $-(2\sqrt{-1+ax}/(1+ax))*(1+ax) + (2\text{ArcCosh}[a*x])/E^{\text{ArcCosh}[a*x]} + 2E^{\text{ArcCosh}[a*x]}\text{ArcCosh}[a*x] + 2*(-\text{ArcCosh}[a*x])^{3/2}\text{Gamma}[1/2, -\text{ArcCosh}[a*x]] - 2\text{ArcCosh}[a*x]^{3/2}\text{Gamma}[1/2, \text{ArcCosh}[a*x]] + 5\text{ArcCosh}[a*x]*(E^{-5\text{ArcCosh}[a*x]} + E^{5\text{ArcCosh}[a*x]} - \text{Sqrt}[5]*\text{Sqrt}[-\text{ArcCosh}[a*x]]*\text{Gamma}[1/2, -5\text{ArcCosh}[a*x]] - \text{Sqrt}[5]*\text{Sqrt}[\text{ArcCosh}[a*x]]*\text{Gamma}[1/2, 5\text{ArcCosh}[a*x]]) + 3*((3\text{ArcCosh}[a*x])/E^{3\text{ArcCosh}[a*x]} + 3E^{3\text{ArcCosh}[a*x]}\text{ArcCosh}[a*x] + 3\text{Sqrt}[3]*(-\text{ArcCosh}[a*x])^{3/2}\text{Gamma}[1/2, -3\text{ArcCosh}[a*x]] - 3\text{Sqrt}[3]*\text{ArcCosh}[a*x]^{3/2}\text{Gamma}[1/2, 3\text{ArcCosh}[a*x]] + \text{Sinh}[3\text{ArcCosh}[a*x]]) + \text{Sinh}[5\text{ArcCosh}[a*x]])/(24a^5\text{ArcCosh}[a*x]^{3/2})$

Maple [F] time = 0.174, size = 0, normalized size = 0.

$$\int x^4 (\text{arccosh}(ax))^{-5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^4/arccosh(a*x)^(5/2),x)`

[Out] `int(x^4/arccosh(a*x)^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arccosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(5/2),x, algorithm="maxima")`

[Out] `integrate(x^4/arccosh(a*x)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4/acosh(a*x)**(5/2),x)`

[Out] `Integral(x**4/acosh(a*x)**(5/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.104 \quad \int \frac{x^3}{\cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=172

$$\frac{2\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} - \frac{\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} + \frac{2\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} + \frac{\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} +$$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\operatorname{ArcCosh}[ax]^{3/2}) + (4x^2)/(a^2\sqrt{\operatorname{ArcCosh}[ax]}) - (16x^4)/(3\sqrt{\operatorname{ArcCosh}[ax]}) - (2\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) - (\sqrt{2\pi}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) + (2\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) + (\sqrt{2\pi}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4)$

Rubi [A] time = 0.755236, antiderivative size = 172, normalized size of antiderivative = 1., number of steps used = 24, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5668, 5775, 5670, 5448, 3308, 2180, 2204, 2205, 12}

$$\frac{2\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} - \frac{\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} + \frac{2\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} + \frac{\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} +$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^3/\operatorname{ArcCosh}[ax]^{5/2}, x]$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(3a\operatorname{ArcCosh}[ax]^{3/2}) + (4x^2)/(a^2\sqrt{\operatorname{ArcCosh}[ax]}) - (16x^4)/(3\sqrt{\operatorname{ArcCosh}[ax]}) - (2\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) - (\sqrt{2\pi}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) + (2\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4) + (\sqrt{2\pi}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(3a^4)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)])(b)^n(x)^m, x] \rightarrow \operatorname{Simp}[x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{n+1}/(b^{n+1}), x] + (-\operatorname{Dist}[c(m+1)/(b(n+1)), \operatorname{Int}[(x)^{m+1}(a+b\operatorname{ArcCosh}[cx])^{n+1}]/(\sqrt{-1+cx}\sqrt{1+cx}), x], x] + \operatorname{Dist}[m/(b^{n+1}), \operatorname{Int}[(x)^{m-1}(a+b\operatorname{ArcCosh}[cx])^{n+1}]/(\sqrt{-1+cx}\sqrt{1+cx}), x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)])(b)^n(f(x))^m/\sqrt{(d_1 + e_1(x))\sqrt{d_2 + e_2(x)}}, x] \rightarrow \operatorname{Simp}[(f(x))^{n+1}(a+b\operatorname{ArcCosh}[cx])^{n+1}/(b^{n+1}\sqrt{-(d_1d_2)}), x] - \operatorname{Dist}[(f(x))^m/(b^{n+1}\sqrt{-(d_1d_2)}), \operatorname{Int}[(f(x))^{m-1}(a+b\operatorname{ArcCosh}[cx])^{n+1}], x], x] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f, m\}, x \ \&\& \ \operatorname{EqQ}[e_1 - cd_1, 0] \ \&\& \ \operatorname{EqQ}[e_2 + cd_2, 0] \ \&\& \ \operatorname{LtQ}[n, -1] \ \&\& \ \operatorname{GtQ}[d_1, 0] \ \&\& \ \operatorname{LtQ}[d_2, 0]$

Rule 5670

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)])(b)^n(x)^m, x] \rightarrow \operatorname{Dist}[1/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a+bx)^n\operatorname{Cosh}[x]^m\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[cx]],$

$x]$ /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sinh[(a_.) + (b_.)*(x_)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rubi steps

$$\begin{aligned}
\int \frac{x^3}{\cosh^{-1}(ax)^{5/2}} dx &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{2 \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx}{a} + \frac{1}{3}(8a) \int \frac{x^4}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} + \frac{64}{3} \int \frac{x^3}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{8 \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}}}{a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} - \frac{8 \text{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} - \frac{8 \text{Subst}\left(\int \frac{\sinh(2x)}{2\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{a^4} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} + \frac{8 \text{Subst}\left(\int \frac{\sinh(4x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^4} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} - \frac{4 \text{Subst}\left(\int \frac{e^{-4x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^4} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} - \frac{8 \text{Subst}\left(\int e^{-4x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{3a^4} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4x^2}{a^2\sqrt{\cosh^{-1}(ax)}} - \frac{16x^4}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{\pi}\text{erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{3a^4} - \frac{\sqrt{2\pi}\text{erf}\left(\sqrt{2\cosh^{-1}(ax)}\right)}{3a^4}
\end{aligned}$$

Mathematica [A] time = 0.758529, size = 175, normalized size = 1.02

$$-4 \cosh^{-1}(ax) \left(-2\sqrt{-\cosh^{-1}(ax)} \Gamma\left(\frac{1}{2}, -4 \cosh^{-1}(ax)\right) - 2\sqrt{\cosh^{-1}(ax)} \Gamma\left(\frac{1}{2}, 4 \cosh^{-1}(ax)\right) + e^{-4 \cosh^{-1}(ax)} \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/ArcCosh[a*x]^(5/2), x]

[Out] $(-4 \text{ArcCosh}[a*x] * (E^{(-4 \text{ArcCosh}[a*x])} + E^{(4 \text{ArcCosh}[a*x])} - 2 \text{Sqrt}[-\text{ArcCosh}[a*x]] * \Gamma[1/2, -4 \text{ArcCosh}[a*x]] - 2 \text{Sqrt}[\text{ArcCosh}[a*x]] * \Gamma[1/2, 4 \text{ArcCosh}[a*x]]) - 2 * (2 \text{ArcCosh}[a*x] * (E^{(-2 \text{ArcCosh}[a*x])} + E^{(2 \text{ArcCosh}[a*x])} - \text{Sqrt}[2] * \text{Sqrt}[-\text{ArcCosh}[a*x]] * \Gamma[1/2, -2 \text{ArcCosh}[a*x]] - \text{Sqrt}[2] * \text{Sqrt}[\text{ArcCosh}[a*x]] * \Gamma[1/2, 2 \text{ArcCosh}[a*x]]) + \text{Sinh}[2 \text{ArcCosh}[a*x]]) - \text{Sinh}[4 \text{ArcCosh}[a*x]]) / (12 * a^4 \text{ArcCosh}[a*x]^{(3/2)})$

Maple [F] time = 0.102, size = 0, normalized size = 0.

$$\int x^3 (\text{arccosh}(ax))^{-5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^3/arccosh(a*x)^(5/2),x)`

[Out] `int(x^3/arccosh(a*x)^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arccosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(5/2),x, algorithm="maxima")`

[Out] `integrate(x^3/arccosh(a*x)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**3/acosh(a*x)**(5/2),x)`

[Out] `Integral(x**3/acosh(a*x)**(5/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0`x

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.105 \quad \int \frac{x^2}{\cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=166

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{2a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{2a^3} + \frac{\dots}{3a^2}$$

[Out] $(-2*x^2*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x])/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + (8*x)/(3*a^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (4*x^3)/\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]] - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(6*a^3) - (\operatorname{Sqrt}[3*\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(2*a^3) + (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(6*a^3) + (\operatorname{Sqrt}[3*\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(2*a^3)$

Rubi [A] time = 0.626936, antiderivative size = 166, normalized size of antiderivative = 1., number of steps used = 22, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5668, 5775, 5670, 5448, 3308, 2180, 2204, 2205, 5658}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3} - \frac{\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{2a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3} + \frac{\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{2a^3} + \frac{\dots}{3a^2}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/\operatorname{ArcCosh}[a*x]^{(5/2)}, x]$

[Out] $(-2*x^2*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x])/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + (8*x)/(3*a^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (4*x^3)/\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]] - (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(6*a^3) - (\operatorname{Sqrt}[3*\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(2*a^3) + (\operatorname{Sqrt}[\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(6*a^3) + (\operatorname{Sqrt}[3*\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[3]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(2*a^3)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{n+1})/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*((f*x)^m)/(\operatorname{Sqrt}[(d1 + (e1*x)*\operatorname{Sqrt}[d2 + (e2*x)])]), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5670

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]],$

$x] /; \text{FreeQ}\{a, b, c, n\}, x\} \&\& \text{IGtQ}[m, 0]$

Rule 5448

$\text{Int}[\text{Cosh}[a_.] + (b_.)(x_.)]^{(p_.)} * ((c_.) + (d_.)(x_.))^{(m_.)} * \text{Sinh}[a_.] + (b_.)(x_.)]^{(n_.)}, x_Symbol] :> \text{Int}[\text{ExpandTrigReduce}[(c + d*x)^m, \text{Sinh}[a + b*x]^n * \text{Cosh}[a + b*x]^p, x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x\} \&\& \text{IGtQ}[n, 0] \& \text{IGtQ}[p, 0]$

Rule 3308

$\text{Int}[(c_.) + (d_.)(x_.)]^{(m_.)} * \sin[(e_.) + (f_.)(x_.)], x_Symbol] :> \text{Dist}[I/2, \text{Int}[(c + d*x)^m / E^{(I*(e + f*x))}, x], x] - \text{Dist}[I/2, \text{Int}[(c + d*x)^m * E^{(I*(e + f*x))}, x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x\}$

Rule 2180

$\text{Int}[(F_.)^{((g_.)((e_.) + (f_.)(x_.)))} / \text{Sqrt}[(c_.) + (d_.)(x_.)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x\} \&\& \text{!}\$UseGamma == \text{True}$

Rule 2204

$\text{Int}[(F_.)^{((a_.) + (b_.)((c_.) + (d_.)(x_.))^2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erfi}[(c + d*x) * \text{Rt}[b * \text{Log}[F], 2]]) / (2 * d * \text{Rt}[b * \text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x\} \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_.)^{((a_.) + (b_.)((c_.) + (d_.)(x_.))^2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erf}[(c + d*x) * \text{Rt}[-(b * \text{Log}[F]), 2]]) / (2 * d * \text{Rt}[-(b * \text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x\} \&\& \text{NegQ}[b]$

Rule 5658

$\text{Int}[(a_.) + \text{ArcCosh}[(c_.)(x_.)] * (b_.)]^{(n_.)}, x_Symbol] :> -\text{Dist}[(b*c)^{-1}, \text{Subst}[\text{Int}[x^n * \text{Sinh}[a/b - x/b], x], x, a + b * \text{ArcCosh}[c*x]], x] /; \text{FreeQ}\{a, b, c, n\}, x\}$

Rubi steps

$$\begin{aligned}
\int \frac{x^2}{\cosh^{-1}(ax)^{5/2}} dx &= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4 \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx}{3a} + (2a) \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} + 12 \int \frac{x^2}{\sqrt{\cosh^{-1}(ax)}} dx - \frac{8 \int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx}{3a^2} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} - \frac{8 \operatorname{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^3} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} + \frac{4 \operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^3} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} + \frac{8 \operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{3a^3} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} + \frac{4\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a^3} - \frac{4\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a^3} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} + \frac{4\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a^3} - \frac{4\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a^3} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{8x}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{4x^3}{\sqrt{\cosh^{-1}(ax)}} - \frac{\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3} - \frac{\sqrt{3\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{6a^3}
\end{aligned}$$

Mathematica [A] time = 0.659596, size = 194, normalized size = 1.17

$$-3\sqrt{3}(-\cosh^{-1}(ax))^{3/2} \operatorname{Gamma}\left(\frac{1}{2}, -3\cosh^{-1}(ax)\right) - (-\cosh^{-1}(ax))^{3/2} \operatorname{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) + \cosh^{-1}(ax)^{3/2} \operatorname{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/ArcCosh[a*x]^(5/2), x]

[Out] $(-\sqrt{-1+ax}/(1+ax))*(1+ax) - (3*\operatorname{ArcCosh}[a*x])/E^{(3*\operatorname{ArcCosh}[a*x])} - \operatorname{ArcCosh}[a*x]/E^{\operatorname{ArcCosh}[a*x]} - E^{\operatorname{ArcCosh}[a*x]}*\operatorname{ArcCosh}[a*x] - 3*E^{(3*\operatorname{ArcCosh}[a*x])}*\operatorname{ArcCosh}[a*x] - 3*\sqrt{3}*(-\operatorname{ArcCosh}[a*x])^{(3/2)}*\operatorname{Gamma}[1/2, -3*\operatorname{ArcCosh}[a*x]] - (-\operatorname{ArcCosh}[a*x])^{(3/2)}*\operatorname{Gamma}[1/2, -\operatorname{ArcCosh}[a*x]] + \operatorname{ArcCosh}[a*x]^{(3/2)}*\operatorname{Gamma}[1/2, \operatorname{ArcCosh}[a*x]] + 3*\sqrt{3}*\operatorname{ArcCosh}[a*x]^{(3/2)}*\operatorname{Gamma}[1/2, 3*\operatorname{ArcCosh}[a*x]] - \operatorname{Sinh}[3*\operatorname{ArcCosh}[a*x]])/(6*a^3*\operatorname{ArcCosh}[a*x]^{(3/2)})$

Maple [F] time = 0.086, size = 0, normalized size = 0.

$$\int x^2 (\operatorname{arccosh}(ax))^{-5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^2/arccosh(a*x)^(5/2),x)`

[Out] `int(x^2/arccosh(a*x)^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{arccosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(5/2),x, algorithm="maxima")`

[Out] `integrate(x^2/arccosh(a*x)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2/acosh(a*x)**(5/2),x)`

[Out] `Integral(x**2/acosh(a*x)**(5/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0`x

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/arccosh(a*x)^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.106 \quad \int \frac{x}{\cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=123

$$-\frac{2\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2} + \frac{2\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{3a\cosh^{-1}(ax)^{3/2}}$$

[Out] $(-2*x*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x])/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + 4/(3*a^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (8*x^2)/(3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (2*\operatorname{Sqrt}[2*\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(3*a^2) + (2*\operatorname{Sqrt}[2*\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(3*a^2)$

Rubi [A] time = 0.482776, antiderivative size = 123, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 10, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.$, Rules used = {5668, 5775, 5670, 5448, 12, 3308, 2180, 2204, 2205, 5676}

$$-\frac{2\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2} + \frac{2\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2x\sqrt{ax-1}\sqrt{ax+1}}{3a\cosh^{-1}(ax)^{3/2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/\operatorname{ArcCosh}[a*x]^{(5/2)}, x]$

[Out] $(-2*x*\operatorname{Sqrt}[-1 + a*x]*\operatorname{Sqrt}[1 + a*x])/(3*a*\operatorname{ArcCosh}[a*x]^{(3/2)}) + 4/(3*a^2*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (8*x^2)/(3*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]) - (2*\operatorname{Sqrt}[2*\operatorname{Pi}]*\operatorname{Erf}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(3*a^2) + (2*\operatorname{Sqrt}[2*\operatorname{Pi}]*\operatorname{Erfi}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[\operatorname{ArcCosh}[a*x]]])/(3*a^2)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b)^{(n)}*(x)^{(m)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x^{(m+1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x^{(m-1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b)^{(n)}*(f*x)^{(m)}/(\operatorname{Sqrt}[(d1 + (e1*x)*\operatorname{Sqrt}[d2 + (e2*x)])]), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), \operatorname{Int}[(f*x)^{(m-1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5670

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b)^{(n)}*(x)^{(m)}, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]], x] /; \operatorname{FreeQ}\{a, b, c, n\}, x \&\& \operatorname{IGtQ}[m, 0]$

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sinh[(a_.) + (b_.)*(x_)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]

Rule 3308

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)/(Sqrt[(d1_) + (e1_.)*(x_)])*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] := Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rubi steps

$$\begin{aligned}
\int \frac{x}{\cosh^{-1}(ax)^{5/2}} dx &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{2 \int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx}{3a} + \frac{1}{3}(4a) \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} + \frac{16}{3} \int \frac{x}{\sqrt{\cosh^{-1}(ax)}} dx \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} + \frac{16 \operatorname{Subst}\left(\int \frac{\cosh(x)\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} + \frac{16 \operatorname{Subst}\left(\int \frac{\sinh(2x)}{2\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} + \frac{8 \operatorname{Subst}\left(\int \frac{\sinh(2x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} - \frac{4 \operatorname{Subst}\left(\int \frac{e^{-2x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} - \frac{8 \operatorname{Subst}\left(\int e^{-2x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{3a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{4}{3a^2\sqrt{\cosh^{-1}(ax)}} - \frac{8x^2}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{2\pi}\operatorname{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2} + \frac{2\sqrt{2\pi}\operatorname{erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{3a^2}
\end{aligned}$$

Mathematica [A] time = 0.255095, size = 83, normalized size = 0.67

$$\frac{2\sqrt{2\pi}\left(\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right) - \operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)\right) + \frac{4\cosh(2\cosh^{-1}(ax))}{\sqrt{\cosh^{-1}(ax)}} + \frac{\sinh(2\cosh^{-1}(ax))}{\cosh^{-1}(ax)^{3/2}}}{3a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/ArcCosh[a*x]^(5/2), x]

[Out] -((4*Cosh[2*ArcCosh[a*x]])/Sqrt[ArcCosh[a*x]] + 2*Sqrt[2*Pi]*(Erf[Sqrt[2]*Sqrt[ArcCosh[a*x]]] - Erfi[Sqrt[2]*Sqrt[ArcCosh[a*x]]]) + Sinh[2*ArcCosh[a*x]])/ArcCosh[a*x]^(3/2)/(3*a^2)

Maple [A] time = 0.113, size = 122, normalized size = 1.

$$-\frac{\sqrt{2}}{3\sqrt{\pi}a^2(\operatorname{arccosh}(ax))^2}\left(4(\operatorname{arccosh}(ax))^{3/2}\sqrt{2}\sqrt{\pi}x^2a^2 + \sqrt{2}\sqrt{\operatorname{arccosh}(ax)}\sqrt{\pi}\sqrt{ax+1}\sqrt{ax-1}xa + 2(\operatorname{arccosh}(ax))^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^(5/2), x)

[Out] -1/3*2^(1/2)*(4*arccosh(a*x)^(3/2)*2^(1/2)*Pi^(1/2)*x^2*a^2+2^(1/2)*arccosh(a*x)^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2)*x*a+2*arccosh(a*x)^2*Pi*er

$$f(2^{(1/2)}*\operatorname{arccosh}(a*x)^{(1/2)})-2*\operatorname{arccosh}(a*x)^2*\operatorname{erfi}(2^{(1/2)}*\operatorname{arccosh}(a*x)^{(1/2)})-2*\operatorname{arccosh}(a*x)^{(3/2)}*2^{(1/2)}*\operatorname{Pi}^{(1/2)})/\operatorname{Pi}^{(1/2)}/a^2/\operatorname{arccosh}(a*x)^2$$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arccosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(5/2),x, algorithm="maxima")

[Out] integrate(x/arccosh(a*x)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/acosh(a*x)**(5/2),x)

[Out] Integral(x/acosh(a*x)**(5/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

$$3.107 \quad \int \frac{1}{\cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=89

$$-\frac{2\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} + \frac{2\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{3a\cosh^{-1}(ax)^{3/2}}$$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(3a\operatorname{ArcCosh}[ax]^{3/2}) - (4x)/(3\sqrt{\operatorname{ArcCosh}[ax]}) - (2\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(3a) + (2\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(3a)$

Rubi [A] time = 0.234149, antiderivative size = 89, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {5656, 5775, 5658, 3308, 2180, 2204, 2205}

$$-\frac{2\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} + \frac{2\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{3a\cosh^{-1}(ax)^{3/2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[\operatorname{ArcCosh}[ax]^{-5/2}, x]$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(3a\operatorname{ArcCosh}[ax]^{3/2}) - (4x)/(3\sqrt{\operatorname{ArcCosh}[ax]}) - (2\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(3a) + (2\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(3a)$

Rule 5656

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n, x_Symbol] \rightarrow \operatorname{Simp}[(\sqrt{-1+cx} \cdot \sqrt{1+cx} \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}) / (b \cdot c \cdot (n+1)), x] - \operatorname{Dist}[c / (b \cdot (n+1)), \operatorname{Int}[(x \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}) / (\sqrt{-1+cx} \cdot \sqrt{1+cx})], x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{LtQ}[n, -1]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n \cdot (f \cdot x)^m / (\sqrt{(d1 \cdot x + e1) \cdot \sqrt{(d2 \cdot x + e2)}}), x_Symbol] \rightarrow \operatorname{Simp}[(f \cdot x)^m \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1} / (b \cdot c \cdot \sqrt{-(d1 \cdot d2)} \cdot (n+1)), x] - \operatorname{Dist}[(f \cdot m) / (b \cdot c \cdot \sqrt{-(d1 \cdot d2)} \cdot (n+1)), \operatorname{Int}[(f \cdot x)^{m-1} \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}], x], x] /;$ $\operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \ \&\& \ \operatorname{EqQ}[e1 - c \cdot d1, 0] \ \&\& \ \operatorname{EqQ}[e2 + c \cdot d2, 0] \ \&\& \ \operatorname{LtQ}[n, -1] \ \&\& \ \operatorname{GtQ}[d1, 0] \ \&\& \ \operatorname{LtQ}[d2, 0]$

Rule 5658

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n, x_Symbol] \rightarrow -\operatorname{Dist}[(b \cdot c)^{-1}], \operatorname{Subst}[\operatorname{Int}[x^n \cdot \operatorname{Sinh}[a/b - x/b], x], x, a + b \cdot \operatorname{ArcCosh}[cx]], x] /;$ $\operatorname{FreeQ}\{a, b, c, n\}, x]$

Rule 3308

$\operatorname{Int}[(c + d \cdot x)^m \cdot \sin[(e + f \cdot x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d \cdot x)^m / E^{I \cdot (e + f \cdot x)}], x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d \cdot x)^m \cdot E^{I \cdot (e + f \cdot x)}], x], x]$

$I*(e + f*x)), x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x]$

Rule 2180

$\text{Int}[(F_)^{((g_)*(e_)+(f_)*(x_))}/\text{Sqrt}[(c_)+(d_)*(x_)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e-(c*f)/d)+(f*g*x^2)/d)}, x], x, \text{Sqrt}[c+d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x] \&\& \text{!}\$UseGamma == \text{True}$

Rule 2204

$\text{Int}[(F_)^{((a_)+(b_)*((c_)+(d_)*(x_))^2)}, x_Symbol] :> \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erfi}[(c+d*x)*\text{Rt}[b*\text{Log}[F], 2]])/(2*d*\text{Rt}[b*\text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^{((a_)+(b_)*((c_)+(d_)*(x_))^2)}, x_Symbol] :> \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erf}[(c+d*x)*\text{Rt}[-(b*\text{Log}[F]), 2]])/(2*d*\text{Rt}[-(b*\text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int \frac{1}{\cosh^{-1}(ax)^{5/2}} dx &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} + \frac{1}{3}(2a) \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{3/2}} dx \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} + \frac{4}{3} \int \frac{1}{\sqrt{\cosh^{-1}(ax)}} dx \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} + \frac{4 \text{Subst}\left(\int \frac{\sinh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2 \text{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a} + \frac{2 \text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{3a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} - \frac{4 \text{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{3a} + \frac{4 \text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{3a} \\ &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{3a \cosh^{-1}(ax)^{3/2}} - \frac{4x}{3\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{\pi} \text{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} + \frac{2\sqrt{\pi} \text{erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{3a} \end{aligned}$$

Mathematica [A] time = 0.150791, size = 121, normalized size = 1.36

$$\frac{2e^{-\cosh^{-1}(ax)} \left(e^{\cosh^{-1}(ax)} (-\cosh^{-1}(ax))^{3/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - e^{\cosh^{-1}(ax)} \cosh^{-1}(ax)^{3/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) \right)}{3a \cosh^{-1}(ax)^{3/2}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^(-5/2), x]

[Out] $(-2*(E^{\text{ArcCosh}[a*x]}*\text{Sqrt}[(-1+a*x)/(1+a*x)]*(1+a*x) + \text{ArcCosh}[a*x] + E^{\text{ArcCosh}[a*x]}*\text{ArcCosh}[a*x] + E^{\text{ArcCosh}[a*x]}*(-\text{ArcCosh}[a*x])^{3/2})*\text{Gamma}[1/2, -\text{ArcCosh}[a*x]] - E^{\text{ArcCosh}[a*x]}*\text{ArcCosh}[a*x]^{3/2})*\text{Gamma}[1/2, \text{ArcCosh}[a*x]]$

`[a*x]])/(3*a*E^ArcCosh[a*x]*ArcCosh[a*x]^(3/2))`

Maple [A] time = 0.106, size = 84, normalized size = 0.9

$$-\frac{2}{3\sqrt{\pi a}(\operatorname{arccosh}(ax))^2} \left(2(\operatorname{arccosh}(ax))^{3/2} \sqrt{\pi x a} + (\operatorname{arccosh}(ax))^2 \pi \operatorname{Erf}\left(\sqrt{\operatorname{arccosh}(ax)}\right) - (\operatorname{arccosh}(ax))^2 \pi \operatorname{erfi}\left(\sqrt{\operatorname{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

`[In] int(1/arccosh(a*x)^(5/2), x)`

`[Out] -2/3*(2*arccosh(a*x)^(3/2)*Pi^(1/2)*x*a+arccosh(a*x)^2*Pi*erf(arccosh(a*x)^(1/2))-arccosh(a*x)^2*Pi*erfi(arccosh(a*x)^(1/2))+arccosh(a*x)^(1/2)*Pi^(1/2)*(a*x+1)^(1/2)*(a*x-1)^(1/2))/Pi^(1/2)/a/arccosh(a*x)^2`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{arcosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

`[In] integrate(1/arccosh(a*x)^(5/2), x, algorithm="maxima")`

`[Out] integrate(arccosh(a*x)^(-5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

`[In] integrate(1/arccosh(a*x)^(5/2), x, algorithm="fricas")`

`[Out] Exception raised: UnboundLocalError`

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

`[In] integrate(1/acosh(a*x)**(5/2), x)`

`[Out] Integral(acosh(a*x)**(-5/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

$$3.108 \quad \int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^{5/2}}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^(5/2)), x]

Rubi [A] time = 0.0148498, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^(5/2)), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^(5/2)), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx = \int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx$$

Mathematica [A] time = 0.342992, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^{5/2}} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^(5/2)), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^(5/2)), x]

Maple [A] time = 0.067, size = 0, normalized size = 0.

$$\int \frac{1}{x} (\operatorname{arccosh}(ax))^{-\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^(5/2), x)

[Out] int(1/x/arccosh(a*x)^(5/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(5/2),x, algorithm="maxima")

[Out] integrate(1/(x*arccosh(a*x)^(5/2)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{acosh}^{\frac{5}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x)**(5/2),x)

[Out] Integral(1/(x*acosh(a*x)**(5/2)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(5/2),x, algorithm="giac")

[Out] sage0*x

$$3.109 \quad \int \frac{x^4}{\cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=300

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{30a^5} + \frac{9\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{20a^5} + \frac{5\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{30a^5} + \frac{9\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{20a^5} + \frac{5\sqrt{5\pi}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{12a^5}$$

[Out] $(-2x^4\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (16x^3)/(15a^2\operatorname{ArcCosh}[ax]^{3/2}) - (4x^5)/(3\operatorname{ArcCosh}[ax]^{3/2}) + (32x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (40x^4\sqrt{-1+ax}\sqrt{1+ax})/(3a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(30a^5) + (9\sqrt{3\pi}\operatorname{Erf}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(20a^5) + (5\sqrt{5\pi}\operatorname{Erf}[\sqrt{5}\sqrt{\operatorname{ArcCosh}[ax]}])/(12a^5) + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(30a^5) + (9\sqrt{3\pi}\operatorname{Erfi}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(20a^5) + (5\sqrt{5\pi}\operatorname{Erfi}[\sqrt{5}\sqrt{\operatorname{ArcCosh}[ax]}])/(12a^5)$

Rubi [A] time = 0.931954, antiderivative size = 300, normalized size of antiderivative = 1., number of steps used = 32, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{30a^5} + \frac{9\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{20a^5} + \frac{5\sqrt{5\pi}\operatorname{Erf}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{12a^5} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{30a^5} + \frac{9\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{20a^5} + \frac{5\sqrt{5\pi}\operatorname{Erfi}\left(\sqrt{5}\sqrt{\cosh^{-1}(ax)}\right)}{12a^5}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^4/\operatorname{ArcCosh}[ax]^{7/2}, x]$

[Out] $(-2x^4\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (16x^3)/(15a^2\operatorname{ArcCosh}[ax]^{3/2}) - (4x^5)/(3\operatorname{ArcCosh}[ax]^{3/2}) + (32x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (40x^4\sqrt{-1+ax}\sqrt{1+ax})/(3a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(30a^5) + (9\sqrt{3\pi}\operatorname{Erf}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(20a^5) + (5\sqrt{5\pi}\operatorname{Erf}[\sqrt{5}\sqrt{\operatorname{ArcCosh}[ax]}])/(12a^5) + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(30a^5) + (9\sqrt{3\pi}\operatorname{Erfi}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(20a^5) + (5\sqrt{5\pi}\operatorname{Erfi}[\sqrt{5}\sqrt{\operatorname{ArcCosh}[ax]}])/(12a^5)$

Rule 5668

$\operatorname{Int}(((a_.) + \operatorname{ArcCosh}[(c_.)(x_.)](b_.))^{(n_.)}(x_.)^{(m_.)}, x_Symbol) \rightarrow \operatorname{Simp}[(x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^c(n+1)), x] + (-\operatorname{Dist}[(c(m+1))/(b(n+1)], \operatorname{Int}[(x^{(m+1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(\sqrt{-1+cx}\sqrt{1+cx}), x], x] + \operatorname{Dist}[m/(b^c(n+1)), \operatorname{Int}[(x^{(m-1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(\sqrt{-1+cx}\sqrt{1+cx}), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}(((a_.) + \operatorname{ArcCosh}[(c_.)(x_.)](b_.))^{(n_.)}((f_.)(x_.))^{(m_.)}/(\sqrt{(d1_.) + (e1_.)(x_.)}\sqrt{(d2_.) + (e2_.)(x_.)}), x_Symbol) \rightarrow \operatorname{Simp}(((f*x)^m(a+b\operatorname{ArcCosh}[c*x])^{(n+1)})/(b^c\sqrt{-(d1*d2)}^{(n+1)}), x] - \operatorname{Dist}[(f*m)/(b^c\sqrt{-(d1*d2)}^{(n+1)}), \operatorname{Int}[(f*x)^{(m-1)}(a+b\operatorname{ArcCosh}[c*x])^{(n+1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0]$

&& EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\int \frac{x^4}{\cosh^{-1}(ax)^{7/2}} dx = -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{8 \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{5a} + (2a) \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{16x^3}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^5}{3 \cosh^{-1}(ax)^{3/2}} + \frac{20}{3} \int \frac{x^4}{\cosh^{-1}(ax)^{3/2}} dx - \frac{16 \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{3}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{16x^3}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^5}{3 \cosh^{-1}(ax)^{3/2}} + \frac{32x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{40x^4}{3a^3 \sqrt{\cosh^{-1}(ax)}} + \frac{16 \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{3}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{16x^3}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^5}{3 \cosh^{-1}(ax)^{3/2}} + \frac{32x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{40x^4}{3a^3 \sqrt{\cosh^{-1}(ax)}} + \frac{16 \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{3}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{16x^3}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^5}{3 \cosh^{-1}(ax)^{3/2}} + \frac{32x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{40x^4}{3a^3 \sqrt{\cosh^{-1}(ax)}} + \frac{16 \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{3}$$

$$= -\frac{2x^4\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{16x^3}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^5}{3 \cosh^{-1}(ax)^{3/2}} + \frac{32x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{40x^4}{3a^3 \sqrt{\cosh^{-1}(ax)}} + \frac{16 \int \frac{x^5}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{3}$$

Mathematica [A] time = 1.98824, size = 374, normalized size = 1.25

$$4(-\cosh^{-1}(ax))^{5/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - 4 \cosh^{-1}(ax)^{5/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) - 5 \cosh^{-1}(ax) \left(10\sqrt{5}(-\cosh^{-1}(ax))^{3/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - 10\sqrt{5} \cosh^{-1}(ax)^{3/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) + 5 \cosh^{-1}(ax) \left(10\sqrt{5}(-\cosh^{-1}(ax))^{1/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - 10\sqrt{5} \cosh^{-1}(ax)^{1/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) + 5 \cosh^{-1}(ax) \left(10\sqrt{5}(-\cosh^{-1}(ax))^{1/2} \text{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) - 10\sqrt{5} \cosh^{-1}(ax)^{1/2} \text{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) + \dots\right)\right)\right)$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[x^4/ArcCosh[a*x]^(7/2), x]
```

```
[Out] (-6*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x) - (2*ArcCosh[a*x])/E^ArcCosh[a*x] - 2*E^ArcCosh[a*x]*ArcCosh[a*x] + (4*ArcCosh[a*x]^2)/E^ArcCosh[a*x] - 4*E^ArcCosh[a*x]*ArcCosh[a*x]^2 + 4*(-ArcCosh[a*x])^(5/2)*Gamma[1/2, -ArcCosh[a*x]] - 4*ArcCosh[a*x]^(5/2)*Gamma[1/2, ArcCosh[a*x]] - 5*ArcCosh[a*x]*((1 - 10*ArcCosh[a*x])/E^(5*ArcCosh[a*x]) + E^(5*ArcCosh[a*x])*(1 + 10*ArcCosh[a*x])) + 10*Sqrt[5]*(-ArcCosh[a*x])^(3/2)*Gamma[1/2, -5*ArcCosh[a*x]] + 10*Sqrt[5]*ArcCosh[a*x]^(3/2)*Gamma[1/2, 5*ArcCosh[a*x]]) - (9*(ArcCosh[a*x] + E^(6*ArcCosh[a*x])*ArcCosh[a*x] - 6*ArcCosh[a*x]^2 + 6*E^(6*ArcCosh[a*x])*ArcCosh[a*x]^2 - 6*Sqrt[3]*E^(3*ArcCosh[a*x])*(-ArcCosh[a*x])^(5/2)*Gamma[1/2, -3*ArcCosh[a*x]] + 6*Sqrt[3]*E^(3*ArcCosh[a*x])*ArcCosh[a*x]^(5/2)*Gamma[1/2, 3*ArcCosh[a*x]] + E^(3*ArcCosh[a*x])*Sinh[3*ArcCosh[a*x]]))/E^(3*ArcCosh[a*x]) - 3*Sinh[5*ArcCosh[a*x]]/(120*a^5*ArcCosh[a*x]^(5/2))
```

Maple [F] time = 0.172, size = 0, normalized size = 0.

$$\int x^4 (\text{arccosh}(ax))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^4/arccosh(a*x)^(7/2),x)`

[Out] `int(x^4/arccosh(a*x)^(7/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^4}{\operatorname{arccosh}(ax)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(7/2),x, algorithm="maxima")`

[Out] `integrate(x^4/arccosh(a*x)^(7/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(7/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**4/acosh(a*x)**(7/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^4/arccosh(a*x)^(7/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.110 \quad \int \frac{x^3}{\cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=244

$$\frac{16\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{4\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{16\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{4\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^4}$$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (4x^2)/(5a^2\operatorname{ArcCosh}[ax]^{3/2}) - (16x^4)/(15\operatorname{ArcCosh}[ax]^{3/2}) + (16x\sqrt{-1+ax}\sqrt{1+ax})/(5a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (128x^3\sqrt{-1+ax}\sqrt{1+ax})/(15a\sqrt{\operatorname{ArcCosh}[ax]}) + (16\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (4\sqrt{2\pi}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (16\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (4\sqrt{2\pi}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4)$

Rubi [A] time = 0.756945, antiderivative size = 244, normalized size of antiderivative = 1., number of steps used = 21, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205}

$$\frac{16\sqrt{\pi}\operatorname{Erf}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{4\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{16\sqrt{\pi}\operatorname{Erfi}\left(2\sqrt{\cosh^{-1}(ax)}\right)}{15a^4} + \frac{4\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^4}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^3/\operatorname{ArcCosh}[ax]^{7/2}, x]$

[Out] $(-2x^3\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (4x^2)/(5a^2\operatorname{ArcCosh}[ax]^{3/2}) - (16x^4)/(15\operatorname{ArcCosh}[ax]^{3/2}) + (16x\sqrt{-1+ax}\sqrt{1+ax})/(5a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (128x^3\sqrt{-1+ax}\sqrt{1+ax})/(15a\sqrt{\operatorname{ArcCosh}[ax]}) + (16\sqrt{\pi}\operatorname{Erf}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (4\sqrt{2\pi}\operatorname{Erf}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (16\sqrt{\pi}\operatorname{Erfi}[2\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4) + (4\sqrt{2\pi}\operatorname{Erfi}[\sqrt{2}\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^4)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(x)^{(m)}, x_{\text{Symbol}}] \rightarrow \operatorname{Simp}[(x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^{(n+1)}c^{(n+1)}), x] + (-\operatorname{Dist}[(c(m+1))/(b(n+1)], \operatorname{Int}[(x^{(m+1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-1+cx}\sqrt{1+cx}], x), x] + \operatorname{Dist}[m/(b^{(n+1)}c^{(n+1)}), \operatorname{Int}[(x^{(m-1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-1+cx}\sqrt{1+cx}], x), x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(f(x))^{(m)}/(\sqrt{(d_1 + e_1(x))\sqrt{(d_2 + e_2(x))}}), x_{\text{Symbol}}] \rightarrow \operatorname{Simp}[(f(x)^m(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^{(n+1)}c^{(n+1)}\sqrt{-(d_1d_2)}), x] - \operatorname{Dist}[(f(x)^m)/(b^{(n+1)}c^{(n+1)}\sqrt{-(d_1d_2)}), \operatorname{Int}[(f(x)^{(m-1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-(d_1d_2)}), x], x] /; \operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f, m\}, x \&\& \operatorname{EqQ}[e_1 - cd_1, 0] \&\& \operatorname{EqQ}[e_2 + cd_2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d_1, 0] \&\& \operatorname{LtQ}[d_2, 0]$

Rule 5666

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Simp[
(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int \frac{x^3}{\cosh^{-1}(ax)^{7/2}} dx &= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{6 \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{5a} + \frac{1}{5}(8a) \int \frac{x^4}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{64}{15} \int \frac{x^3}{\cosh^{-1}(ax)^{3/2}} dx - \frac{8 \int \frac{x^4}{\cosh^{-1}(ax)}}{5a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16x\sqrt{-1+ax}\sqrt{1+ax}}{5a^3\sqrt{\cosh^{-1}(ax)}} - \frac{128x^3}{15a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16x\sqrt{-1+ax}\sqrt{1+ax}}{5a^3\sqrt{\cosh^{-1}(ax)}} - \frac{128x^3}{15a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16x\sqrt{-1+ax}\sqrt{1+ax}}{5a^3\sqrt{\cosh^{-1}(ax)}} - \frac{128x^3}{15a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16x\sqrt{-1+ax}\sqrt{1+ax}}{5a^3\sqrt{\cosh^{-1}(ax)}} - \frac{128x^3}{15a} \\
&= -\frac{2x^3\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4x^2}{5a^2 \cosh^{-1}(ax)^{3/2}} - \frac{16x^4}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16x\sqrt{-1+ax}\sqrt{1+ax}}{5a^3\sqrt{\cosh^{-1}(ax)}} - \frac{128x^3}{15a}
\end{aligned}$$

Mathematica [A] time = 0.555799, size = 291, normalized size = 1.19

$$e^{-4 \cosh^{-1}(ax)} \left(128e^{4 \cosh^{-1}(ax)} \left(-\cosh^{-1}(ax) \right)^{5/2} \Gamma\left(\frac{1}{2}, -4 \cosh^{-1}(ax)\right) - 8e^{2 \cosh^{-1}(ax)} \left(-4\sqrt{2}e^{2 \cosh^{-1}(ax)} \left(-\cosh^{-1}(ax) \right) \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^3/ArcCosh[a*x]^(7/2), x]

[Out] (3 - 3*E^(8*ArcCosh[a*x]) - 8*ArcCosh[a*x] - 8*E^(8*ArcCosh[a*x])*ArcCosh[a*x] + 64*ArcCosh[a*x]^2 - 64*E^(8*ArcCosh[a*x])*ArcCosh[a*x]^2 + 128*E^(4*ArcCosh[a*x])*(-ArcCosh[a*x])^(5/2)*Gamma[1/2, -4*ArcCosh[a*x]] - 8*E^(2*ArcCosh[a*x])*(3*a*E^(2*ArcCosh[a*x])*x*Sqrt[(-1 + a*x)/(1 + a*x)]*(1 + a*x) + ArcCosh[a*x] + E^(4*ArcCosh[a*x])*ArcCosh[a*x] - 4*ArcCosh[a*x]^2 + 4*E^(4*ArcCosh[a*x])*ArcCosh[a*x]^2 - 4*Sqrt[2]*E^(2*ArcCosh[a*x])*(-ArcCosh[a*x])^(5/2)*Gamma[1/2, -2*ArcCosh[a*x]] + 4*Sqrt[2]*E^(2*ArcCosh[a*x])*ArcCosh[a*x]^(5/2)*Gamma[1/2, 2*ArcCosh[a*x]]) - 128*E^(4*ArcCosh[a*x])*ArcCosh[a*x]^(5/2)*Gamma[1/2, 4*ArcCosh[a*x]])/(120*a^4*E^(4*ArcCosh[a*x])*ArcCosh[a*x]^(5/2))

Maple [F] time = 0.098, size = 0, normalized size = 0.

$$\int x^3 (\operatorname{arccosh}(ax))^{-\frac{7}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3/arccosh(a*x)^(7/2), x)

[Out] $\int (x^3/\operatorname{arccosh}(ax))^{7/2}, x$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^3}{\operatorname{arccosh}(ax)^{7/2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(7/2),x, algorithm="maxima")`

[Out] `integrate(x^3/arccosh(a*x)^(7/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(7/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**3/acosh(a*x)**(7/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^3/arccosh(a*x)^(7/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.111 \quad \int \frac{x^2}{\cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=237

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3}$$

[Out] $(-2x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (8x)/(15a^2\operatorname{ArcCosh}[ax]^{3/2}) - (4x^3)/(5\operatorname{ArcCosh}[ax]^{3/2}) + (16\sqrt{-1+ax}\sqrt{1+ax})/(15a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (24x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^3) + (3\sqrt{3\pi}\operatorname{Erf}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(5a^3) + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^3) + (3\sqrt{3\pi}\operatorname{Erfi}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(5a^3)$

Rubi [A] time = 0.847696, antiderivative size = 237, normalized size of antiderivative = 1., number of steps used = 22, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.75$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205, 5656, 5781}

$$\frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erf}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3} + \frac{\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a^3} + \frac{3\sqrt{3\pi}\operatorname{Erfi}\left(\sqrt{3}\sqrt{\cosh^{-1}(ax)}\right)}{5a^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/\operatorname{ArcCosh}[ax]^{7/2}, x]$

[Out] $(-2x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) + (8x)/(15a^2\operatorname{ArcCosh}[ax]^{3/2}) - (4x^3)/(5\operatorname{ArcCosh}[ax]^{3/2}) + (16\sqrt{-1+ax}\sqrt{1+ax})/(15a^3\sqrt{\operatorname{ArcCosh}[ax]}) - (24x^2\sqrt{-1+ax}\sqrt{1+ax})/(5a\sqrt{\operatorname{ArcCosh}[ax]}) + (\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^3) + (3\sqrt{3\pi}\operatorname{Erf}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(5a^3) + (\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a^3) + (3\sqrt{3\pi}\operatorname{Erfi}[\sqrt{3}\sqrt{\operatorname{ArcCosh}[ax]}])/(5a^3)$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(x)^{(m)}, x_{\text{Symbol}}] \rightarrow \operatorname{Simp}[(x^m\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^{(n+1)}c^{(n+1)}), x] + (-\operatorname{Dist}[(c(m+1))/(b^{(n+1)}c^{(n+1)}), \operatorname{Int}[(x^{(m+1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-1+cx}\sqrt{1+cx}], x], x] + \operatorname{Dist}[m/(b^{(n+1)}c^{(n+1)}), \operatorname{Int}[(x^{(m-1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-1+cx}\sqrt{1+cx}], x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(f(x))^{(m)}/(\sqrt{(d_1 + (e_1(x))\sqrt{d_2 + (e_2(x))})}), x_{\text{Symbol}}] \rightarrow \operatorname{Simp}[(f(x)^m(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^{(n+1)}c^{(n+1)}\sqrt{-(d_1d_2)}), x] - \operatorname{Dist}[(f(x)^m)/(b^{(n+1)}c^{(n+1)}\sqrt{-(d_1d_2)}), \operatorname{Int}[(f(x)^{(m-1)}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(c\sqrt{-(d_1d_2)}), x], x] /; \operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f, m\}, x \&\& \operatorname{EqQ}[e_1 - cd_1, 0] \&\& \operatorname{EqQ}[e_2 + cd_2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d_1, 0] \&\& \operatorname{LtQ}[d_2, 0]$

Rule 5666

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Simp[
(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rule 5656

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.), x_Symbol] := Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]
```

Rule 5781

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.)*((d1_.) + (e1_.)*(x_.))^((p_.)*((d2_.) + (e2_.)*(x_.))^(p_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])
```

Rubi steps

$$\begin{aligned}
\int \frac{x^2}{\cosh^{-1}(ax)^{7/2}} dx &= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4 \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{5a} + \frac{1}{5}(6a) \int \frac{x^3}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{12}{5} \int \frac{x^2}{\cosh^{-1}(ax)^{3/2}} dx - \frac{8 \int \frac{x}{\cosh^{-1}(ax)}}{5} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{16\sqrt{-1+ax}\sqrt{1+ax}}{15a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{24x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{3/2}} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{16\sqrt{-1+ax}\sqrt{1+ax}}{15a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{24x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{3/2}} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{16\sqrt{-1+ax}\sqrt{1+ax}}{15a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{24x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{3/2}} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{16\sqrt{-1+ax}\sqrt{1+ax}}{15a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{24x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{3/2}} \\
&= -\frac{2x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{8x}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{4x^3}{5 \cosh^{-1}(ax)^{3/2}} + \frac{16\sqrt{-1+ax}\sqrt{1+ax}}{15a^3 \sqrt{\cosh^{-1}(ax)}} - \frac{24x^2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{3/2}}
\end{aligned}$$

Mathematica [A] time = 0.795736, size = 286, normalized size = 1.21

$$e^{-3 \cosh^{-1}(ax)} \left(-e^{2 \cosh^{-1}(ax)} \left(-2e^{\cosh^{-1}(ax)} \left(-\cosh^{-1}(ax) \right)^{5/2} \text{Gamma} \left(\frac{1}{2}, -\cosh^{-1}(ax) \right) + 2e^{\cosh^{-1}(ax)} \cosh^{-1}(ax)^{5/2} \text{Gamma} \left(\frac{1}{2}, \cosh^{-1}(ax) \right) \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/ArcCosh[a*x]^(7/2), x]

[Out] $(- (E^{(2 \text{ArcCosh}[a*x])} * (3 * E^{\text{ArcCosh}[a*x]} * \text{Sqrt}[(-1 + a*x)/(1 + a*x)] * (1 + a*x) + \text{ArcCosh}[a*x] + E^{(2 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x] - 2 * \text{ArcCosh}[a*x]^2 + 2 * E^{(2 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x]^2 - 2 * E^{\text{ArcCosh}[a*x]} * (-\text{ArcCosh}[a*x])^{(5/2)} * \text{Gamma}[1/2, -\text{ArcCosh}[a*x]] + 2 * E^{\text{ArcCosh}[a*x]} * \text{ArcCosh}[a*x]^{(5/2)} * \text{Gamma}[1/2, \text{ArcCosh}[a*x]])) - 3 * (\text{ArcCosh}[a*x] + E^{(6 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x] - 6 * \text{ArcCosh}[a*x]^2 + 6 * E^{(6 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x]^2 - 6 * \text{Sqrt}[3] * E^{(3 \text{ArcCosh}[a*x])} * (-\text{ArcCosh}[a*x])^{(5/2)} * \text{Gamma}[1/2, -3 * \text{ArcCosh}[a*x]] + 6 * \text{Sqrt}[3] * E^{(3 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x]^{(5/2)} * \text{Gamma}[1/2, 3 * \text{ArcCosh}[a*x]] + E^{(3 \text{ArcCosh}[a*x])} * \text{Sinh}[3 * \text{ArcCosh}[a*x]])) / (30 * a^3 * E^{(3 \text{ArcCosh}[a*x])} * \text{ArcCosh}[a*x]^{(5/2)})$

Maple [F] time = 0.086, size = 0, normalized size = 0.

$$\int x^2 (\text{arccosh}(ax))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/arccosh(a*x)^(7/2), x)

[Out] $\text{int}(x^2/\text{arccosh}(a*x)^{(7/2)}, x)$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\text{arcosh}(ax)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] $\text{integrate}(x^2/\text{arccosh}(a*x)^{(7/2)}, x, \text{algorithm}="maxima")$

[Out] $\text{integrate}(x^2/\text{arccosh}(a*x)^{(7/2)}, x)$

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] $\text{integrate}(x^2/\text{arccosh}(a*x)^{(7/2)}, x, \text{algorithm}="fricas")$

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] $\text{integrate}(x^{**2}/\text{acosh}(a*x)^{(7/2)}, x)$

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] $\text{integrate}(x^2/\text{arccosh}(a*x)^{(7/2)}, x, \text{algorithm}="giac")$

[Out] sage₀*x

$$3.112 \quad \int \frac{x}{\cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=157

$$\frac{8\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^2} + \frac{8\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^2} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{ax-1}\sqrt{a}}{15a\sqrt{\cosh^{-1}(ax)}}$$

[Out] $(-2*x*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(5*a*\operatorname{ArcCosh}[a*x]^{(5/2)}) + 4/(15*a^2*\operatorname{ArcCosh}[a*x]^{(3/2)}) - (8*x^2)/(15*\operatorname{ArcCosh}[a*x]^{(3/2)}) - (32*x*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(15*a*\sqrt{\operatorname{ArcCosh}[a*x]}) + (8*\sqrt{2*\pi}*\operatorname{Erf}[\sqrt{2}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(15*a^2) + (8*\sqrt{2*\pi}*\operatorname{Erfi}[\sqrt{2}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(15*a^2)$

Rubi [A] time = 0.495435, antiderivative size = 157, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 8, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.8$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205, 5676}

$$\frac{8\sqrt{2\pi}\operatorname{Erf}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^2} + \frac{8\sqrt{2\pi}\operatorname{Erfi}\left(\sqrt{2}\sqrt{\cosh^{-1}(ax)}\right)}{15a^2} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{ax-1}\sqrt{a}}{15a\sqrt{\cosh^{-1}(ax)}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/\operatorname{ArcCosh}[a*x]^{(7/2)}, x]$

[Out] $(-2*x*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(5*a*\operatorname{ArcCosh}[a*x]^{(5/2)}) + 4/(15*a^2*\operatorname{ArcCosh}[a*x]^{(3/2)}) - (8*x^2)/(15*\operatorname{ArcCosh}[a*x]^{(3/2)}) - (32*x*\sqrt{-1 + a*x}*\sqrt{1 + a*x})/(15*a*\sqrt{\operatorname{ArcCosh}[a*x]}) + (8*\sqrt{2*\pi}*\operatorname{Erf}[\sqrt{2}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(15*a^2) + (8*\sqrt{2*\pi}*\operatorname{Erfi}[\sqrt{2}*\sqrt{\operatorname{ArcCosh}[a*x]}])/(15*a^2)$

Rule 5668

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(b*c*(n + 1)), x] + (-\operatorname{Dist}[(c*(m + 1))/(b*(n + 1)], \operatorname{Int}[(x^{(m + 1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] + \operatorname{Dist}[m/(b*c*(n + 1)), \operatorname{Int}[(x^{(m - 1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*((f_.)*(x_.))^{(m_.)}/(\sqrt{(d1_. + (e1_.)*(x_.))*\sqrt{(d2_. + (e2_.)*(x_.))}), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(b*c*\sqrt{-(d1*d2)}*(n + 1)), x] - \operatorname{Dist}[(f*m)/(b*c*\sqrt{-(d1*d2)}*(n + 1)), \operatorname{Int}[(f*x)^{(m - 1)}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5666

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{(n + 1)})/(b*c*(n + 1)), x] + \operatorname{Dist}[1/(b*c^{(m + 1)}*(n + 1)), \operatorname{Subst}[\operatorname{Int}[\operatorname{ExpandTrigReduce}[a + b*x]$

$^{(n+1)}\text{Cosh}[x]^{(m-1)}(m-(m+1)\text{Cosh}[x]^2), x], x], x, \text{ArcCosh}[c*x]], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 5676

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]

Rubi steps

$$\begin{aligned}
\int \frac{x}{\cosh^{-1}(ax)^{7/2}} dx &= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{2 \int \frac{1}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx}{5a} + \frac{1}{5}(4a) \int \frac{x^2}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} + \frac{16}{15} \int \frac{x}{\cosh^{-1}(ax)^{3/2}} dx \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{32\sqrt{2\pi}}{15a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{16\sqrt{2\pi}}{15a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{32\sqrt{2\pi}}{15a^2} \\
&= -\frac{2x\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{4}{15a^2 \cosh^{-1}(ax)^{3/2}} - \frac{8x^2}{15 \cosh^{-1}(ax)^{3/2}} - \frac{32x\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{8\sqrt{2\pi}}{15a^2}
\end{aligned}$$

Mathematica [A] time = 0.285803, size = 91, normalized size = 0.58

$$\frac{-8\sqrt{2\pi} \left(\operatorname{Erf} \left(\sqrt{2}\sqrt{\cosh^{-1}(ax)} \right) + \operatorname{Erfi} \left(\sqrt{2}\sqrt{\cosh^{-1}(ax)} \right) \right) + \frac{4 \cosh(2 \cosh^{-1}(ax))}{\cosh^{-1}(ax)^{3/2}} + \frac{(16 \cosh^{-1}(ax)^2 + 3) \sinh(2 \cosh^{-1}(ax))}{\cosh^{-1}(ax)^{5/2}}}{15a^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/ArcCosh[a*x]^(7/2), x]

[Out] $-\left(\frac{4 \cosh[2 \operatorname{ArcCosh}[a x]]}{\operatorname{ArcCosh}[a x]^{3/2}} - 8 \sqrt{2} \pi \left(\operatorname{Erf}[\sqrt{2} \sqrt{\operatorname{ArcCosh}[a x]}] + \operatorname{Erfi}[\sqrt{2} \sqrt{\operatorname{ArcCosh}[a x]}] \right) + \frac{(3 + 16 \operatorname{ArcCosh}[a x]^2) \sinh[2 \operatorname{ArcCosh}[a x]]}{\operatorname{ArcCosh}[a x]^{5/2}}\right) / (15 a^2)$

Maple [A] time = 0.118, size = 153, normalized size = 1.

$$\frac{\sqrt{2}}{15 \sqrt{\pi} a^2 (\operatorname{arccosh}(ax))^3} \left(-16 (\operatorname{arccosh}(ax))^{5/2} \sqrt{2} \sqrt{\pi} \sqrt{ax+1} \sqrt{ax-1} xa - 4 (\operatorname{arccosh}(ax))^{3/2} \sqrt{2} \sqrt{\pi} x^2 a^2 - 3 \sqrt{2} \sqrt{\operatorname{arccosh}(ax)} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/arccosh(a*x)^(7/2), x)

[Out] $\frac{1}{15} 2^{1/2} \left(-16 \operatorname{arccosh}(ax)^{5/2} 2^{1/2} \pi^{1/2} (ax+1)^{1/2} (ax-1)^{1/2} x a - 4 \operatorname{arccosh}(ax)^{3/2} 2^{1/2} \pi^{1/2} x^2 a^2 - 3 2^{1/2} \operatorname{arccosh}(ax)^{1/2} \pi^{1/2} (ax+1)^{1/2} (ax-1)^{1/2} x a + 8 \operatorname{arccosh}(ax)^3 \pi \operatorname{erf}(2^{1/2} \operatorname{arccosh}(ax)^{1/2}) + 8 \operatorname{arccosh}(ax)^3 \pi \operatorname{erfi}(2^{1/2} \operatorname{arccosh}(ax)^{1/2}) + 2 \operatorname{arccosh}(ax)^{3/2} 2^{1/2} \pi^{1/2} \right) / \pi^{1/2} a^2 \operatorname{arccosh}(ax)^3$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\operatorname{arcosh}(ax)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(7/2),x, algorithm="maxima")

[Out] integrate(x/arccosh(a*x)^(7/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(7/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/acosh(a*x)**(7/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/arccosh(a*x)^(7/2),x, algorithm="giac")

[Out] sage0*x

$$3.113 \quad \int \frac{1}{\cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=122

$$\frac{4\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a} + \frac{4\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a} - \frac{4x}{15\cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{ax-1}\sqrt{ax+1}}{15a\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{5a\cosh^{-1}(ax)^{5/2}}$$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) - (4x)/(15\operatorname{ArcCosh}[ax]^{3/2}) - (8\sqrt{-1+ax}\sqrt{1+ax})/(15a\sqrt{\operatorname{ArcCosh}[ax]}) + (4\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a) + (4\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a)$

Rubi [A] time = 0.443552, antiderivative size = 122, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {5656, 5775, 5781, 3307, 2180, 2204, 2205}

$$\frac{4\sqrt{\pi}\operatorname{Erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a} + \frac{4\sqrt{\pi}\operatorname{Erfi}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a} - \frac{4x}{15\cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{ax-1}\sqrt{ax+1}}{15a\sqrt{\cosh^{-1}(ax)}} - \frac{2\sqrt{ax-1}\sqrt{ax+1}}{5a\cosh^{-1}(ax)^{5/2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[\operatorname{ArcCosh}[ax]^{-7/2}, x]$

[Out] $(-2\sqrt{-1+ax}\sqrt{1+ax})/(5a\operatorname{ArcCosh}[ax]^{5/2}) - (4x)/(15\operatorname{ArcCosh}[ax]^{3/2}) - (8\sqrt{-1+ax}\sqrt{1+ax})/(15a\sqrt{\operatorname{ArcCosh}[ax]}) + (4\sqrt{\pi}\operatorname{Erf}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a) + (4\sqrt{\pi}\operatorname{Erfi}[\sqrt{\operatorname{ArcCosh}[ax]}])/(15a)$

Rule 5656

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n, x_Symbol] \rightarrow \operatorname{Simp}[(\sqrt{-1+cx}) \cdot \sqrt{1+cx} \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1} / (b \cdot c \cdot (n+1)), x] - \operatorname{Dist}[c / (b \cdot (n+1)), \operatorname{Int}[(x \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}) / (\sqrt{-1+cx}) \cdot \sqrt{1+cx}], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{LtQ}[n, -1]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n \cdot (f \cdot x)^m / (\sqrt{(d_1 \cdot x + e_1) \cdot (d_2 \cdot x + e_2)}), x_Symbol] \rightarrow \operatorname{Simp}[(f \cdot x)^m \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1} / (b \cdot c \cdot \sqrt{-(d_1 \cdot d_2)}) \cdot (n+1), x] - \operatorname{Dist}[(f \cdot m) / (b \cdot c \cdot \sqrt{-(d_1 \cdot d_2)}) \cdot (n+1), \operatorname{Int}[(f \cdot x)^{m-1} \cdot (a + b \cdot \operatorname{ArcCosh}[cx])^{n+1}], x] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f, m\}, x \ \&\& \ \operatorname{EqQ}[e_1 - c \cdot d_1, 0] \ \&\& \ \operatorname{EqQ}[e_2 + c \cdot d_2, 0] \ \&\& \ \operatorname{LtQ}[n, -1] \ \&\& \ \operatorname{GtQ}[d_1, 0] \ \&\& \ \operatorname{LtQ}[d_2, 0]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n \cdot (x)^m \cdot ((d_1 \cdot x + e_1) \cdot (d_2 \cdot x + e_2))^p, x_Symbol] \rightarrow \operatorname{Dist}[-(d_1 \cdot d_2)^p / c^m + 1, \operatorname{Subst}[\operatorname{Int}[(a + b \cdot x)^n \cdot \operatorname{Cosh}[x]^m \cdot \operatorname{Sinh}[x]^{2p+1}], x], x, \operatorname{ArcCosh}[cx]] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, n\}, x \ \&\& \ \operatorname{EqQ}[e_1 - c \cdot d_1, 0] \ \&\& \ \operatorname{EqQ}[e_2 + c \cdot d_2, 0] \ \&\& \ \operatorname{IntegerQ}[p + 1/2] \ \&\& \ \operatorname{GtQ}[p, -1] \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ (\operatorname{GtQ}[d_1, 0] \ \&\& \ \operatorname{LtQ}[d_2, 0])$

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned}
 \int \frac{1}{\cosh^{-1}(ax)^{7/2}} dx &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} + \frac{1}{5}(2a) \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax} \cosh^{-1}(ax)^{5/2}} dx \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} + \frac{4}{15} \int \frac{1}{\cosh^{-1}(ax)^{3/2}} dx \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{1}{15}(8a) \int \frac{x}{\sqrt{-1+ax}\sqrt{1+ax}} dx \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{8 \operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{15a} \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{4 \operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{x}} dx, x, \cosh^{-1}(ax)\right)}{15a} \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{8 \operatorname{Subst}\left(\int e^{-x^2} dx, x, \sqrt{\cosh^{-1}(ax)}\right)}{15a} \\
 &= -\frac{2\sqrt{-1+ax}\sqrt{1+ax}}{5a \cosh^{-1}(ax)^{5/2}} - \frac{4x}{15 \cosh^{-1}(ax)^{3/2}} - \frac{8\sqrt{-1+ax}\sqrt{1+ax}}{15a\sqrt{\cosh^{-1}(ax)}} + \frac{4\sqrt{\pi}\operatorname{erf}\left(\sqrt{\cosh^{-1}(ax)}\right)}{15a} + \dots
 \end{aligned}$$

Mathematica [A] time = 0.181454, size = 147, normalized size = 1.2

$$2e^{-\cosh^{-1}(ax)} \left(-2e^{\cosh^{-1}(ax)} \left(-\cosh^{-1}(ax) \right)^{5/2} \operatorname{Gamma}\left(\frac{1}{2}, -\cosh^{-1}(ax)\right) + 2e^{\cosh^{-1}(ax)} \cosh^{-1}(ax)^{5/2} \operatorname{Gamma}\left(\frac{1}{2}, \cosh^{-1}(ax)\right) \right)$$

15a co

Warning: Unable to verify antiderivative.

[In] Integrate[ArcCosh[a*x]^(-7/2), x]

[Out] $(-2*(3*E^{\text{ArcCosh}[a*x]}*\text{Sqrt}[(-1 + a*x)/(1 + a*x)]*(1 + a*x) + \text{ArcCosh}[a*x] + E^{(2*\text{ArcCosh}[a*x])}*\text{ArcCosh}[a*x] - 2*\text{ArcCosh}[a*x]^2 + 2*E^{(2*\text{ArcCosh}[a*x])}*\text{ArcCosh}[a*x]^2 - 2*E^{\text{ArcCosh}[a*x]}*(-\text{ArcCosh}[a*x])^{(5/2)}*\text{Gamma}[1/2, -\text{ArcCosh}[a*x]] + 2*E^{\text{ArcCosh}[a*x]}*\text{ArcCosh}[a*x]^{(5/2)}*\text{Gamma}[1/2, \text{ArcCosh}[a*x]]))/(15*a*E^{\text{ArcCosh}[a*x]}*\text{ArcCosh}[a*x]^{(5/2)})$

Maple [A] time = 0.101, size = 111, normalized size = 0.9

$$\frac{2}{15\sqrt{\pi a}(\text{arccosh}(ax))^3} \left(-4\sqrt{ax-1}(\text{arccosh}(ax))^{5/2}\sqrt{ax+1}\sqrt{\pi} + 2(\text{arccosh}(ax))^3\pi \text{Erf}\left(\sqrt{\text{arccosh}(ax)}\right) + 2(\text{arccosh}(ax))^{3/2}\pi \text{Erfi}\left(\sqrt{\text{arccosh}(ax)}\right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/arccosh(a*x)^(7/2), x)

[Out] $2/15*(-4*(a*x-1)^{(1/2)}*\text{arccosh}(a*x)^{(5/2)}*(a*x+1)^{(1/2)}*\text{Pi}^{(1/2)}+2*\text{arccosh}(a*x)^3*\text{Pi}*erf(\text{arccosh}(a*x)^{(1/2)})+2*\text{arccosh}(a*x)^3*\text{Pi}*erfi(\text{arccosh}(a*x)^{(1/2)})-2*\text{arccosh}(a*x)^{(3/2)}*\text{Pi}^{(1/2)}*x*a-3*\text{arccosh}(a*x)^{(1/2)}*\text{Pi}^{(1/2)}*(a*x+1)^{(1/2)}*(a*x-1)^{(1/2)})/\text{Pi}^{(1/2)}/a/\text{arccosh}(a*x)^3$

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\text{arccosh}(ax)^{7/2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(7/2), x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^(-7/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/arccosh(a*x)^(7/2), x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/acosh(a*x)**(7/2),x)
```

```
[Out] Timed out
```

Giac [F] time = 0., size = 0, normalized size = 0.

$\text{sage}_0 x$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/arccosh(a*x)^(7/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.114 \quad \int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{1}{x \cosh^{-1}(ax)^{7/2}}, x\right)$$

[Out] Unintegrable[1/(x*ArcCosh[a*x]^(7/2)), x]

Rubi [A] time = 0.0166465, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx$$

Verification is Not applicable to the result.

[In] Int[1/(x*ArcCosh[a*x]^(7/2)), x]

[Out] Defer[Int][1/(x*ArcCosh[a*x]^(7/2)), x]

Rubi steps

$$\int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx = \int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx$$

Mathematica [A] time = 0.345481, size = 0, normalized size = 0.

$$\int \frac{1}{x \cosh^{-1}(ax)^{7/2}} dx$$

Verification is Not applicable to the result.

[In] Integrate[1/(x*ArcCosh[a*x]^(7/2)), x]

[Out] Integrate[1/(x*ArcCosh[a*x]^(7/2)), x]

Maple [A] time = 0.066, size = 0, normalized size = 0.

$$\int \frac{1}{x} (\operatorname{arccosh}(ax))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/x/arccosh(a*x)^(7/2), x)

[Out] int(1/x/arccosh(a*x)^(7/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{x \operatorname{arcosh}(ax)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(7/2),x, algorithm="maxima")

[Out] integrate(1/(x*arccosh(a*x)^(7/2)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(7/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/acosh(a*x)**(7/2),x)

[Out] Timed out

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/x/arccosh(a*x)^(7/2),x, algorithm="giac")

[Out] sage0*x

3.115 $\int x^m \cosh^{-1}(ax)^4 dx$

Optimal. Leaf size=58

$$\frac{x^{m+1} \cosh^{-1}(ax)^4}{m+1} - \frac{4a \text{Unintegrable}\left(\frac{x^{m+1} \cosh^{-1}(ax)^3}{\sqrt{ax-1}\sqrt{ax+1}}, x\right)}{m+1}$$

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]^4)/(1+m) - (4*a*\text{Unintegrable}[(x^{(1+m)} \text{ArcCosh}[a*x]^3)/(\text{Sqrt}[-1+a*x]*\text{Sqrt}[1+a*x]), x])/(1+m)$

Rubi [A] time = 0.277429, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int x^m \cosh^{-1}(ax)^4 dx$$

Verification is Not applicable to the result.

[In] Int[x^m*ArcCosh[a*x]^4,x]

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]^4)/(1+m) - (4*a*\text{Defer}[\text{Int}[(x^{(1+m)} \text{ArcCosh}[a*x]^3)/(\text{Sqrt}[-1+a*x]*\text{Sqrt}[1+a*x]), x])/(1+m)$

Rubi steps

$$\int x^m \cosh^{-1}(ax)^4 dx = \frac{x^{1+m} \cosh^{-1}(ax)^4}{1+m} - \frac{(4a) \int \frac{x^{1+m} \cosh^{-1}(ax)^3}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{1+m}$$

Mathematica [A] time = 1.80911, size = 0, normalized size = 0.

$$\int x^m \cosh^{-1}(ax)^4 dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m*ArcCosh[a*x]^4,x]

[Out] Integrate[x^m*ArcCosh[a*x]^4, x]

Maple [A] time = 0.646, size = 0, normalized size = 0.

$$\int x^m (\text{arccosh}(ax))^4 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x)^4,x)

[Out] int(x^m*arccosh(a*x)^4,x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)⁴,x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x^m \operatorname{arcosh}(ax)^4, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)⁴,x, algorithm="fricas")

[Out] integral(x^m*arccosh(a*x)⁴, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{acosh}^4(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m*acosh(a*x)**4,x)

[Out] Integral(x**m*acosh(a*x)**4, x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{arcosh}(ax)^4 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)⁴,x, algorithm="giac")

[Out] integrate(x^m*arccosh(a*x)⁴, x)

3.116 $\int x^m \cosh^{-1}(ax)^3 dx$

Optimal. Leaf size=58

$$\frac{x^{m+1} \cosh^{-1}(ax)^3}{m+1} - \frac{3a \text{Unintegrable}\left(\frac{x^{m+1} \cosh^{-1}(ax)^2}{\sqrt{ax-1}\sqrt{ax+1}}, x\right)}{m+1}$$

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]^3)/(1+m) - (3*a*\text{Unintegrable}[(x^{(1+m)} \text{ArcCosh}[a*x]^2)/(\text{Sqrt}[-1+a*x]*\text{Sqrt}[1+a*x]), x])/(1+m)$

Rubi [A] time = 0.298019, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int x^m \cosh^{-1}(ax)^3 dx$$

Verification is Not applicable to the result.

[In] Int[x^m*ArcCosh[a*x]^3,x]

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]^3)/(1+m) - (3*a*\text{Defer}[\text{Int}[(x^{(1+m)} \text{ArcCosh}[a*x]^2)/(\text{Sqrt}[-1+a*x]*\text{Sqrt}[1+a*x]), x])/(1+m)$

Rubi steps

$$\int x^m \cosh^{-1}(ax)^3 dx = \frac{x^{1+m} \cosh^{-1}(ax)^3}{1+m} - \frac{(3a) \int \frac{x^{1+m} \cosh^{-1}(ax)^2}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{1+m}$$

Mathematica [A] time = 1.73522, size = 0, normalized size = 0.

$$\int x^m \cosh^{-1}(ax)^3 dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m*ArcCosh[a*x]^3,x]

[Out] Integrate[x^m*ArcCosh[a*x]^3, x]

Maple [A] time = 0.569, size = 0, normalized size = 0.

$$\int x^m (\text{arccosh}(ax))^3 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x)^3,x)

[Out] int(x^m*arccosh(a*x)^3,x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)³,x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x^m \operatorname{arcosh}(ax)^3, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)³,x, algorithm="fricas")

[Out] integral(x^m*arccosh(a*x)³, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{acosh}^3(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m*acosh(a*x)**3,x)

[Out] Integral(x**m*acosh(a*x)**3, x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{arcosh}(ax)^3 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)³,x, algorithm="giac")

[Out] integrate(x^m*arccosh(a*x)³, x)

3.117 $\int x^m \cosh^{-1}(ax)^2 dx$

Optimal. Leaf size=154

$$\frac{2a^2x^{m+3}\text{HypergeometricPFQ}\left(\left\{1, \frac{m}{2} + \frac{3}{2}, \frac{m}{2} + \frac{3}{2}\right\}, \left\{\frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}\right\}, a^2x^2\right)}{m^3 + 6m^2 + 11m + 6} - \frac{2a\sqrt{1-ax}x^{m+2}\cosh^{-1}(ax)\text{HypergeometricPFQ}\left(\left\{1, \frac{m}{2} + \frac{3}{2}\right\}, \left\{\frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}\right\}, a^2x^2\right)}{(m^2 + 3m + 2)\sqrt{ax-1}\sqrt{ax+1}}$$

[Out] $(x^{(1+m)}\text{ArcCosh}[a*x]^2)/(1+m) - (2*a*x^{(2+m)}*\text{Sqrt}[1-a*x]*\text{ArcCosh}[a*x]*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, a^2*x^2])/((2+3*m+m^2)*\text{Sqrt}[-1+a*x]) - (2*a^2*x^{(3+m)}*\text{HypergeometricPFQ}[\{1, 3/2+m/2, 3/2+m/2\}, \{2+m/2, 5/2+m/2\}, a^2*x^2])/(6+11*m+6*m^2+m^3)$

Rubi [A] time = 0.238126, antiderivative size = 167, normalized size of antiderivative = 1.08, number of steps used = 2, number of rules used = 2, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.2$, Rules used = {5662, 5763}

$$\frac{2a^2x^{m+3}{}_3F_2\left(1, \frac{m}{2} + \frac{3}{2}, \frac{m}{2} + \frac{3}{2}; \frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}; a^2x^2\right)}{m^3 + 6m^2 + 11m + 6} - \frac{2a\sqrt{1-a^2x^2}x^{m+2}\cosh^{-1}(ax){}_2F_1\left(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; a^2x^2\right)}{(m^2 + 3m + 2)\sqrt{ax-1}\sqrt{ax+1}} + \frac{x^{m+1}\cosh^{-1}(ax)}{m+1}$$

Antiderivative was successfully verified.

[In] Int[x^m*ArcCosh[a*x]^2,x]

[Out] $(x^{(1+m)}\text{ArcCosh}[a*x]^2)/(1+m) - (2*a*x^{(2+m)}*\text{Sqrt}[1-a^2*x^2]*\text{ArcCosh}[a*x]*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, a^2*x^2])/((2+3*m+m^2)*\text{Sqrt}[-1+a*x]*\text{Sqrt}[1+a*x]) - (2*a^2*x^{(3+m)}*\text{HypergeometricPFQ}[\{1, 3/2+m/2, 3/2+m/2\}, \{2+m/2, 5/2+m/2\}, a^2*x^2])/(6+11*m+6*m^2+m^3)$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol] :> Simp[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^n)/(d*(m+1)), x] - Dist[(b*c*n)/(d*(m+1)), Int[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^(n-1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5763

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))*((f_.)*(x_.))^(m_.))/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[((f*x)^(m+1)*Sqrt[1-c^2*x^2]*(a+b*ArcCosh[c*x])*Hypergeometric2F1[1/2, (1+m)/2, (3+m)/2, c^2*x^2])/(f*(m+1)*Sqrt[d1+e1*x]*Sqrt[d2+e2*x]), x] + Simp[(b*c*(f*x)^(m+2)*HypergeometricPFQ[\{1, 1+m/2, 1+m/2\}, \{3/2+m/2, 2+m/2\}, c^2*x^2])/(Sqrt[-(d1*d2)]*f^2*(m+1)*(m+2)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1-c*d1, 0] && EqQ[e2+c*d2, 0] && GtQ[d1, 0] && LtQ[d2, 0] && !IntegerQ[m]

Rubi steps

$$\int x^m \cosh^{-1}(ax)^2 dx = \frac{x^{1+m} \cosh^{-1}(ax)^2}{1+m} - \frac{(2a) \int \frac{x^{1+m} \cosh^{-1}(ax)}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{1+m}$$

$$= \frac{x^{1+m} \cosh^{-1}(ax)^2}{1+m} - \frac{2ax^{2+m} \sqrt{1-a^2x^2} \cosh^{-1}(ax) {}_2F_1\left(\frac{1}{2}, \frac{2+m}{2}; \frac{4+m}{2}; a^2x^2\right)}{(2+3m+m^2)\sqrt{-1+ax}\sqrt{1+ax}} - \frac{2a^2x^{3+m} {}_3F_2\left(1, \frac{3}{2}, \frac{3}{2}; \frac{4+m}{2}, \frac{4+m}{2}; a^2x^2\right)}{6+m^2}$$

Mathematica [A] time = 0.354987, size = 143, normalized size = 0.93

$$x^{m+1} \left(\cosh^{-1}(ax)^2 - \frac{2ax \left(\frac{{}_2F_1\left(\frac{1}{2}, \frac{2+m}{2}; \frac{4+m}{2}; a^2x^2\right)}{\sqrt{-1+ax}\sqrt{1+ax}} + \frac{{}_3F_2\left(1, \frac{3}{2}, \frac{3}{2}; \frac{4+m}{2}, \frac{4+m}{2}; a^2x^2\right)}{\sqrt{-1+ax}\sqrt{1+ax}} \right)}{m+2} \right)$$

$m+1$

Antiderivative was successfully verified.

[In] Integrate[x^m*ArcCosh[a*x]^2,x]

[Out] (x^(1+m)*(ArcCosh[a*x]^2 - (2*a*x*((Sqrt[1 - a^2*x^2]*ArcCosh[a*x]*Hypergeometric2F1[1/2, (2+m)/2, (4+m)/2, a^2*x^2])/(Sqrt[-1+a*x]*Sqrt[1+a*x]) + (a*x*HypergeometricPFQ[{1, 3/2+m/2, 3/2+m/2}, {2+m/2, 5/2+m/2}, a^2*x^2])/(3+m)))/(2+m)))/(1+m)

Maple [F] time = 0.693, size = 0, normalized size = 0.

$$\int x^m (\operatorname{arccosh}(ax))^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x)^2,x)

[Out] int(x^m*arccosh(a*x)^2,x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)^2,x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(x^m \operatorname{arccosh}(ax)^2, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*arccosh(a*x)^2,x, algorithm="fricas")
```

```
[Out] integral(x^m*arccosh(a*x)^2, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{acosh}^2(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*acosh(a*x)**2,x)
```

```
[Out] Integral(x**m*acosh(a*x)**2, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{arcosh}(ax)^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*arccosh(a*x)^2,x, algorithm="giac")
```

```
[Out] integrate(x^m*arccosh(a*x)^2, x)
```


3.118 $\int x^m \cosh^{-1}(ax) dx$

Optimal. Leaf size=91

$$\frac{x^{m+1} \cosh^{-1}(ax)}{m+1} - \frac{a\sqrt{1-a^2x^2}x^{m+2} \text{Hypergeometric2F1}\left(\frac{1}{2}, \frac{m+2}{2}, \frac{m+4}{2}, a^2x^2\right)}{(m^2+3m+2)\sqrt{ax-1}\sqrt{ax+1}}$$

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]) / (1+m) - (a*x^{(2+m)} \text{Sqrt}[1-a^2*x^2] \text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, a^2*x^2]) / ((2+3*m+m^2) \text{Sqrt}[-1+a*x] \text{Sqrt}[1+a*x])$

Rubi [A] time = 0.054826, antiderivative size = 91, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5662, 126, 365, 364}

$$\frac{x^{m+1} \cosh^{-1}(ax)}{m+1} - \frac{a\sqrt{1-a^2x^2}x^{m+2} {}_2F_1\left(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; a^2x^2\right)}{(m^2+3m+2)\sqrt{ax-1}\sqrt{ax+1}}$$

Antiderivative was successfully verified.

[In] Int[x^m*ArcCosh[a*x], x]

[Out] $(x^{(1+m)} \text{ArcCosh}[a*x]) / (1+m) - (a*x^{(2+m)} \text{Sqrt}[1-a^2*x^2] \text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, a^2*x^2]) / ((2+3*m+m^2) \text{Sqrt}[-1+a*x] \text{Sqrt}[1+a*x])$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^n)/(d*(m+1)), x] - Dist[(b*c*n)/(d*(m+1)), Int[((d*x)^(m+1)*(a+b*ArcCosh[c*x])^(n-1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 126

Int[((f_.)*(x_.))^ (p_.)*((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.), x_Symbol] :> Dist[((a+b*x)^FracPart[m]*(c+d*x)^FracPart[m])/(a*c+b*d*x^2)^FracPart[m], Int[(a*c+b*d*x^2)^m*(f*x)^p, x], x] /; FreeQ[{a, b, c, d, f, m, n, p}, x] && EqQ[b*c+a*d, 0] && EqQ[m-n, 0]

Rule 365

Int[((c_.)*(x_.))^ (m_.)*((a_.) + (b_.)*(x_.))^ (n_.))^ (p_.), x_Symbol] :> Dist[(a^IntPart[p]*(a+b*x^n)^FracPart[p])/(1+(b*x^n)/a)^FracPart[p], Int[(c*x)^m*(1+(b*x^n)/a)^p, x], x] /; FreeQ[{a, b, c, m, n, p}, x] && !IGtQ[p, 0] && !(ILtQ[p, 0] || GtQ[a, 0])

Rule 364

Int[((c_.)*(x_.))^ (m_.)*((a_.) + (b_.)*(x_.))^ (n_.))^ (p_.), x_Symbol] :> Simp[(a^p*(c*x)^(m+1)*Hypergeometric2F1[-p, (m+1)/n, (m+1)/n+1, -(b*x^n)/a])/(c*(m+1)), x] /; FreeQ[{a, b, c, m, n, p}, x] && !IGtQ[p, 0] && (ILtQ[p, 0] || GtQ[a, 0])

Rubi steps

$$\begin{aligned}
\int x^m \cosh^{-1}(ax) dx &= \frac{x^{1+m} \cosh^{-1}(ax)}{1+m} - \frac{a \int \frac{x^{1+m}}{\sqrt{-1+ax}\sqrt{1+ax}} dx}{1+m} \\
&= \frac{x^{1+m} \cosh^{-1}(ax)}{1+m} - \frac{\left(a\sqrt{-1+a^2x^2}\right) \int \frac{x^{1+m}}{\sqrt{-1+a^2x^2}} dx}{(1+m)\sqrt{-1+ax}\sqrt{1+ax}} \\
&= \frac{x^{1+m} \cosh^{-1}(ax)}{1+m} - \frac{\left(a\sqrt{1-a^2x^2}\right) \int \frac{x^{1+m}}{\sqrt{1-a^2x^2}} dx}{(1+m)\sqrt{-1+ax}\sqrt{1+ax}} \\
&= \frac{x^{1+m} \cosh^{-1}(ax)}{1+m} - \frac{ax^{2+m}\sqrt{1-a^2x^2} {}_2F_1\left(\frac{1}{2}, \frac{2+m}{2}; \frac{4+m}{2}; a^2x^2\right)}{(2+3m+m^2)\sqrt{-1+ax}\sqrt{1+ax}}
\end{aligned}$$

Mathematica [A] time = 0.0954662, size = 82, normalized size = 0.9

$$\frac{x^{m+1} \left(\cosh^{-1}(ax) - \frac{ax\sqrt{1-a^2x^2} \operatorname{Hypergeometric2F1}\left(\frac{1}{2}, \frac{m+2}{2}, \frac{m+4}{2}, a^2x^2\right)}{(m+2)\sqrt{ax-1}\sqrt{ax+1}} \right)}{m+1}$$

Antiderivative was successfully verified.

[In] Integrate[x^m*ArcCosh[a*x], x]

[Out] (x^(1+m)*(ArcCosh[a*x] - (a*x*Sqrt[1 - a^2*x^2]*Hypergeometric2F1[1/2, (2+m)/2, (4+m)/2, a^2*x^2])/((2+m)*Sqrt[-1+a*x]*Sqrt[1+a*x]))/(1+m)

Maple [F] time = 0.676, size = 0, normalized size = 0.

$$\int x^m \operatorname{arccosh}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x), x)

[Out] int(x^m*arccosh(a*x), x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x), x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x^m \operatorname{arcosh}(ax), x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^m*arccosh(a*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{acosh}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m*acosh(a*x),x)

[Out] Integral(x**m*acosh(a*x), x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{arcosh}(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x),x, algorithm="giac")

[Out] integrate(x^m*arccosh(a*x), x)

$$3.119 \quad \int \frac{x^m}{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{x^m}{\cosh^{-1}(ax)}, x\right)$$

[Out] Unintegrable[x^m/ArcCosh[a*x], x]

Rubi [A] time = 0.0229181, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{x^m}{\cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Int[x^m/ArcCosh[a*x], x]

[Out] Defer[Int][x^m/ArcCosh[a*x], x]

Rubi steps

$$\int \frac{x^m}{\cosh^{-1}(ax)} dx = \int \frac{x^m}{\cosh^{-1}(ax)} dx$$

Mathematica [A] time = 1.30103, size = 0, normalized size = 0.

$$\int \frac{x^m}{\cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m/ArcCosh[a*x], x]

[Out] Integrate[x^m/ArcCosh[a*x], x]

Maple [A] time = 0.485, size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m/arccosh(a*x), x)

[Out] int(x^m/arccosh(a*x), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x),x, algorithm="maxima")

[Out] integrate(x^m/arccosh(a*x), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{x^m}{\operatorname{arcosh}(ax)}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x),x, algorithm="fricas")

[Out] integral(x^m/arccosh(a*x), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m/acosh(a*x),x)

[Out] Integral(x**m/acosh(a*x), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x),x, algorithm="giac")

[Out] integrate(x^m/arccosh(a*x), x)

$$3.120 \quad \int \frac{x^m}{\cosh^{-1}(ax)^2} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{x^m}{\cosh^{-1}(ax)^2}, x\right)$$

[Out] Unintegrable[x^m/ArcCosh[a*x]^2, x]

Rubi [A] time = 0.0229005, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{x^m}{\cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Int[x^m/ArcCosh[a*x]^2,x]

[Out] Defer[Int][x^m/ArcCosh[a*x]^2, x]

Rubi steps

$$\int \frac{x^m}{\cosh^{-1}(ax)^2} dx = \int \frac{x^m}{\cosh^{-1}(ax)^2} dx$$

Mathematica [A] time = 1.31887, size = 0, normalized size = 0.

$$\int \frac{x^m}{\cosh^{-1}(ax)^2} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m/ArcCosh[a*x]^2,x]

[Out] Integrate[x^m/ArcCosh[a*x]^2, x]

Maple [A] time = 0.576, size = 0, normalized size = 0.

$$\int \frac{x^m}{(\operatorname{arccosh}(ax))^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m/arccosh(a*x)^2,x)

[Out] int(x^m/arccosh(a*x)^2,x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\frac{(a^2x^2 - 1)\sqrt{ax + 1}\sqrt{ax - 1}x^m + (a^3x^3 - ax)x^m}{(a^3x^2 + \sqrt{ax + 1}\sqrt{ax - 1}a^2x - a)\log(ax + \sqrt{ax + 1}\sqrt{ax - 1})} + \int \frac{(a^3(m + 1)x^3 - a(m - 1)x)(ax + 1)(ax - 1)x^m + (2a^5x^5 + (ax + 1)(ax - 1)a^3x^3)}{(a^5x^5 + (ax + 1)(ax - 1)a^3x^3)}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^2,x, algorithm="maxima")

[Out] -((a^2*x^2 - 1)*sqrt(a*x + 1)*sqrt(a*x - 1)*x^m + (a^3*x^3 - a*x)*x^m)/((a^3*x^2 + sqrt(a*x + 1)*sqrt(a*x - 1)*a^2*x - a)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))) + integrate(((a^3*(m + 1)*x^3 - a*(m - 1)*x)*(a*x + 1)*(a*x - 1)*x^m + (2*a^4*(m + 1)*x^4 - a^2*(3*m + 1)*x^2 + m)*sqrt(a*x + 1)*sqrt(a*x - 1)*x^m + (a^5*(m + 1)*x^5 - 2*a^3*(m + 1)*x^3 + a*(m + 1)*x)*x^m)/((a^5*x^5 + (a*x + 1)*(a*x - 1)*a^3*x^3 - 2*a^3*x^3 + 2*(a^4*x^4 - a^2*x^2)*sqrt(a*x + 1)*sqrt(a*x - 1) + a*x)*log(a*x + sqrt(a*x + 1)*sqrt(a*x - 1))), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^m}{\text{arcosh}(ax)^2}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^2,x, algorithm="fricas")

[Out] integral(x^m/arccosh(a*x)^2, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\text{acosh}^2(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m/acosh(a*x)**2,x)

[Out] Integral(x**m/acosh(a*x)**2, x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\text{arcosh}(ax)^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^2,x, algorithm="giac")

[Out] integrate(x^m/arccosh(a*x)^2, x)

$$3.121 \quad \int \frac{x^m}{\cosh^{-1}(ax)^3} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{x^m}{\cosh^{-1}(ax)^3}, x\right)$$

[Out] Unintegrable[x^m/ArcCosh[a*x]^3, x]

Rubi [A] time = 0.0196945, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{x^m}{\cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Int[x^m/ArcCosh[a*x]^3,x]

[Out] Defer[Int][x^m/ArcCosh[a*x]^3, x]

Rubi steps

$$\int \frac{x^m}{\cosh^{-1}(ax)^3} dx = \int \frac{x^m}{\cosh^{-1}(ax)^3} dx$$

Mathematica [A] time = 1.32557, size = 0, normalized size = 0.

$$\int \frac{x^m}{\cosh^{-1}(ax)^3} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m/ArcCosh[a*x]^3,x]

[Out] Integrate[x^m/ArcCosh[a*x]^3, x]

Maple [A] time = 0.457, size = 0, normalized size = 0.

$$\int \frac{x^m}{(\operatorname{arccosh}(ax))^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m/arccosh(a*x)^3,x)

[Out] int(x^m/arccosh(a*x)^3,x)

Maxima [A] time = 0., size = 0, normalized size = 0.

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)³, x, algorithm="maxima")

[Out]
$$-1/2*((a^5*x^5 - a^3*x^3)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*x^m + (3*a^6*x^6 - 5*a^4*x^4 + 2*a^2*x^2)*(a*x + 1)*(a*x - 1)*x^m + (3*a^7*x^7 - 7*a^5*x^5 + 5*a^3*x^3 - a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}*x^m + (a^8*x^8 - 3*a^6*x^6 + 3*a^4*x^4 - a^2*x^2)*x^m + ((a^5*(m + 1)*x^5 - 2*a^3*m*x^3 + a*(m - 1)*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*x^m + (3*a^6*(m + 1)*x^6 - a^4*(7*m + 3)*x^4 + 5*a^2*m*x^2 - m)*(a*x + 1)*(a*x - 1)*x^m + (3*a^7*(m + 1)*x^7 - 2*a^5*(4*m + 3)*x^5 + a^3*(7*m + 4)*x^3 - a*(2*m + 1)*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}*x^m + (a^8*(m + 1)*x^8 - 3*a^6*(m + 1)*x^6 + 3*a^4*(m + 1)*x^4 - a^2*(m + 1)*x^2)*x^m)*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))/((a^8*x^7 + (a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*a^5*x^4 - 3*a^6*x^5 + 3*a^4*x^3 + 3*(a^6*x^5 - a^4*x^3)*(a*x + 1)*(a*x - 1) - a^2*x + 3*(a^7*x^6 - 2*a^5*x^4 + a^3*x^2)*\sqrt{a*x + 1}*\sqrt{a*x - 1})*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1})^2) + \text{integrate}(1/2*(((m^2 + 2*m + 1)*a^6*x^6 - 2*(m^2 - m)*a^4*x^4 + (m^2 - 4*m + 3)*a^2*x^2)*(a*x + 1)^2*(a*x - 1)^2*x^m + (4*(m^2 + 2*m + 1)*a^7*x^7 - 2*(5*m^2 + m + 2)*a^5*x^5 + (8*m^2 - 11*m + 3)*a^3*x^3 - (2*m^2 - 5*m)*a*x)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)}*x^m + (6*(m^2 + 2*m + 1)*a^8*x^8 - 6*(3*m^2 + 3*m + 2)*a^6*x^6 + (19*m^2 + 2*m + 3)*a^4*x^4 - (8*m^2 - 5*m - 3)*a^2*x^2 + m^2 - m)*(a*x + 1)*(a*x - 1)*x^m + (4*(m^2 + 2*m + 1)*a^9*x^9 - 2*(7*m^2 + 11*m + 6)*a^7*x^7 + 3*(6*m^2 + 7*m + 3)*a^5*x^5 - (10*m^2 + 8*m + 1)*a^3*x^3 + (2*m^2 + m)*a*x)*\sqrt{a*x + 1}*\sqrt{a*x - 1}*x^m + ((m^2 + 2*m + 1)*a^{10}*x^{10} - 4*(m^2 + 2*m + 1)*a^8*x^8 + 6*(m^2 + 2*m + 1)*a^6*x^6 - 4*(m^2 + 2*m + 1)*a^4*x^4 + (m^2 + 2*m + 1)*a^2*x^2)*x^m)/((a^{10}*x^{10} + (a*x + 1)^2*(a*x - 1)^2*a^6*x^6 - 4*a^8*x^8 + 6*a^6*x^6 - 4*a^4*x^4 + 4*(a^7*x^7 - a^5*x^5)*(a*x + 1)^{(3/2)}*(a*x - 1)^{(3/2)} + a^2*x^2 + 6*(a^8*x^8 - 2*a^6*x^6 + a^4*x^4)*(a*x + 1)*(a*x - 1) + 4*(a^9*x^9 - 3*a^7*x^7 + 3*a^5*x^5 - a^3*x^3)*\sqrt{a*x + 1}*\sqrt{a*x - 1})*\log(a*x + \sqrt{a*x + 1}*\sqrt{a*x - 1}))), x)$$

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{x^m}{\text{arccosh}(ax)^3}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)³, x, algorithm="fricas")

[Out] integral(x^m/arccosh(a*x)³, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\text{acosh}^3(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m/acosh(a*x)**3,x)
```

```
[Out] Integral(x**m/acosh(a*x)**3, x)
```

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{arcosh}(ax)^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m/arccosh(a*x)^3,x, algorithm="giac")
```

```
[Out] integrate(x^m/arccosh(a*x)^3, x)
```

$$3.122 \quad \int x^m \cosh^{-1}(ax)^{3/2} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}(x^m \cosh^{-1}(ax)^{3/2}, x)$$

[Out] Unintegrable[x^m*ArcCosh[a*x]^(3/2), x]

Rubi [A] time = 0.0194091, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int x^m \cosh^{-1}(ax)^{3/2} dx$$

Verification is Not applicable to the result.

[In] Int[x^m*ArcCosh[a*x]^(3/2), x]

[Out] Defer[Int][x^m*ArcCosh[a*x]^(3/2), x]

Rubi steps

$$\int x^m \cosh^{-1}(ax)^{3/2} dx = \int x^m \cosh^{-1}(ax)^{3/2} dx$$

Mathematica [A] time = 1.87123, size = 0, normalized size = 0.

$$\int x^m \cosh^{-1}(ax)^{3/2} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m*ArcCosh[a*x]^(3/2), x]

[Out] Integrate[x^m*ArcCosh[a*x]^(3/2), x]

Maple [A] time = 0.07, size = 0, normalized size = 0.

$$\int x^m (\operatorname{arccosh}(ax))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x)^(3/2), x)

[Out] int(x^m*arccosh(a*x)^(3/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \operatorname{arcosh}(ax)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*arccosh(a*x)^(3/2),x, algorithm="maxima")
```

```
[Out] integrate(x^m*arccosh(a*x)^(3/2), x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*arccosh(a*x)^(3/2),x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*acosh(a*x)**(3/2),x)
```

```
[Out] Timed out
```

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*arccosh(a*x)^(3/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.123 \quad \int x^m \sqrt{\cosh^{-1}(ax)} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(x^m \sqrt{\cosh^{-1}(ax)}, x\right)$$

[Out] Unintegrable[x^m*Sqrt[ArcCosh[a*x]], x]

Rubi [A] time = 0.0156938, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int x^m \sqrt{\cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Int[x^m*Sqrt[ArcCosh[a*x]], x]

[Out] Defer[Int][x^m*Sqrt[ArcCosh[a*x]], x]

Rubi steps

$$\int x^m \sqrt{\cosh^{-1}(ax)} dx = \int x^m \sqrt{\cosh^{-1}(ax)} dx$$

Mathematica [A] time = 2.16921, size = 0, normalized size = 0.

$$\int x^m \sqrt{\cosh^{-1}(ax)} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m*Sqrt[ArcCosh[a*x]], x]

[Out] Integrate[x^m*Sqrt[ArcCosh[a*x]], x]

Maple [A] time = 0.067, size = 0, normalized size = 0.

$$\int x^m \sqrt{\operatorname{arccosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*arccosh(a*x)^(1/2), x)

[Out] int(x^m*arccosh(a*x)^(1/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \sqrt{\operatorname{arcosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)^(1/2),x, algorithm="maxima")

[Out] integrate(x^m*sqrt(arccosh(a*x)), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int x^m \sqrt{\operatorname{acosh}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m*acosh(a*x)**(1/2),x)

[Out] Integral(x**m*sqrt(acosh(a*x)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m*arccosh(a*x)^(1/2),x, algorithm="giac")

[Out] sage0*x

$$3.124 \quad \int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable} \left(\frac{x^m}{\sqrt{\cosh^{-1}(ax)}}, x \right)$$

[Out] Unintegrable[x^m/Sqrt[ArcCosh[a*x]], x]

Rubi [A] time = 0.0162995, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Int[x^m/Sqrt[ArcCosh[a*x]], x]

[Out] Defer[Int][x^m/Sqrt[ArcCosh[a*x]], x]

Rubi steps

$$\int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx = \int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx$$

Mathematica [A] time = 2.01138, size = 0, normalized size = 0.

$$\int \frac{x^m}{\sqrt{\cosh^{-1}(ax)}} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m/Sqrt[ArcCosh[a*x]], x]

[Out] Integrate[x^m/Sqrt[ArcCosh[a*x]], x]

Maple [A] time = 0.071, size = 0, normalized size = 0.

$$\int x^m \frac{1}{\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m/arccosh(a*x)^(1/2), x)

[Out] `int(x^m/arccosh(a*x)^(1/2),x)`

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\sqrt{\operatorname{arccosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^m/arccosh(a*x)^(1/2),x, algorithm="maxima")`

[Out] `integrate(x^m/sqrt(arccosh(a*x)), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^m/arccosh(a*x)^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\sqrt{\operatorname{acosh}(ax)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**m/acosh(a*x)**(1/2),x)`

[Out] `Integral(x**m/sqrt(acosh(a*x)), x)`

Giac [A] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^m/arccosh(a*x)^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.125 \quad \int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx$$

Optimal. Leaf size=14

$$\text{Unintegrable}\left(\frac{x^m}{\cosh^{-1}(ax)^{3/2}}, x\right)$$

[Out] Unintegrable[x^m/ArcCosh[a*x]^(3/2), x]

Rubi [A] time = 0.0164417, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx$$

Verification is Not applicable to the result.

[In] Int[x^m/ArcCosh[a*x]^(3/2), x]

[Out] Defer[Int][x^m/ArcCosh[a*x]^(3/2), x]

Rubi steps

$$\int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx = \int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx$$

Mathematica [A] time = 1.93164, size = 0, normalized size = 0.

$$\int \frac{x^m}{\cosh^{-1}(ax)^{3/2}} dx$$

Verification is Not applicable to the result.

[In] Integrate[x^m/ArcCosh[a*x]^(3/2), x]

[Out] Integrate[x^m/ArcCosh[a*x]^(3/2), x]

Maple [A] time = 0.069, size = 0, normalized size = 0.

$$\int x^m (\operatorname{arccosh}(ax))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m/arccosh(a*x)^(3/2), x)

[Out] int(x^m/arccosh(a*x)^(3/2), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{arcosh}(ax)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^(3/2),x, algorithm="maxima")

[Out] integrate(x^m/arccosh(a*x)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^m}{\operatorname{acosh}^{\frac{3}{2}}(ax)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**m/acosh(a*x)**(3/2),x)

[Out] Integral(x**m/acosh(a*x)**(3/2), x)

Giac [A] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^m/arccosh(a*x)^(3/2),x, algorithm="giac")

[Out] sage0*x

3.126 $\int (dx)^m \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=14

Unintegrable $((dx)^m \cosh^{-1}(ax)^n, x)$

[Out] Unintegrable $[(d*x)^m * \text{ArcCosh}[a*x]^n, x]$

Rubi [A] time = 0.0192157, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int (dx)^m \cosh^{-1}(ax)^n dx$$

Verification is Not applicable to the result.

[In] Int $[(d*x)^m * \text{ArcCosh}[a*x]^n, x]$

[Out] Defer[Int] $[(d*x)^m * \text{ArcCosh}[a*x]^n, x]$

Rubi steps

$$\int (dx)^m \cosh^{-1}(ax)^n dx = \int (dx)^m \cosh^{-1}(ax)^n dx$$

Mathematica [A] time = 1.39556, size = 0, normalized size = 0.

$$\int (dx)^m \cosh^{-1}(ax)^n dx$$

Verification is Not applicable to the result.

[In] Integrate $[(d*x)^m * \text{ArcCosh}[a*x]^n, x]$

[Out] Integrate $[(d*x)^m * \text{ArcCosh}[a*x]^n, x]$

Maple [A] time = 0.082, size = 0, normalized size = 0.

$$\int (dx)^m (\text{arccosh}(ax))^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int $((d*x)^m * \text{arccosh}(a*x)^n, x)$

[Out] int $((d*x)^m * \text{arccosh}(a*x)^n, x)$

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int (dx)^m \text{arcosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*arccosh(a*x)^n,x, algorithm="maxima")

[Out] integrate((d*x)^m*arccosh(a*x)^n, x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\text{integral}((dx)^m \operatorname{arcosh}(ax)^n, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*arccosh(a*x)^n,x, algorithm="fricas")

[Out] integral((d*x)^m*arccosh(a*x)^n, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int (dx)^m \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)**m*acosh(a*x)**n,x)

[Out] Integral((d*x)**m*acosh(a*x)**n, x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\text{sage}_0 x$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*arccosh(a*x)^n,x, algorithm="giac")

[Out] sage0*x

3.127 $\int x^4 \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=173

$$\frac{5^{-n-1} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -5 \cosh^{-1}(ax))}{32a^5} + \frac{3^{-n} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -3 \cosh^{-1}(ax))}{32a^5}$$

```
[Out] (5^(-1 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -5*ArcCosh[a*x]])/(32*a^5*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -3*ArcCosh[a*x]])/(32*3^n*a^5*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(16*a^5*(-ArcCosh[a*x])^n) + Gamma[1 + n, ArcCosh[a*x]]/(16*a^5) + Gamma[1 + n, 3*ArcCosh[a*x]]/(32*3^n*a^5) + (5^(-1 - n)*Gamma[1 + n, 5*ArcCosh[a*x]])/(32*a^5)
```

Rubi [A] time = 0.247297, antiderivative size = 173, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5670, 5448, 3308, 2181}

$$\frac{5^{-n-1} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -5 \cosh^{-1}(ax))}{32a^5} + \frac{3^{-n} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -3 \cosh^{-1}(ax))}{32a^5}$$

Antiderivative was successfully verified.

```
[In] Int[x^4*ArcCosh[a*x]^n,x]
```

```
[Out] (5^(-1 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -5*ArcCosh[a*x]])/(32*a^5*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -3*ArcCosh[a*x]])/(32*3^n*a^5*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(16*a^5*(-ArcCosh[a*x])^n) + Gamma[1 + n, ArcCosh[a*x]]/(16*a^5) + Gamma[1 + n, 3*ArcCosh[a*x]]/(32*3^n*a^5) + (5^(-1 - n)*Gamma[1 + n, 5*ArcCosh[a*x]])/(32*a^5)
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^m, x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^p*((c_.) + (d_.)*(x_.))^m*Sinh[(a_.) + (b_.)*(x_.)]^n, x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^m*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2181

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))*((c_.) + (d_.)*(x_.))^m, x_Symbol] := -Simp[(F^(g*(e - (c*f)/d))*(c + d*x)^FracPart[m]*Gamma[m + 1, (-((f*g*Log[F])/d))*(c + d*x)])/(d*(-((f*g*Log[F])/d))^(IntPart[m] + 1)*(-((f*g*Log[F])*(c + d*x)/d))^FracPart[m]), x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]
```

Rubi steps

$$\begin{aligned}
\int x^4 \cosh^{-1}(ax)^n dx &= \frac{\text{Subst}\left(\int x^n \cosh^4(x) \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= \frac{\text{Subst}\left(\int \left(\frac{1}{8}x^n \sinh(x) + \frac{3}{16}x^n \sinh(3x) + \frac{1}{16}x^n \sinh(5x)\right) dx, x, \cosh^{-1}(ax)\right)}{a^5} \\
&= \frac{\text{Subst}\left(\int x^n \sinh(5x) dx, x, \cosh^{-1}(ax)\right)}{16a^5} + \frac{\text{Subst}\left(\int x^n \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{8a^5} + \frac{3 \text{Subst}\left(\int x^n \sinh(3x) dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\
&= -\frac{\text{Subst}\left(\int e^{-5x} x^n dx, x, \cosh^{-1}(ax)\right)}{32a^5} + \frac{\text{Subst}\left(\int e^{5x} x^n dx, x, \cosh^{-1}(ax)\right)}{32a^5} - \frac{\text{Subst}\left(\int e^{-x} x^n dx, x, \cosh^{-1}(ax)\right)}{16a^5} \\
&= \frac{5^{-1-n} \left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax) \Gamma(1+n, -5 \cosh^{-1}(ax))}{32a^5} + \frac{3^{-n} \left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax) \Gamma(1+n, -\cosh^{-1}(ax))}{32a^5}
\end{aligned}$$

Mathematica [A] time = 0.193687, size = 144, normalized size = 0.83

$$\frac{5^{-n} \cosh^{-1}(ax)^n \left(-\cosh^{-1}(ax)\right)^{-n} \text{Gamma}(n+1, -5 \cosh^{-1}(ax)) + 5 \cdot 3^{-n} \cosh^{-1}(ax)^n \left(-\cosh^{-1}(ax)\right)^{-n} \text{Gamma}(n+1, -\cosh^{-1}(ax))}{32a^5}$$

Antiderivative was successfully verified.

[In] Integrate[x^4*ArcCosh[a*x]^n,x]

[Out] ((ArcCosh[a*x]^n*Gamma[1+n, -5*ArcCosh[a*x]])/(5^n*(-ArcCosh[a*x])^n) + (5*ArcCosh[a*x]^n*Gamma[1+n, -3*ArcCosh[a*x]])/(3^n*(-ArcCosh[a*x])^n) + (10*ArcCosh[a*x]^n*Gamma[1+n, -ArcCosh[a*x]])/(-ArcCosh[a*x])^n + 10*Gamma[1+n, ArcCosh[a*x]] + (5*Gamma[1+n, 3*ArcCosh[a*x]])/3^n + Gamma[1+n, 5*ArcCosh[a*x]]/5^n)/(160*a^5)

Maple [F] time = 0.155, size = 0, normalized size = 0.

$$\int x^4 (\operatorname{arccosh}(ax))^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^4*arccosh(a*x)^n,x)

[Out] int(x^4*arccosh(a*x)^n,x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \operatorname{arccosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^n,x, algorithm="maxima")

[Out] integrate(x^4*arccosh(a*x)^n, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x^4 \operatorname{arcosh}(ax)^n, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^n,x, algorithm="fricas")

[Out] integral(x^4*arccosh(a*x)^n, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^4 \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**4*acosh(a*x)**n,x)

[Out] Integral(x**4*acosh(a*x)**n, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\text{sage}_0 x$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^4*arccosh(a*x)^n,x, algorithm="giac")

[Out] sage0*x

3.128 $\int x^3 \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=117

$$\frac{2^{-2(n+3)} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -4 \cosh^{-1}(ax))}{a^4} + \frac{2^{-n-4} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -2 \cosh^{-1}(ax))}{a^4}$$

[Out] (ArcCosh[a*x]^n*Gamma[1 + n, -4*ArcCosh[a*x]])/(2^(2*(3 + n))*a^4*(-ArcCosh[a*x])^n) + (2^(-4 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -2*ArcCosh[a*x]])/(a^4*(-ArcCosh[a*x])^n) + (2^(-4 - n)*Gamma[1 + n, 2*ArcCosh[a*x]])/a^4 + Gamma[1 + n, 4*ArcCosh[a*x]]/(2^(2*(3 + n))*a^4)

Rubi [A] time = 0.19092, antiderivative size = 117, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5670, 5448, 3308, 2181}

$$\frac{2^{-2(n+3)} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -4 \cosh^{-1}(ax))}{a^4} + \frac{2^{-n-4} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -2 \cosh^{-1}(ax))}{a^4}$$

Antiderivative was successfully verified.

[In] Int[x^3*ArcCosh[a*x]^n,x]

[Out] (ArcCosh[a*x]^n*Gamma[1 + n, -4*ArcCosh[a*x]])/(2^(2*(3 + n))*a^4*(-ArcCosh[a*x])^n) + (2^(-4 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -2*ArcCosh[a*x]])/(a^4*(-ArcCosh[a*x])^n) + (2^(-4 - n)*Gamma[1 + n, 2*ArcCosh[a*x]])/a^4 + Gamma[1 + n, 4*ArcCosh[a*x]]/(2^(2*(3 + n))*a^4)

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^m, x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^p*((c_.) + (d_.)*(x_.))^m*Sinh[(a_.) + (b_.)*(x_.)]^n, x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^m*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2181

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))*((c_.) + (d_.)*(x_.))^m, x_Symbol] := -Simp[(F^(g*(e - (c*f)/d))*(c + d*x)^FracPart[m]*Gamma[m + 1, (-((f*g*Log[F])/d))*(c + d*x])]/(d*(-((f*g*Log[F])/d))^(IntPart[m] + 1)*(-((f*g*Log[F])*(c + d*x)/d))^FracPart[m]), x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]

Rubi steps

$$\begin{aligned}
\int x^3 \cosh^{-1}(ax)^n dx &= \frac{\text{Subst}\left(\int x^n \cosh^3(x) \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\
&= \frac{\text{Subst}\left(\int \left(\frac{1}{4}x^n \sinh(2x) + \frac{1}{8}x^n \sinh(4x)\right) dx, x, \cosh^{-1}(ax)\right)}{a^4} \\
&= \frac{\text{Subst}\left(\int x^n \sinh(4x) dx, x, \cosh^{-1}(ax)\right)}{8a^4} + \frac{\text{Subst}\left(\int x^n \sinh(2x) dx, x, \cosh^{-1}(ax)\right)}{4a^4} \\
&= -\frac{\text{Subst}\left(\int e^{-4x}x^n dx, x, \cosh^{-1}(ax)\right)}{16a^4} + \frac{\text{Subst}\left(\int e^{4x}x^n dx, x, \cosh^{-1}(ax)\right)}{16a^4} - \frac{\text{Subst}\left(\int e^{-2x}x^n dx, x, \cosh^{-1}(ax)\right)}{8a^4} \\
&= \frac{4^{-3-n} \left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax)^n \Gamma\left(1+n, -4 \cosh^{-1}(ax)\right)}{a^4} + \frac{2^{-4-n} \left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax)^n \Gamma\left(1+n, 4 \cosh^{-1}(ax)\right)}{a^4}
\end{aligned}$$

Mathematica [A] time = 0.0950426, size = 97, normalized size = 0.83

$$\frac{4^{-n-3} \left(-\cosh^{-1}(ax)\right)^{-n} \left(\left(-\cosh^{-1}(ax)\right)^n \left(2^{n+2} \text{Gamma}\left(n+1, 2 \cosh^{-1}(ax)\right) + \text{Gamma}\left(n+1, 4 \cosh^{-1}(ax)\right)\right) + \text{Cos}\left(2 \cosh^{-1}(ax)\right)}{a^4}$$

Antiderivative was successfully verified.

[In] Integrate[x^3*ArcCosh[a*x]^n,x]

[Out] (4^(-3 - n)*(ArcCosh[a*x]^n*Gamma[1 + n, -4*ArcCosh[a*x]] + 2^(2 + n)*ArcCosh[a*x]^n*Gamma[1 + n, -2*ArcCosh[a*x]] + (-ArcCosh[a*x])^n*(2^(2 + n)*Gamma[1 + n, 2*ArcCosh[a*x]] + Gamma[1 + n, 4*ArcCosh[a*x]])))/(a^4*(-ArcCosh[a*x])^n)

Maple [F] time = 0.08, size = 0, normalized size = 0.

$$\int x^3 (\text{arccosh}(ax))^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*arccosh(a*x)^n,x)

[Out] int(x^3*arccosh(a*x)^n,x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \text{arcosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^n,x, algorithm="maxima")

[Out] integrate(x^3*arccosh(a*x)^n, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(x^3 \operatorname{arcosh}(ax)^n, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^n,x, algorithm="fricas")

[Out] integral(x^3*arccosh(a*x)^n, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^3 \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*acosh(a*x)**n,x)

[Out] Integral(x**3*acosh(a*x)**n, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\text{sage}_0x$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*arccosh(a*x)^n,x, algorithm="giac")

[Out] sage0*x

3.129 $\int x^2 \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=113

$$\frac{3^{-n-1} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -3 \cosh^{-1}(ax))}{8a^3} + \frac{\cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, 3 \cosh^{-1}(ax))}{8a^3}$$

```
[Out] (3^(-1 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -3*ArcCosh[a*x]])/(8*a^3*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(8*a^3*(-ArcCosh[a*x])^n) + Gamma[1 + n, ArcCosh[a*x]]/(8*a^3) + (3^(-1 - n)*Gamma[1 + n, 3*ArcCosh[a*x]])/(8*a^3)
```

Rubi [A] time = 0.182161, antiderivative size = 113, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 4, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.4$, Rules used = {5670, 5448, 3308, 2181}

$$\frac{3^{-n-1} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -3 \cosh^{-1}(ax))}{8a^3} + \frac{\cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, 3 \cosh^{-1}(ax))}{8a^3}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*ArcCosh[a*x]^n,x]
```

```
[Out] (3^(-1 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -3*ArcCosh[a*x]])/(8*a^3*(-ArcCosh[a*x])^n) + (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(8*a^3*(-ArcCosh[a*x])^n) + Gamma[1 + n, ArcCosh[a*x]]/(8*a^3) + (3^(-1 - n)*Gamma[1 + n, 3*ArcCosh[a*x]])/(8*a^3)
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^m, x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^p*((c_.) + (d_.)*(x_.))^m*Sinh[(a_.) + (b_.)*(x_.)]^n, x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^m*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2181

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))*((c_.) + (d_.)*(x_.))^m, x_Symbol] := -Simp[(F^(g*(e - (c*f)/d))*(c + d*x)^FracPart[m]*Gamma[m + 1, (-(f*g*Log[F])/d)*(c + d*x)]/(d*(-((f*g*Log[F])/d))^(IntPart[m] + 1)*(-(f*g*Log[F])*(c + d*x)/d))^FracPart[m]], x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]
```

Rubi steps

$$\begin{aligned}
\int x^2 \cosh^{-1}(ax)^n dx &= \frac{\text{Subst}\left(\int x^n \cosh^2(x) \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{a^3} \\
&= \frac{\text{Subst}\left(\int \left(\frac{1}{4}x^n \sinh(x) + \frac{1}{4}x^n \sinh(3x)\right) dx, x, \cosh^{-1}(ax)\right)}{a^3} \\
&= \frac{\text{Subst}\left(\int x^n \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{4a^3} + \frac{\text{Subst}\left(\int x^n \sinh(3x) dx, x, \cosh^{-1}(ax)\right)}{4a^3} \\
&= -\frac{\text{Subst}\left(\int e^{-3x} x^n dx, x, \cosh^{-1}(ax)\right)}{8a^3} - \frac{\text{Subst}\left(\int e^{-x} x^n dx, x, \cosh^{-1}(ax)\right)}{8a^3} + \frac{\text{Subst}\left(\int e^x x^n dx, x, \cosh^{-1}(ax)\right)}{8a^3} \\
&= \frac{3^{-1-n} \left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax)^n \Gamma(1+n, -3 \cosh^{-1}(ax))}{8a^3} + \frac{\left(-\cosh^{-1}(ax)\right)^{-n} \cosh^{-1}(ax)^n \Gamma(1+n, -\cosh^{-1}(ax))}{8a^3}
\end{aligned}$$

Mathematica [A] time = 0.110834, size = 95, normalized size = 0.84

$$\frac{3^{-n-1} \cosh^{-1}(ax)^n \left(-\cosh^{-1}(ax)\right)^{-n} \text{Gamma}(n+1, -3 \cosh^{-1}(ax)) + \cosh^{-1}(ax)^n \left(-\cosh^{-1}(ax)\right)^{-n} \text{Gamma}(n+1, -\cosh^{-1}(ax))}{8a^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2*ArcCosh[a*x]^n,x]

[Out] ((3^(-1 - n)*ArcCosh[a*x]^n*Gamma[1 + n, -3*ArcCosh[a*x]])/(-ArcCosh[a*x])^n + (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(-ArcCosh[a*x])^n + Gamma[1 + n, ArcCosh[a*x]] + 3^(-1 - n)*Gamma[1 + n, 3*ArcCosh[a*x]])/(8*a^3)

Maple [F] time = 0.092, size = 0, normalized size = 0.

$$\int x^2 (\text{arccosh}(ax))^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*arccosh(a*x)^n,x)

[Out] int(x^2*arccosh(a*x)^n,x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \text{arcosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*arccosh(a*x)^n,x, algorithm="maxima")

[Out] integrate(x^2*arccosh(a*x)^n, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x^2 \text{arcosh}(ax)^n, x)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*arccosh(a*x)^n,x, algorithm="fricas")
```

```
[Out] integral(x^2*arccosh(a*x)^n, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*acosh(a*x)**n,x)
```

```
[Out] Integral(x**2*acosh(a*x)**n, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{sage}_0 x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*arccosh(a*x)^n,x, algorithm="giac")
```

```
[Out] sage0*x
```

3.130 $\int x \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=59

$$\frac{2^{-n-3} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -2 \cosh^{-1}(ax))}{a^2} + \frac{2^{-n-3} \Gamma(n+1, 2 \cosh^{-1}(ax))}{a^2}$$

[Out] $(2^{-(3-n)} \text{ArcCosh}[a*x]^n \Gamma[1+n, -2*\text{ArcCosh}[a*x]])/(a^2*(-\text{ArcCosh}[a*x])^n) + (2^{-(3-n)} \Gamma[1+n, 2*\text{ArcCosh}[a*x]])/a^2$

Rubi [A] time = 0.087337, antiderivative size = 59, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5670, 5448, 12, 3308, 2181}

$$\frac{2^{-n-3} \cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -2 \cosh^{-1}(ax))}{a^2} + \frac{2^{-n-3} \Gamma(n+1, 2 \cosh^{-1}(ax))}{a^2}$$

Antiderivative was successfully verified.

[In] Int[x*ArcCosh[a*x]^n,x]

[Out] $(2^{-(3-n)} \text{ArcCosh}[a*x]^n \Gamma[1+n, -2*\text{ArcCosh}[a*x]])/(a^2*(-\text{ArcCosh}[a*x])^n) + (2^{-(3-n)} \Gamma[1+n, 2*\text{ArcCosh}[a*x]])/a^2$

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^n*(x_)^m, x_Symbol] :> Dist[1/c^(m+1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^p*((c_.) + (d_.)*(x_.))^m*Sinh[(a_.) + (b_.)*(x_.)]^n, x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] & IGtQ[p, 0]

Rule 12

Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^m*sin[(e_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2181

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))*((c_.) + (d_.)*(x_.))^m, x_Symbol] :> -Simp[(F^(g*(e - (c*f)/d))*(c + d*x)^FracPart[m]*Gamma[m+1, (-((f*g*Log[F])/d))*(c + d*x])]/(d*(-((f*g*Log[F])/d))^(IntPart[m]+1)*(-((f*g*Log[F])*(c + d*x))/d))^FracPart[m]), x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]

Rubi steps

$$\begin{aligned}
\int x \cosh^{-1}(ax)^n dx &= \frac{\text{Subst}\left(\int x^n \cosh(x) \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{a^2} \\
&= \frac{\text{Subst}\left(\int \frac{1}{2}x^n \sinh(2x) dx, x, \cosh^{-1}(ax)\right)}{a^2} \\
&= \frac{\text{Subst}\left(\int x^n \sinh(2x) dx, x, \cosh^{-1}(ax)\right)}{2a^2} \\
&= -\frac{\text{Subst}\left(\int e^{-2x}x^n dx, x, \cosh^{-1}(ax)\right)}{4a^2} + \frac{\text{Subst}\left(\int e^{2x}x^n dx, x, \cosh^{-1}(ax)\right)}{4a^2} \\
&= \frac{2^{-3-n}(-\cosh^{-1}(ax))^{-n} \cosh^{-1}(ax)^n \Gamma(1+n, -2 \cosh^{-1}(ax))}{a^2} + \frac{2^{-3-n} \Gamma(1+n, 2 \cosh^{-1}(ax))}{a^2}
\end{aligned}$$

Mathematica [A] time = 0.0447461, size = 58, normalized size = 0.98

$$\frac{2^{-n-3}(-\cosh^{-1}(ax))^{-n} \left((-\cosh^{-1}(ax))^n \text{Gamma}(n+1, 2 \cosh^{-1}(ax)) + \cosh^{-1}(ax)^n \text{Gamma}(n+1, -2 \cosh^{-1}(ax)) \right)}{a^2}$$

Antiderivative was successfully verified.

[In] Integrate[x*ArcCosh[a*x]^n,x]

[Out] (2^(-3 - n)*(ArcCosh[a*x]^n*Gamma[1 + n, -2*ArcCosh[a*x]] + (-ArcCosh[a*x])^n*Gamma[1 + n, 2*ArcCosh[a*x]]))/(a^2*(-ArcCosh[a*x])^n)

Maple [C] time = 0.031, size = 38, normalized size = 0.6

$$\frac{(\text{arccosh}(ax))^{2+n}}{a^2(2+n)} {}_1F_2\left(1 + \frac{n}{2}; \frac{3}{2}, 2 + \frac{n}{2}; (\text{arccosh}(ax))^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*arccosh(a*x)^n,x)

[Out] 1/a^2/(2+n)*arccosh(a*x)^(2+n)*hypergeom([1+1/2*n],[3/2,2+1/2*n],arccosh(a*x)^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int x \text{arccosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^n,x, algorithm="maxima")

[Out] integrate(x*arccosh(a*x)^n, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}(x \operatorname{arcosh}(ax)^n, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^n,x, algorithm="fricas")

[Out] integral(x*arccosh(a*x)^n, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*acosh(a*x)**n,x)

[Out] Integral(x*acosh(a*x)**n, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\text{sage}_0 x$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*arccosh(a*x)^n,x, algorithm="giac")

[Out] sage0*x

3.131 $\int \cosh^{-1}(ax)^n dx$

Optimal. Leaf size=49

$$\frac{\cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -\cosh^{-1}(ax))}{2a} + \frac{\Gamma(n+1, \cosh^{-1}(ax))}{2a}$$

[Out] (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(2*a*(-ArcCosh[a*x])^n) + Gamma[a[1 + n, ArcCosh[a*x]]/(2*a)

Rubi [A] time = 0.0492336, antiderivative size = 49, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5658, 3308, 2181}

$$\frac{\cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -\cosh^{-1}(ax))}{2a} + \frac{\Gamma(n+1, \cosh^{-1}(ax))}{2a}$$

Antiderivative was successfully verified.

[In] Int[ArcCosh[a*x]^n, x]

[Out] (ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(2*a*(-ArcCosh[a*x])^n) + Gamma[a[1 + n, ArcCosh[a*x]]/(2*a)

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^n, x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3308

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2181

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))*((c_.) + (d_.)*(x_))^(m_), x_Symbol] := -Simp[(F^(g*(e - (c*f)/d))*(c + d*x)^FracPart[m]*Gamma[m + 1, (-((f*g*Log[F])/d))*(c + d*x])]/(d*(-((f*g*Log[F])/d))^(IntPart[m] + 1)*(-((f*g*Log[F])*(c + d*x)/d))^FracPart[m]), x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]

Rubi steps

$$\begin{aligned} \int \cosh^{-1}(ax)^n dx &= \frac{\text{Subst}\left(\int x^n \sinh(x) dx, x, \cosh^{-1}(ax)\right)}{a} \\ &= -\frac{\text{Subst}\left(\int e^{-x} x^n dx, x, \cosh^{-1}(ax)\right)}{2a} + \frac{\text{Subst}\left(\int e^x x^n dx, x, \cosh^{-1}(ax)\right)}{2a} \\ &= \frac{(-\cosh^{-1}(ax))^{-n} \cosh^{-1}(ax)^n \Gamma(1+n, -\cosh^{-1}(ax))}{2a} + \frac{\Gamma(1+n, \cosh^{-1}(ax))}{2a} \end{aligned}$$

Mathematica [A] time = 0.0241498, size = 43, normalized size = 0.88

$$\frac{\cosh^{-1}(ax)^n (-\cosh^{-1}(ax))^{-n} \Gamma(n+1, -\cosh^{-1}(ax)) + \Gamma(n+1, \cosh^{-1}(ax))}{2a}$$

Antiderivative was successfully verified.

[In] Integrate[ArcCosh[a*x]^n, x]

[Out] ((ArcCosh[a*x]^n*Gamma[1 + n, -ArcCosh[a*x]])/(-ArcCosh[a*x])^n + Gamma[1 + n, ArcCosh[a*x]])/(2*a)

Maple [C] time = 0.041, size = 40, normalized size = 0.8

$$\frac{(\operatorname{arccosh}(ax))^{2+n}}{a(2+n)} {}_1F_2\left(1 + \frac{n}{2}; \frac{3}{2}, 2 + \frac{n}{2}; \frac{(\operatorname{arccosh}(ax))^2}{4}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^n, x)

[Out] 1/a/(2+n)*arccosh(a*x)^(2+n)*hypergeom([1+1/2*n], [3/2, 2+1/2*n], 1/4*arccosh(a*x)^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \operatorname{arcosh}(ax)^n dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^n, x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^n, x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}(\operatorname{arcosh}(ax)^n, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^n, x, algorithm="fricas")

[Out] integral(arccosh(a*x)^n, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \operatorname{acosh}^n(ax) dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(acosh(a*x)**n,x)
```

```
[Out] Integral(acosh(a*x)**n, x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(arccosh(a*x)^n,x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.132 \quad \int \frac{\cosh^{-1}(ax)^n}{x} dx$$

Optimal. Leaf size=12

$$\text{Unintegrable}\left(\frac{\cosh^{-1}(ax)^n}{x}, x\right)$$

[Out] Unintegrable[ArcCosh[a*x]^n/x, x]

Rubi [A] time = 0.017206, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{\cosh^{-1}(ax)^n}{x} dx$$

Verification is Not applicable to the result.

[In] Int[ArcCosh[a*x]^n/x, x]

[Out] Defer[Int][ArcCosh[a*x]^n/x, x]

Rubi steps

$$\int \frac{\cosh^{-1}(ax)^n}{x} dx = \int \frac{\cosh^{-1}(ax)^n}{x} dx$$

Mathematica [A] time = 0.32685, size = 0, normalized size = 0.

$$\int \frac{\cosh^{-1}(ax)^n}{x} dx$$

Verification is Not applicable to the result.

[In] Integrate[ArcCosh[a*x]^n/x, x]

[Out] Integrate[ArcCosh[a*x]^n/x, x]

Maple [A] time = 0.053, size = 0, normalized size = 0.

$$\int \frac{(\operatorname{arccosh}(ax))^n}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(arccosh(a*x)^n/x, x)

[Out] int(arccosh(a*x)^n/x, x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{arcosh}(ax)^n}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^n/x,x, algorithm="maxima")

[Out] integrate(arccosh(a*x)^n/x, x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{\operatorname{arcosh}(ax)^n}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^n/x,x, algorithm="fricas")

[Out] integral(arccosh(a*x)^n/x, x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{\operatorname{acosh}^n(ax)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(acosh(a*x)**n/x,x)

[Out] Integral(acosh(a*x)**n/x, x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{sage}_0 x$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(arccosh(a*x)^n/x,x, algorithm="giac")

[Out] sage0*x

3.133 $\int x^3 (a + b \cosh^{-1}(cx)) dx$

Optimal. Leaf size=84

$$\frac{1}{4}x^4(a + b \cosh^{-1}(cx)) - \frac{3bx\sqrt{cx-1}\sqrt{cx+1}}{32c^3} - \frac{3b \cosh^{-1}(cx)}{32c^4} - \frac{bx^3\sqrt{cx-1}\sqrt{cx+1}}{16c}$$

[Out] $(-3*b*x*sqrt[-1 + c*x]*sqrt[1 + c*x])/(32*c^3) - (b*x^3*sqrt[-1 + c*x]*sqrt[1 + c*x])/(16*c) - (3*b*ArcCosh[c*x])/(32*c^4) + (x^4*(a + b*ArcCosh[c*x]))/4$

Rubi [A] time = 0.0390041, antiderivative size = 84, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5662, 100, 12, 90, 52}

$$\frac{1}{4}x^4(a + b \cosh^{-1}(cx)) - \frac{3bx\sqrt{cx-1}\sqrt{cx+1}}{32c^3} - \frac{3b \cosh^{-1}(cx)}{32c^4} - \frac{bx^3\sqrt{cx-1}\sqrt{cx+1}}{16c}$$

Antiderivative was successfully verified.

[In] Int[x^3*(a + b*ArcCosh[c*x]),x]

[Out] $(-3*b*x*sqrt[-1 + c*x]*sqrt[1 + c*x])/(32*c^3) - (b*x^3*sqrt[-1 + c*x]*sqrt[1 + c*x])/(16*c) - (3*b*ArcCosh[c*x])/(32*c^4) + (x^4*(a + b*ArcCosh[c*x]))/4$

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 100

```
Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_
))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m - 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/(d*f*(m + n + p + 1)), x] + Dist[1/(d*f*(m + n + p + 1)), Int[(a
+ b*x)^(m - 2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m + n + p + 1) - b*(b
*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*
(d*e*(m + n) + c*f*(m + p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p
}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 90

```
Int[((a_.) + (b_.)*(x_.))^ 2*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_))
^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/
(d*f*(n + p + 3)), x] + Dist[1/(d*f*(n + p + 3)), Int[(c + d*x)^n*(e + f*x)
^p*Simp[a^2*d*f*(n + p + 3) - b*(b*c*e + a*(d*e*(n + 1) + c*f*(p + 1))) + b
*(a*d*f*(n + p + 4) - b*(d*e*(n + 2) + c*f*(p + 2)))*x, x], x] /; FreeQ
```

$\{a, b, c, d, e, f, n, p\}, x\} \&\& \text{NeQ}[n + p + 3, 0]$

Rule 52

$\text{Int}[1/(\text{Sqrt}[(a_) + (b_)*(x_)]*\text{Sqrt}[(c_) + (d_)*(x_)]), x_Symbol] \rightarrow \text{Simp}[\text{ArcCosh}[(b*x)/a]/b, x] /; \text{FreeQ}\{a, b, c, d\}, x\} \&\& \text{EqQ}[a + c, 0] \&\& \text{EqQ}[b - d, 0] \&\& \text{GtQ}[a, 0]$

Rubi steps

$$\begin{aligned} \int x^3 (a + b \cosh^{-1}(cx)) dx &= \frac{1}{4}x^4 (a + b \cosh^{-1}(cx)) - \frac{1}{4}(bc) \int \frac{x^4}{\sqrt{-1+cx}\sqrt{1+cx}} dx \\ &= -\frac{bx^3\sqrt{-1+cx}\sqrt{1+cx}}{16c} + \frac{1}{4}x^4 (a + b \cosh^{-1}(cx)) - \frac{b \int \frac{3x^2}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{16c} \\ &= -\frac{bx^3\sqrt{-1+cx}\sqrt{1+cx}}{16c} + \frac{1}{4}x^4 (a + b \cosh^{-1}(cx)) - \frac{(3b) \int \frac{x^2}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{16c} \\ &= -\frac{3bx\sqrt{-1+cx}\sqrt{1+cx}}{32c^3} - \frac{bx^3\sqrt{-1+cx}\sqrt{1+cx}}{16c} + \frac{1}{4}x^4 (a + b \cosh^{-1}(cx)) - \frac{(3b) \int \frac{1}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{32} \\ &= -\frac{3bx\sqrt{-1+cx}\sqrt{1+cx}}{32c^3} - \frac{bx^3\sqrt{-1+cx}\sqrt{1+cx}}{16c} - \frac{3b \cosh^{-1}(cx)}{32c^4} + \frac{1}{4}x^4 (a + b \cosh^{-1}(cx)) \end{aligned}$$

Mathematica [A] time = 0.037223, size = 105, normalized size = 1.25

$$\frac{ax^4}{4} - \frac{3bx\sqrt{cx-1}\sqrt{cx+1}}{32c^3} - \frac{3b \tanh^{-1}\left(\frac{\sqrt{cx-1}}{\sqrt{cx+1}}\right)}{16c^4} - \frac{bx^3\sqrt{cx-1}\sqrt{cx+1}}{16c} + \frac{1}{4}bx^4 \cosh^{-1}(cx)$$

Antiderivative was successfully verified.

[In] Integrate[x^3*(a + b*ArcCosh[c*x]), x]

[Out] (a*x^4)/4 - (3*b*x*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(32*c^3) - (b*x^3*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(16*c) + (b*x^4*ArcCosh[c*x])/4 - (3*b*ArcTanh[Sqrt[-1 + c*x]/Sqrt[1 + c*x]])/(16*c^4)

Maple [A] time = 0.012, size = 109, normalized size = 1.3

$$\frac{x^4 a}{4} + \frac{bx^4 \operatorname{arccosh}(cx)}{4} - \frac{bx^3}{16c} \sqrt{cx-1} \sqrt{cx+1} - \frac{3bx}{32c^3} \sqrt{cx-1} \sqrt{cx+1} - \frac{3b}{32c^4} \sqrt{cx-1} \sqrt{cx+1} \ln\left(cx + \sqrt{c^2 x^2 - 1}\right) \frac{1}{\sqrt{c}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^3*(a+b*arccosh(c*x)), x)

[Out] 1/4*x^4*a+1/4*b*x^4*arccosh(c*x)-1/16*b*x^3*(c*x-1)^(1/2)*(c*x+1)^(1/2)/c-3/32*b*x*(c*x-1)^(1/2)*(c*x+1)^(1/2)/c^3-3/32/c^4*b*(c*x-1)^(1/2)*(c*x+1)^(1/2)/(c^2*x^2-1)^(1/2)*ln(c*x+(c^2*x^2-1)^(1/2))

Maxima [A] time = 1.1697, size = 130, normalized size = 1.55

$$\frac{1}{4} ax^4 + \frac{1}{32} \left(8x^4 \operatorname{arccosh}(cx) - \left(\frac{2\sqrt{c^2x^2-1}x^3}{c^2} + \frac{3\sqrt{c^2x^2-1}x}{c^4} + \frac{3 \log\left(2c^2x + 2\sqrt{c^2x^2-1}\sqrt{c^2}\right)}{\sqrt{c^2}c^4} \right) \right) c^b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*(a+b*arccosh(c*x)),x, algorithm="maxima")

[Out] 1/4*a*x^4 + 1/32*(8*x^4*arccosh(c*x) - (2*sqrt(c^2*x^2 - 1)*x^3/c^2 + 3*sqrt(c^2*x^2 - 1)*x/c^4 + 3*log(2*c^2*x + 2*sqrt(c^2*x^2 - 1)*sqrt(c^2))/(sqrt(c^2)*c^4))*c)*b

Fricas [A] time = 2.45928, size = 161, normalized size = 1.92

$$\frac{8ac^4x^4 + (8bc^4x^4 - 3b) \log\left(cx + \sqrt{c^2x^2 - 1}\right) - (2bc^3x^3 + 3bcx)\sqrt{c^2x^2 - 1}}{32c^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*(a+b*arccosh(c*x)),x, algorithm="fricas")

[Out] 1/32*(8*a*c^4*x^4 + (8*b*c^4*x^4 - 3*b)*log(c*x + sqrt(c^2*x^2 - 1)) - (2*b*c^3*x^3 + 3*b*c*x)*sqrt(c^2*x^2 - 1))/c^4

Sympy [A] time = 1.45855, size = 87, normalized size = 1.04

$$\begin{cases} \frac{ax^4}{4} + \frac{bx^4 \operatorname{acosh}(cx)}{4} - \frac{bx^3 \sqrt{c^2x^2-1}}{16c} - \frac{3bx \sqrt{c^2x^2-1}}{32c^3} - \frac{3b \operatorname{acosh}(cx)}{32c^4} & \text{for } c \neq 0 \\ \frac{x^4 \left(a + \frac{ib}{2}\right)}{4} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**3*(a+b*acosh(c*x)),x)

[Out] Piecewise((a*x**4/4 + b*x**4*acosh(c*x)/4 - b*x**3*sqrt(c**2*x**2 - 1)/(16*c) - 3*b*x*sqrt(c**2*x**2 - 1)/(32*c**3) - 3*b*acosh(c*x)/(32*c**4), Ne(c, 0)), (x**4*(a + I*pi*b/2)/4, True))

Giac [A] time = 1.46898, size = 123, normalized size = 1.46

$$\frac{1}{4} ax^4 + \frac{1}{32} \left(8x^4 \log\left(cx + \sqrt{c^2x^2-1}\right) - \left(\sqrt{c^2x^2-1}x \left(\frac{2x^2}{c^2} + \frac{3}{c^4} \right) - \frac{3 \log\left(\left| -x|c| + \sqrt{c^2x^2-1} \right| \right)}{c^4|c|} \right) \right) c^b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^3*(a+b*arccosh(c*x)),x, algorithm="giac")


```
[Out] 1/4*a*x^4 + 1/32*(8*x^4*log(c*x + sqrt(c^2*x^2 - 1)) - (sqrt(c^2*x^2 - 1)*x
*(2*x^2/c^2 + 3/c^4) - 3*log(abs(-x*abs(c) + sqrt(c^2*x^2 - 1))))/(c^4*abs(c
))) *c)*b
```

3.134 $\int x^2 (a + b \cosh^{-1}(cx)) dx$

Optimal. Leaf size=71

$$\frac{1}{3}x^3(a + b \cosh^{-1}(cx)) - \frac{2b\sqrt{cx-1}\sqrt{cx+1}}{9c^3} - \frac{bx^2\sqrt{cx-1}\sqrt{cx+1}}{9c}$$

[Out] $(-2*b*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(9*c^3) - (b*x^2*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(9*c) + (x^3*(a + b*\text{ArcCosh}[c*x]))/3$

Rubi [A] time = 0.0295427, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {5662, 100, 12, 74}

$$\frac{1}{3}x^3(a + b \cosh^{-1}(cx)) - \frac{2b\sqrt{cx-1}\sqrt{cx+1}}{9c^3} - \frac{bx^2\sqrt{cx-1}\sqrt{cx+1}}{9c}$$

Antiderivative was successfully verified.

[In] $\text{Int}[x^2*(a + b*\text{ArcCosh}[c*x]), x]$

[Out] $(-2*b*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(9*c^3) - (b*x^2*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(9*c) + (x^3*(a + b*\text{ArcCosh}[c*x]))/3$

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol]
:> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 100

```
Int[((a_.) + (b_.)*(x_.))^(m_.)*((c_.) + (d_.)*(x_.))^(n_.)*((e_.) + (f_.)*(x_
.))^(p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m - 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/(d*f*(m + n + p + 1)), x] + Dist[1/(d*f*(m + n + p + 1)), Int[(a
+ b*x)^(m - 2)*(c + d*x)^n*(e + f*x)^p*Simp[a^2*d*f*(m + n + p + 1) - b*(b
*c*e*(m - 1) + a*(d*e*(n + 1) + c*f*(p + 1))) + b*(a*d*f*(2*m + n + p) - b*
(d*e*(m + n) + c*f*(m + p)))*x, x], x] /; FreeQ[{a, b, c, d, e, f, n, p
}, x] && GtQ[m, 1] && NeQ[m + n + p + 1, 0] && IntegerQ[m]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 74

```
Int[((a_.) + (b_.)*(x_.))*((c_.) + (d_.)*(x_.))^(n_.)*((e_.) + (f_.)*(x_.))^(p
_.), x_Symbol] :> Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p
+ 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ
[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]
```

Rubi steps

$$\begin{aligned}
\int x^2 (a + b \cosh^{-1}(cx)) dx &= \frac{1}{3}x^3 (a + b \cosh^{-1}(cx)) - \frac{1}{3}(bc) \int \frac{x^3}{\sqrt{-1+cx}\sqrt{1+cx}} dx \\
&= -\frac{bx^2\sqrt{-1+cx}\sqrt{1+cx}}{9c} + \frac{1}{3}x^3 (a + b \cosh^{-1}(cx)) - \frac{b \int \frac{2x}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{9c} \\
&= -\frac{bx^2\sqrt{-1+cx}\sqrt{1+cx}}{9c} + \frac{1}{3}x^3 (a + b \cosh^{-1}(cx)) - \frac{(2b) \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{9c} \\
&= -\frac{2b\sqrt{-1+cx}\sqrt{1+cx}}{9c^3} - \frac{bx^2\sqrt{-1+cx}\sqrt{1+cx}}{9c} + \frac{1}{3}x^3 (a + b \cosh^{-1}(cx))
\end{aligned}$$

Mathematica [A] time = 0.043911, size = 54, normalized size = 0.76

$$\frac{1}{9} \left(3ax^3 - \frac{b\sqrt{cx-1}\sqrt{cx+1}(c^2x^2+2)}{c^3} + 3bx^3 \cosh^{-1}(cx) \right)$$

Antiderivative was successfully verified.

[In] Integrate[x^2*(a + b*ArcCosh[c*x]), x]

[Out] (3*a*x^3 - (b*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(2 + c^2*x^2))/c^3 + 3*b*x^3*ArcCosh[c*x])/9

Maple [A] time = 0.004, size = 55, normalized size = 0.8

$$\frac{1}{c^3} \left(\frac{c^3 x^3 a}{3} + b \left(\frac{c^3 x^3 \operatorname{arccosh}(cx)}{3} - \frac{c^2 x^2 + 2}{9} \sqrt{cx-1} \sqrt{cx+1} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*(a+b*arccosh(c*x)), x)

[Out] 1/c^3*(1/3*c^3*x^3*a+b*(1/3*c^3*x^3*arccosh(c*x)-1/9*(c*x-1)^(1/2)*(c*x+1)^(1/2)*(c^2*x^2+2)))

Maxima [A] time = 1.17177, size = 78, normalized size = 1.1

$$\frac{1}{3}ax^3 + \frac{1}{9} \left(3x^3 \operatorname{arccosh}(cx) - c \left(\frac{\sqrt{c^2x^2-1}x^2}{c^2} + \frac{2\sqrt{c^2x^2-1}}{c^4} \right) \right) b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*(a+b*arccosh(c*x)), x, algorithm="maxima")

[Out] 1/3*a*x^3 + 1/9*(3*x^3*arccosh(c*x) - c*(sqrt(c^2*x^2 - 1)*x^2/c^2 + 2*sqrt(c^2*x^2 - 1)/c^4))*b

Fricas [A] time = 2.42938, size = 140, normalized size = 1.97

$$\frac{3bc^3x^3 \log\left(cx + \sqrt{c^2x^2 - 1}\right) + 3ac^3x^3 - (bc^2x^2 + 2b)\sqrt{c^2x^2 - 1}}{9c^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*(a+b*arccosh(c*x)),x, algorithm="fricas")

[Out] 1/9*(3*b*c^3*x^3*log(c*x + sqrt(c^2*x^2 - 1)) + 3*a*c^3*x^3 - (b*c^2*x^2 + 2*b)*sqrt(c^2*x^2 - 1))/c^3

Sympy [A] time = 0.67728, size = 71, normalized size = 1.

$$\begin{cases} \frac{ax^3}{3} + \frac{bx^3 \operatorname{acosh}(cx)}{3} - \frac{bx^2\sqrt{c^2x^2-1}}{9c} - \frac{2b\sqrt{c^2x^2-1}}{9c^3} & \text{for } c \neq 0 \\ \frac{x^3\left(a + \frac{i\pi b}{2}\right)}{3} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*(a+b*acosh(c*x)),x)

[Out] Piecewise((a*x**3/3 + b*x**3*acosh(c*x)/3 - b*x**2*sqrt(c**2*x**2 - 1)/(9*c) - 2*b*sqrt(c**2*x**2 - 1)/(9*c**3), Ne(c, 0)), (x**3*(a + I*pi*b/2)/3, True))

Giac [A] time = 1.45294, size = 84, normalized size = 1.18

$$\frac{1}{3}ax^3 + \frac{1}{9}\left(3x^3 \log\left(cx + \sqrt{c^2x^2 - 1}\right) - \frac{(c^2x^2 - 1)^{\frac{3}{2}} + 3\sqrt{c^2x^2 - 1}}{c^3}\right)b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*(a+b*arccosh(c*x)),x, algorithm="giac")

[Out] 1/3*a*x^3 + 1/9*(3*x^3*log(c*x + sqrt(c^2*x^2 - 1)) - ((c^2*x^2 - 1)^(3/2) + 3*sqrt(c^2*x^2 - 1))/c^3)*b

3.135 $\int x (a + b \cosh^{-1}(cx)) dx$

Optimal. Leaf size=55

$$\frac{1}{2}x^2(a + b \cosh^{-1}(cx)) - \frac{b \cosh^{-1}(cx)}{4c^2} - \frac{bx\sqrt{cx-1}\sqrt{cx+1}}{4c}$$

[Out] $-(b*x*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(4*c) - (b*\text{ArcCosh}[c*x])/(4*c^2) + (x^2*(a + b*\text{ArcCosh}[c*x]))/2$

Rubi [A] time = 0.0197901, antiderivative size = 55, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.3$, Rules used = {5662, 90, 52}

$$\frac{1}{2}x^2(a + b \cosh^{-1}(cx)) - \frac{b \cosh^{-1}(cx)}{4c^2} - \frac{bx\sqrt{cx-1}\sqrt{cx+1}}{4c}$$

Antiderivative was successfully verified.

[In] $\text{Int}[x*(a + b*\text{ArcCosh}[c*x]), x]$

[Out] $-(b*x*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(4*c) - (b*\text{ArcCosh}[c*x])/(4*c^2) + (x^2*(a + b*\text{ArcCosh}[c*x]))/2$

Rule 5662

$\text{Int}[(a + \text{ArcCosh}[c*x])*(b*x)^n*(d*x)^m, x_Symbol] \rightarrow \text{Simp}[(d*x)^{m+1}*(a + b*\text{ArcCosh}[c*x])^n/(d*(m+1)), x] - \text{Dist}[(b*c*n)/(d*(m+1)), \text{Int}[(d*x)^{m+1}*(a + b*\text{ArcCosh}[c*x])^{n-1}/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x \ \&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{NeQ}[m, -1]$

Rule 90

$\text{Int}[(a + (b*x)^2*(c + d*x)^n*(e + f*x)^p, x_Symbol] \rightarrow \text{Simp}[(b*(a + b*x)*(c + d*x)^{n+1}*(e + f*x)^{p+1})/(d*f*(n+p+3)), x] + \text{Dist}[1/(d*f*(n+p+3)), \text{Int}[(c + d*x)^n*(e + f*x)^{p+1}*\text{Simp}[a^2*d*f*(n+p+3) - b*(b*c*e + a*(d*e*(n+1) + c*f*(p+1))) + b*(a*d*f*(n+p+4) - b*(d*e*(n+2) + c*f*(p+2))]*x, x], x] /; \text{FreeQ}\{a, b, c, d, e, f, n, p\}, x \ \&\& \ \text{NeQ}[n+p+3, 0]$

Rule 52

$\text{Int}[1/(\text{Sqrt}[a + (b*x)^2]*\text{Sqrt}[c + d*x]), x_Symbol] \rightarrow \text{Simp}[\text{ArcCosh}[(b*x)/a]/b, x] /; \text{FreeQ}\{a, b, c, d\}, x \ \&\& \ \text{EqQ}[a + c, 0] \ \&\& \ \text{EqQ}[b - d, 0] \ \&\& \ \text{GtQ}[a, 0]$

Rubi steps

$$\begin{aligned} \int x (a + b \cosh^{-1}(cx)) dx &= \frac{1}{2}x^2(a + b \cosh^{-1}(cx)) - \frac{1}{2}(bc) \int \frac{x^2}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx \\ &= -\frac{bx\sqrt{-1 + cx}\sqrt{1 + cx}}{4c} + \frac{1}{2}x^2(a + b \cosh^{-1}(cx)) - \frac{b \int \frac{1}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx}{4c} \\ &= -\frac{bx\sqrt{-1 + cx}\sqrt{1 + cx}}{4c} - \frac{b \cosh^{-1}(cx)}{4c^2} + \frac{1}{2}x^2(a + b \cosh^{-1}(cx)) \end{aligned}$$

Mathematica [A] time = 0.035222, size = 76, normalized size = 1.38

$$\frac{ax^2}{2} - \frac{b \tanh^{-1}\left(\frac{\sqrt{cx-1}}{\sqrt{cx+1}}\right)}{2c^2} + \frac{1}{2}bx^2 \cosh^{-1}(cx) - \frac{bx\sqrt{cx-1}\sqrt{cx+1}}{4c}$$

Antiderivative was successfully verified.

[In] Integrate[x*(a + b*ArcCosh[c*x]), x]

[Out] (a*x^2)/2 - (b*x*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(4*c) + (b*x^2*ArcCosh[c*x])/2 - (b*ArcTanh[Sqrt[-1 + c*x]/Sqrt[1 + c*x]])/(2*c^2)

Maple [A] time = 0.004, size = 86, normalized size = 1.6

$$\frac{ax^2}{2} + \frac{bx^2 \operatorname{arccosh}(cx)}{2} - \frac{bx}{4c} \sqrt{cx-1} \sqrt{cx+1} - \frac{b}{4c^2} \sqrt{cx-1} \sqrt{cx+1} \ln\left(cx + \sqrt{c^2x^2-1}\right) \frac{1}{\sqrt{c^2x^2-1}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*(a+b*arccosh(c*x)), x)

[Out] 1/2*a*x^2+1/2*b*x^2*arccosh(c*x)-1/4*b*x*(c*x-1)^(1/2)*(c*x+1)^(1/2)/c-1/4/c^2*b*(c*x-1)^(1/2)*(c*x+1)^(1/2)/(c^2*x^2-1)^(1/2)*ln(c*x+(c^2*x^2-1)^(1/2))

Maxima [A] time = 1.15047, size = 101, normalized size = 1.84

$$\frac{1}{2}ax^2 + \frac{1}{4} \left(2x^2 \operatorname{arccosh}(cx) - c \left(\frac{\sqrt{c^2x^2-1}x}{c^2} + \frac{\log\left(2c^2x + 2\sqrt{c^2x^2-1}\sqrt{c^2}\right)}{\sqrt{c^2}c^2} \right) \right) b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x)), x, algorithm="maxima")

[Out] 1/2*a*x^2 + 1/4*(2*x^2*arccosh(c*x) - c*(sqrt(c^2*x^2 - 1)*x/c^2 + log(2*c^2*x + 2*sqrt(c^2*x^2 - 1)*sqrt(c^2))/(sqrt(c^2)*c^2))*b

Fricas [A] time = 2.50037, size = 132, normalized size = 2.4

$$\frac{2ac^2x^2 - \sqrt{c^2x^2-1}bcx + (2bc^2x^2 - b) \log\left(cx + \sqrt{c^2x^2-1}\right)}{4c^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x)), x, algorithm="fricas")

[Out] 1/4*(2*a*c^2*x^2 - sqrt(c^2*x^2 - 1)*b*c*x + (2*b*c^2*x^2 - b)*log(c*x + sqrt(c^2*x^2 - 1)))/c^2

Sympy [A] time = 0.372885, size = 61, normalized size = 1.11

$$\begin{cases} \frac{ax^2}{2} + \frac{bx^2 \operatorname{acosh}(cx)}{2} - \frac{bx\sqrt{c^2x^2-1}}{4c} - \frac{b \operatorname{acosh}(cx)}{4c^2} & \text{for } c \neq 0 \\ \frac{x^2\left(a + \frac{ib}{2}\right)}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*acosh(c*x)),x)

[Out] Piecewise((a*x**2/2 + b*x**2*acosh(c*x)/2 - b*x*sqrt(c**2*x**2 - 1)/(4*c) - b*acosh(c*x)/(4*c**2), Ne(c, 0)), (x**2*(a + I*pi*b/2)/2, True))

Giac [A] time = 1.43285, size = 108, normalized size = 1.96

$$\frac{1}{2}ax^2 + \frac{1}{4}\left(2x^2 \log\left(cx + \sqrt{c^2x^2 - 1}\right) - c\left(\frac{\sqrt{c^2x^2 - 1}x}{c^2} - \frac{\log\left(|-x|c + \sqrt{c^2x^2 - 1}\right)}{c^2|c|}\right)\right)b$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x)),x, algorithm="giac")

[Out] 1/2*a*x^2 + 1/4*(2*x^2*log(c*x + sqrt(c^2*x^2 - 1)) - c*(sqrt(c^2*x^2 - 1)*x/c^2 - log(abs(-x*abs(c) + sqrt(c^2*x^2 - 1)))/(c^2*abs(c))))*b

3.136 $\int (a + b \cosh^{-1}(cx)) dx$

Optimal. Leaf size=35

$$ax - \frac{b\sqrt{cx-1}\sqrt{cx+1}}{c} + bx \cosh^{-1}(cx)$$

[Out] a*x - (b*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/c + b*x*ArcCosh[c*x]

Rubi [A] time = 0.0143607, antiderivative size = 35, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 2, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.25$, Rules used = {5654, 74}

$$ax - \frac{b\sqrt{cx-1}\sqrt{cx+1}}{c} + bx \cosh^{-1}(cx)$$

Antiderivative was successfully verified.

[In] Int[a + b*ArcCosh[c*x], x]

[Out] a*x - (b*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/c + b*x*ArcCosh[c*x]

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] :> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 74

Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Simp[(b*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/(d*f*(n + p + 2)), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]

Rubi steps

$$\begin{aligned} \int (a + b \cosh^{-1}(cx)) dx &= ax + b \int \cosh^{-1}(cx) dx \\ &= ax + bx \cosh^{-1}(cx) - (bc) \int \frac{x}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx \\ &= ax - \frac{b\sqrt{-1 + cx}\sqrt{1 + cx}}{c} + bx \cosh^{-1}(cx) \end{aligned}$$

Mathematica [A] time = 0.0207335, size = 35, normalized size = 1.

$$ax - \frac{b\sqrt{cx-1}\sqrt{cx+1}}{c} + bx \cosh^{-1}(cx)$$

Antiderivative was successfully verified.

[In] Integrate[a + b*ArcCosh[c*x], x]

[Out] $a*x - (b*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/c + b*x*\text{ArcCosh}[c*x]$

Maple [A] time = 0.003, size = 34, normalized size = 1.

$$ax + \frac{b}{c} \left(cx \operatorname{arccosh}(cx) - \sqrt{cx-1} \sqrt{cx+1} \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(a+b*arccosh(c*x),x)`

[Out] $a*x + b/c*(c*x*\operatorname{arccosh}(c*x) - (c*x-1)^{(1/2)}*(c*x+1)^{(1/2)})$

Maxima [A] time = 1.10648, size = 41, normalized size = 1.17

$$ax + \frac{\left(cx \operatorname{arccosh}(cx) - \sqrt{c^2x^2 - 1} \right) b}{c}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(a+b*arccosh(c*x),x, algorithm="maxima")`

[Out] $a*x + (c*x*\operatorname{arccosh}(c*x) - \operatorname{sqrt}(c^2*x^2 - 1))*b/c$

Fricas [A] time = 2.49282, size = 95, normalized size = 2.71

$$\frac{bcx \log\left(cx + \sqrt{c^2x^2 - 1}\right) + acx - \sqrt{c^2x^2 - 1}b}{c}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(a+b*arccosh(c*x),x, algorithm="fricas")`

[Out] $(b*c*x*\log(c*x + \operatorname{sqrt}(c^2*x^2 - 1)) + a*c*x - \operatorname{sqrt}(c^2*x^2 - 1)*b)/c$

Sympy [A] time = 0.166587, size = 31, normalized size = 0.89

$$ax + b \begin{cases} x \operatorname{acosh}(cx) - \frac{\sqrt{c^2x^2-1}}{c} & \text{for } c \neq 0 \\ \frac{i\pi x}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(a+b*acosh(c*x),x)`

[Out] $a*x + b*\operatorname{Piecewise}((x*\operatorname{acosh}(c*x) - \operatorname{sqrt}(c**2*x**2 - 1))/c, \operatorname{Ne}(c, 0)), (I*\pi*x/2, \operatorname{True}))$

Giac [A] time = 1.29573, size = 55, normalized size = 1.57

$$\left(x \log \left(cx + \sqrt{c^2 x^2 - 1} \right) - \frac{\sqrt{c^2 x^2 - 1}}{c} \right) b + ax$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(a+b*arccosh(c*x),x, algorithm="giac")

[Out] (x*log(c*x + sqrt(c^2*x^2 - 1)) - sqrt(c^2*x^2 - 1)/c)*b + a*x

$$3.137 \quad \int \frac{a+b \cosh^{-1}(cx)}{x} dx$$

Optimal. Leaf size=55

$$-\frac{1}{2}b \operatorname{PolyLog}\left(2, -e^{-2 \cosh^{-1}(cx)}\right) + \frac{(a+b \cosh^{-1}(cx))^2}{2b} + \log\left(e^{-2 \cosh^{-1}(cx)} + 1\right)(a+b \cosh^{-1}(cx))$$

[Out] (a + b*ArcCosh[c*x])^2/(2*b) + (a + b*ArcCosh[c*x])*Log[1 + E^(-2*ArcCosh[c*x])] - (b*PolyLog[2, -E^(-2*ArcCosh[c*x])])/2

Rubi [A] time = 0.0766328, antiderivative size = 55, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5660, 3718, 2190, 2279, 2391}

$$\frac{1}{2}b \operatorname{PolyLog}\left(2, -e^{2 \cosh^{-1}(cx)}\right) - \frac{(a+b \cosh^{-1}(cx))^2}{2b} + \log\left(e^{2 \cosh^{-1}(cx)} + 1\right)(a+b \cosh^{-1}(cx))$$

Warning: Unable to verify antiderivative.

[In] Int[(a + b*ArcCosh[c*x])/x, x]

[Out] -(a + b*ArcCosh[c*x])^2/(2*b) + (a + b*ArcCosh[c*x])*Log[1 + E^(2*ArcCosh[c*x])] + (b*PolyLog[2, -E^(2*ArcCosh[c*x])])/2

Rule 5660

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.)]^(n_.)/(x_), x_Symbol] :> Subst[Int[(a + b*x)^n/Coth[x], x], x, ArcCosh[c*x]] /; FreeQ[{a, b, c}, x] && IGtQ[n, 0]

Rule 3718

Int[((c_.) + (d_.)*(x_)^(m_.)*tan[(e_.) + (Complex[0, fz_])*(f_.)*(x_)])^(n_.), x_Symbol] :> -Simp[(I*(c + d*x)^(m + 1))/(d*(m + 1)), x] + Dist[2*I, Int[((c + d*x)^m * E^(2*(-I*e) + f*fz*x))]/(1 + E^(2*(-I*e) + f*fz*x)), x, x] /; FreeQ[{c, d, e, f, fz}, x] && IGtQ[m, 0]

Rule 2190

Int[((F_)^(g_.)*((e_.) + (f_.)*(x_)))^(n_.)*((c_.) + (d_.)*(x_)^(m_.))/((a_.) + (b_.)*((F_)^(g_.)*((e_.) + (f_.)*(x_)))^(n_.), x_Symbol] :> Simp[((c + d*x)^m * Log[1 + (b*(F^(g*(e + f*x)))^n]/a)]/(b*f*g*n*Log[F]), x] - Dist[(d*m)/(b*f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*Log[1 + (b*(F^(g*(e + f*x)))^n]/a], x, x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]

Rule 2279

Int[Log[(a_) + (b_.)*((F_)^(e_.)*((c_.) + (d_.)*(x_)))^(n_.)], x_Symbol] :> Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x)))^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]

Rule 2391

Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] :> -Simp[PolyLog[2, -(c*e*x^n)]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]

Rubi steps

$$\begin{aligned}
\int \frac{a + b \cosh^{-1}(cx)}{x} dx &= \text{Subst} \left(\int (a + bx) \tanh(x) dx, x, \cosh^{-1}(cx) \right) \\
&= -\frac{(a + b \cosh^{-1}(cx))^2}{2b} + 2 \text{Subst} \left(\int \frac{e^{2x}(a + bx)}{1 + e^{2x}} dx, x, \cosh^{-1}(cx) \right) \\
&= -\frac{(a + b \cosh^{-1}(cx))^2}{2b} + (a + b \cosh^{-1}(cx)) \log(1 + e^{2 \cosh^{-1}(cx)}) - b \text{Subst} \left(\int \log(1 + e^{2x}) dx, x, \cosh^{-1}(cx) \right) \\
&= -\frac{(a + b \cosh^{-1}(cx))^2}{2b} + (a + b \cosh^{-1}(cx)) \log(1 + e^{2 \cosh^{-1}(cx)}) - \frac{1}{2} b \text{Subst} \left(\int \frac{\log(1 + x)}{x} dx, x, \cosh^{-1}(cx) \right) \\
&= -\frac{(a + b \cosh^{-1}(cx))^2}{2b} + (a + b \cosh^{-1}(cx)) \log(1 + e^{2 \cosh^{-1}(cx)}) + \frac{1}{2} b \text{Li}_2(-e^{2 \cosh^{-1}(cx)})
\end{aligned}$$

Mathematica [A] time = 0.0401445, size = 48, normalized size = 0.87

$$\frac{1}{2} b \left(\cosh^{-1}(cx) \left(\cosh^{-1}(cx) + 2 \log(e^{-2 \cosh^{-1}(cx)} + 1) \right) - \text{PolyLog}\left(2, -e^{-2 \cosh^{-1}(cx)}\right) \right) + a \log(x)$$

Warning: Unable to verify antiderivative.

[In] Integrate[(a + b*ArcCosh[c*x])/x, x]

[Out] a*Log[x] + (b*(ArcCosh[c*x]*(ArcCosh[c*x] + 2*Log[1 + E^(-2*ArcCosh[c*x])]) - PolyLog[2, -E^(-2*ArcCosh[c*x])]))/2

Maple [A] time = 0.03, size = 75, normalized size = 1.4

$$a \ln(cx) - \frac{b(\operatorname{arccosh}(cx))^2}{2} + b \operatorname{arccosh}(cx) \ln\left(\left(cx + \sqrt{cx-1}\sqrt{cx+1}\right)^2 + 1\right) + \frac{b}{2} \operatorname{polylog}\left(2, -\left(cx + \sqrt{cx-1}\sqrt{cx+1}\right)^2\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))/x, x)

[Out] a*ln(c*x)-1/2*b*arccosh(c*x)^2+b*arccosh(c*x)*ln((c*x+(c*x-1)^(1/2)*(c*x+1)^(1/2))^2+1)+1/2*b*polylog(2, -(c*x+(c*x-1)^(1/2)*(c*x+1)^(1/2))^2)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$b \int \frac{\log(cx + \sqrt{cx+1}\sqrt{cx-1})}{x} dx + a \log(x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x, x, algorithm="maxima")

[Out] b*integrate(log(c*x + sqrt(c*x + 1)*sqrt(c*x - 1))/x, x) + a*log(x)

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\frac{b \operatorname{arcosh}(cx) + a}{x}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x,x, algorithm="fricas")

[Out] integral((b*arccosh(c*x) + a)/x, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{a + b \operatorname{acosh}(cx)}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*acosh(c*x))/x,x)

[Out] Integral((a + b*acosh(c*x))/x, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{b \operatorname{arcosh}(cx) + a}{x} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x,x, algorithm="giac")

[Out] integrate((b*arccosh(c*x) + a)/x, x)

$$3.138 \quad \int \frac{a+b \cosh^{-1}(cx)}{x^2} dx$$

Optimal. Leaf size=37

$$bc \tan^{-1}\left(\sqrt{cx-1}\sqrt{cx+1}\right) - \frac{a+b \cosh^{-1}(cx)}{x}$$

[Out] $-(a + b \operatorname{ArcCosh}[c*x])/x + b*c \operatorname{ArcTan}[\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]]$

Rubi [A] time = 0.0239983, antiderivative size = 37, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.25$, Rules used = {5662, 92, 205}

$$bc \tan^{-1}\left(\sqrt{cx-1}\sqrt{cx+1}\right) - \frac{a+b \cosh^{-1}(cx)}{x}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[(a + b \operatorname{ArcCosh}[c*x])/x^2, x]$

[Out] $-(a + b \operatorname{ArcCosh}[c*x])/x + b*c \operatorname{ArcTan}[\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]]$

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 92

```
Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_
))), x_Symbol] :> Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x],
x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
2*b*d*e - f*(b*c + a*d), 0]
```

Rule 205

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] :> Simp[(Rt[a/b, 2]*ArcTan[x/Rt[a
/b, 2]])/a, x] /; FreeQ[{a, b}, x] && PosQ[a/b]
```

Rubi steps

$$\begin{aligned} \int \frac{a+b \cosh^{-1}(cx)}{x^2} dx &= -\frac{a+b \cosh^{-1}(cx)}{x} + (bc) \int \frac{1}{x\sqrt{-1+cx}\sqrt{1+cx}} dx \\ &= -\frac{a+b \cosh^{-1}(cx)}{x} + (bc^2) \operatorname{Subst}\left(\int \frac{1}{c+cx^2} dx, x, \sqrt{-1+cx}\sqrt{1+cx}\right) \\ &= -\frac{a+b \cosh^{-1}(cx)}{x} + bc \tan^{-1}\left(\sqrt{-1+cx}\sqrt{1+cx}\right) \end{aligned}$$

Mathematica [A] time = 0.0716771, size = 65, normalized size = 1.76

$$-\frac{a}{x} + \frac{bc\sqrt{c^2x^2-1}\tan^{-1}\left(\sqrt{c^2x^2-1}\right)}{\sqrt{cx-1}\sqrt{cx+1}} - \frac{b\cosh^{-1}(cx)}{x}$$

Antiderivative was successfully verified.

[In] Integrate[(a + b*ArcCosh[c*x])/x^2,x]

[Out] -(a/x) - (b*ArcCosh[c*x])/x + (b*c*Sqrt[-1 + c^2*x^2]*ArcTan[Sqrt[-1 + c^2*x^2]])/(Sqrt[-1 + c*x]*Sqrt[1 + c*x])

Maple [A] time = 0.004, size = 59, normalized size = 1.6

$$-\frac{a}{x} - \frac{b\operatorname{arccosh}(cx)}{x} - bc\sqrt{cx-1}\sqrt{cx+1}\arctan\left(\frac{1}{\sqrt{c^2x^2-1}}\right)\frac{1}{\sqrt{c^2x^2-1}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))/x^2,x)

[Out] -a/x-b/x*arccosh(c*x)-c*b*(c*x-1)^(1/2)*(c*x+1)^(1/2)/(c^2*x^2-1)^(1/2)*arc tan(1/(c^2*x^2-1)^(1/2))

Maxima [A] time = 1.6757, size = 43, normalized size = 1.16

$$-\left(c\arcsin\left(\frac{1}{\sqrt{c^2|x|}}\right) + \frac{\operatorname{arccosh}(cx)}{x}\right)b - \frac{a}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^2,x, algorithm="maxima")

[Out] -(c*arcsin(1/(sqrt(c^2)*abs(x)))) + arccosh(c*x)/x)*b - a/x

Fricas [B] time = 2.5959, size = 171, normalized size = 4.62

$$\frac{2bcx\arctan\left(-cx + \sqrt{c^2x^2-1}\right) + bx\log\left(-cx + \sqrt{c^2x^2-1}\right) + (bx-b)\log\left(cx + \sqrt{c^2x^2-1}\right) - a}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^2,x, algorithm="fricas")

[Out] (2*b*c*x*arctan(-c*x + sqrt(c^2*x^2 - 1)) + b*x*log(-c*x + sqrt(c^2*x^2 - 1)) + (b*x - b)*log(c*x + sqrt(c^2*x^2 - 1)) - a)/x

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{a + b \operatorname{acosh}(cx)}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*acosh(c*x))/x**2,x)

[Out] Integral((a + b*acosh(c*x))/x**2, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{b \operatorname{arcosh}(cx) + a}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^2,x, algorithm="giac")

[Out] integrate((b*arccosh(c*x) + a)/x^2, x)

$$3.139 \quad \int \frac{a+b \cosh^{-1}(cx)}{x^3} dx$$

Optimal. Leaf size=43

$$\frac{bc\sqrt{cx-1}\sqrt{cx+1}}{2x} - \frac{a+b \cosh^{-1}(cx)}{2x^2}$$

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(2*x) - (a + b*ArcCosh[c*x])/(2*x^2)

Rubi [A] time = 0.0200365, antiderivative size = 43, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {5662, 95}

$$\frac{bc\sqrt{cx-1}\sqrt{cx+1}}{2x} - \frac{a+b \cosh^{-1}(cx)}{2x^2}$$

Antiderivative was successfully verified.

[In] Int[(a + b*ArcCosh[c*x])/x^3,x]

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(2*x) - (a + b*ArcCosh[c*x])/(2*x^2)

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 95

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] /; FreeQ[{a, b, c, d, e, f, m, n, p}, x] && EqQ[Simplify[m + n + p + 3], 0] && EqQ[a*d*f*(m + 1) + b*c*f*(n + 1) + b*d*e*(p + 1), 0] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \int \frac{a+b \cosh^{-1}(cx)}{x^3} dx &= -\frac{a+b \cosh^{-1}(cx)}{2x^2} + \frac{1}{2}(bc) \int \frac{1}{x^2\sqrt{-1+cx}\sqrt{1+cx}} dx \\ &= \frac{bc\sqrt{-1+cx}\sqrt{1+cx}}{2x} - \frac{a+b \cosh^{-1}(cx)}{2x^2} \end{aligned}$$

Mathematica [A] time = 0.0175018, size = 48, normalized size = 1.12

$$-\frac{a}{2x^2} - \frac{b \cosh^{-1}(cx)}{2x^2} + \frac{bc\sqrt{cx-1}\sqrt{cx+1}}{2x}$$

Antiderivative was successfully verified.

[In] Integrate[(a + b*ArcCosh[c*x])/x^3,x]

[Out] $-a/(2*x^2) + (b*c*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x])/(2*x) - (b*\text{ArcCosh}[c*x])/(2*x^2)$

Maple [A] time = 0.004, size = 52, normalized size = 1.2

$$c^2 \left(-\frac{a}{2c^2x^2} + b \left(-\frac{\text{arccosh}(cx)}{2c^2x^2} + \frac{1}{2cx} \sqrt{cx-1} \sqrt{cx+1} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int((a+b*arccosh(c*x))/x^3,x)`

[Out] $c^2*(-1/2*a/c^2/x^2+b*(-1/2/c^2/x^2*\text{arccosh}(c*x)+1/2*(c*x-1)^{(1/2)}*(c*x+1)^{(1/2)}/c/x)$

Maxima [A] time = 1.74016, size = 49, normalized size = 1.14

$$\frac{1}{2} b \left(\frac{\sqrt{c^2x^2-1}c}{x} - \frac{\text{arcosh}(cx)}{x^2} \right) - \frac{a}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*arccosh(c*x))/x^3,x, algorithm="maxima")`

[Out] $1/2*b*(\text{sqrt}(c^2*x^2 - 1)*c/x - \text{arccosh}(c*x)/x^2) - 1/2*a/x^2$

Fricas [A] time = 2.31892, size = 108, normalized size = 2.51

$$\frac{\sqrt{c^2x^2-1}bcx + ax^2 - b \log(cx + \sqrt{c^2x^2-1}) - a}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*arccosh(c*x))/x^3,x, algorithm="fricas")`

[Out] $1/2*(\text{sqrt}(c^2*x^2 - 1)*b*c*x + a*x^2 - b*\log(c*x + \text{sqrt}(c^2*x^2 - 1)) - a)/x^2$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{a + b \text{acosh}(cx)}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*acosh(c*x))/x**3,x)`

[Out] `Integral((a + b*acosh(c*x))/x**3, x)`

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{b \operatorname{arcosh}(cx) + a}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^3,x, algorithm="giac")

[Out] integrate((b*arccosh(c*x) + a)/x^3, x)

$$3.140 \quad \int \frac{a+b \cosh^{-1}(cx)}{x^4} dx$$

Optimal. Leaf size=71

$$-\frac{a+b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6}bc^3 \tan^{-1}\left(\sqrt{cx-1}\sqrt{cx+1}\right) + \frac{bc\sqrt{cx-1}\sqrt{cx+1}}{6x^2}$$

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(6*x^2) - (a + b*ArcCosh[c*x])/(3*x^3) + (b*c^3*ArcTan[Sqrt[-1 + c*x]*Sqrt[1 + c*x]])/6

Rubi [A] time = 0.0334076, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5662, 103, 12, 92, 205}

$$-\frac{a+b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6}bc^3 \tan^{-1}\left(\sqrt{cx-1}\sqrt{cx+1}\right) + \frac{bc\sqrt{cx-1}\sqrt{cx+1}}{6x^2}$$

Antiderivative was successfully verified.

[In] Int[(a + b*ArcCosh[c*x])/x^4, x]

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(6*x^2) - (a + b*ArcCosh[c*x])/(3*x^3) + (b*c^3*ArcTan[Sqrt[-1 + c*x]*Sqrt[1 + c*x]])/6

Rule 5662

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol]
  :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c
*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1
+ c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &&
NeQ[m, -1]
```

Rule 103

```
Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_
))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x
)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] + Dist[1/((m + 1)*(b*c - a
*d)*(b*e - a*f)), Int[(a + b*x)^(m + 1)*(c + d*x)^n*(e + f*x)^p*Simp[a*d*f*
(m + 1) - b*(d*e*(m + n + 2) + c*f*(m + p + 2)) - b*d*f*(m + n + p + 3)*x,
x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && LtQ[m, -1] && IntegerQ[
m] && (IntegerQ[n] || IntegersQ[2*n, 2*p])
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 92

```
Int[1/(Sqrt[(a_.) + (b_.)*(x_.)]*Sqrt[(c_.) + (d_.)*(x_.)]*((e_.) + (f_.)*(x_
))), x_Symbol] :> Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x],
x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
2*b*d*e - f*(b*c + a*d), 0]
```

Rule 205

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] :> Simp[(Rt[a/b, 2]*ArcTan[x/Rt[a/b, 2]])/a, x] /; FreeQ[{a, b}, x] && PosQ[a/b]

Rubi steps

$$\begin{aligned} \int \frac{a + b \cosh^{-1}(cx)}{x^4} dx &= -\frac{a + b \cosh^{-1}(cx)}{3x^3} + \frac{1}{3}(bc) \int \frac{1}{x^3 \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\ &= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{6x^2} - \frac{a + b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6}(bc) \int \frac{c^2}{x \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\ &= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{6x^2} - \frac{a + b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6}(bc^3) \int \frac{1}{x \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\ &= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{6x^2} - \frac{a + b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6}(bc^4) \text{Subst} \left(\int \frac{1}{c + cx^2} dx, x, \sqrt{-1 + cx} \sqrt{1 + cx} \right) \\ &= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{6x^2} - \frac{a + b \cosh^{-1}(cx)}{3x^3} + \frac{1}{6} bc^3 \tan^{-1} \left(\sqrt{-1 + cx} \sqrt{1 + cx} \right) \end{aligned}$$

Mathematica [A] time = 0.100809, size = 101, normalized size = 1.42

$$-\frac{a}{3x^3} + \frac{bc^3 \sqrt{c^2 x^2 - 1} \tan^{-1} \left(\sqrt{c^2 x^2 - 1} \right)}{6 \sqrt{cx - 1} \sqrt{cx + 1}} + \frac{bc \sqrt{cx - 1} \sqrt{cx + 1}}{6x^2} - \frac{b \cosh^{-1}(cx)}{3x^3}$$

Antiderivative was successfully verified.

[In] Integrate[(a + b*ArcCosh[c*x])/x^4, x]

[Out] -a/(3*x^3) + (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(6*x^2) - (b*ArcCosh[c*x])/(3*x^3) + (b*c^3*Sqrt[-1 + c^2*x^2]*ArcTan[Sqrt[-1 + c^2*x^2]])/(6*Sqrt[-1 + c*x]*Sqrt[1 + c*x])

Maple [A] time = 0.006, size = 82, normalized size = 1.2

$$-\frac{a}{3x^3} - \frac{b \operatorname{arccosh}(cx)}{3x^3} - \frac{c^3 b}{6} \sqrt{cx - 1} \sqrt{cx + 1} \arctan \left(\frac{1}{\sqrt{c^2 x^2 - 1}} \right) \frac{1}{\sqrt{c^2 x^2 - 1}} + \frac{bc}{6x^2} \sqrt{cx - 1} \sqrt{cx + 1}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))/x^4, x)

[Out] -1/3*a/x^3 - 1/3*b/x^3*arccosh(c*x) - 1/6*c^3*b*(c*x-1)^(1/2)*(c*x+1)^(1/2)/(c^2*x^2-1)^(1/2)*arctan(1/(c^2*x^2-1)^(1/2)) + 1/6*b*c*(c*x-1)^(1/2)*(c*x+1)^(1/2)/x^2

Maxima [A] time = 1.69955, size = 73, normalized size = 1.03

$$-\frac{1}{6} \left(\left(c^2 \arcsin \left(\frac{1}{\sqrt{c^2 |x|}} \right) - \frac{\sqrt{c^2 x^2 - 1}}{x^2} \right) c + \frac{2 \operatorname{arccosh}(cx)}{x^3} \right) b - \frac{a}{3x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^4,x, algorithm="maxima")

[Out] $-1/6*((c^2*\arcsin(1/(\sqrt{c^2}*abs(x)))) - \sqrt{c^2*x^2 - 1}/x^2)*c + 2*\arccosh(c*x)/x^3)*b - 1/3*a/x^3$

Fricas [A] time = 2.64239, size = 234, normalized size = 3.3

$$\frac{2b^3x^3 \arctan\left(-cx + \sqrt{c^2x^2 - 1}\right) + 2bx^3 \log\left(-cx + \sqrt{c^2x^2 - 1}\right) + \sqrt{c^2x^2 - 1}bcx + 2\left(bx^3 - b\right) \log\left(cx + \sqrt{c^2x^2 - 1}\right) - 2a}{6x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^4,x, algorithm="fricas")

[Out] $1/6*(2*b*c^3*x^3*\arctan(-c*x + \sqrt{c^2*x^2 - 1}) + 2*b*x^3*\log(-c*x + \sqrt{c^2*x^2 - 1}) + \sqrt{c^2*x^2 - 1}*b*c*x + 2*(b*x^3 - b)*\log(c*x + \sqrt{c^2*x^2 - 1}) - 2*a)/x^3$

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{a + b \operatorname{acosh}(cx)}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*acosh(c*x))/x**4,x)

[Out] Integral((a + b*acosh(c*x))/x**4, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{b \operatorname{arcosh}(cx) + a}{x^4} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^4,x, algorithm="giac")

[Out] integrate((b*arccosh(c*x) + a)/x^4, x)

$$3.141 \quad \int \frac{a+b \cosh^{-1}(cx)}{x^5} dx$$

Optimal. Leaf size=72

$$-\frac{a+b \cosh^{-1}(cx)}{4x^4} + \frac{bc^3 \sqrt{cx-1} \sqrt{cx+1}}{6x} + \frac{bc \sqrt{cx-1} \sqrt{cx+1}}{12x^3}$$

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(12*x^3) + (b*c^3*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(6*x) - (a + b*ArcCosh[c*x])/(4*x^4)

Rubi [A] time = 0.0322867, antiderivative size = 72, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {5662, 103, 12, 95}

$$-\frac{a+b \cosh^{-1}(cx)}{4x^4} + \frac{bc^3 \sqrt{cx-1} \sqrt{cx+1}}{6x} + \frac{bc \sqrt{cx-1} \sqrt{cx+1}}{12x^3}$$

Antiderivative was successfully verified.

[In] Int[(a + b*ArcCosh[c*x])/x^5,x]

[Out] (b*c*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(12*x^3) + (b*c^3*Sqrt[-1 + c*x]*Sqrt[1 + c*x])/(6*x) - (a + b*ArcCosh[c*x])/(4*x^4)

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^ (n_.)*((d_.)*(x_.))^ (m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 103

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] + Dist[1/((m + 1)*(b*c - a*d)*(b*e - a*f)), Int[(a + b*x)^(m + 1)*(c + d*x)^n*(e + f*x)^p*Simp[a*d*f*(m + 1) - b*(d*e*(m + n + 2) + c*f*(m + p + 2)) - b*d*f*(m + n + p + 3)*x, x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && LtQ[m, -1] && IntegerQ[m] && (IntegerQ[n] || IntegersQ[2*n, 2*p])

Rule 12

Int[(a_.)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_.)*(v_) /; FreeQ[b, x]]

Rule 95

Int[((a_.) + (b_.)*(x_.))^ (m_.)*((c_.) + (d_.)*(x_.))^ (n_.)*((e_.) + (f_.)*(x_.))^ (p_.), x_Symbol] :> Simp[(b*(a + b*x)^(m + 1)*(c + d*x)^(n + 1)*(e + f*x)^(p + 1))/((m + 1)*(b*c - a*d)*(b*e - a*f)), x] /; FreeQ[{a, b, c, d, e, f, m, n, p}, x] && EqQ[Simplify[m + n + p + 3], 0] && EqQ[a*d*f*(m + 1) + b*c*f*(n + 1) + b*d*e*(p + 1), 0] && NeQ[m, -1]

Rubi steps

$$\begin{aligned}
\int \frac{a + b \cosh^{-1}(cx)}{x^5} dx &= -\frac{a + b \cosh^{-1}(cx)}{4x^4} + \frac{1}{4}(bc) \int \frac{1}{x^4 \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{12x^3} - \frac{a + b \cosh^{-1}(cx)}{4x^4} + \frac{1}{12}(bc) \int \frac{2c^2}{x^2 \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{12x^3} - \frac{a + b \cosh^{-1}(cx)}{4x^4} + \frac{1}{6}(bc^3) \int \frac{1}{x^2 \sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= \frac{bc \sqrt{-1 + cx} \sqrt{1 + cx}}{12x^3} + \frac{bc^3 \sqrt{-1 + cx} \sqrt{1 + cx}}{6x} - \frac{a + b \cosh^{-1}(cx)}{4x^4}
\end{aligned}$$

Mathematica [A] time = 0.0289037, size = 50, normalized size = 0.69

$$\frac{-3a + bcx\sqrt{cx-1}\sqrt{cx+1}(2c^2x^2+1) - 3b \cosh^{-1}(cx)}{12x^4}$$

Antiderivative was successfully verified.

[In] Integrate[(a + b*ArcCosh[c*x])/x^5,x]

[Out] (-3*a + b*c*x*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(1 + 2*c^2*x^2) - 3*b*ArcCosh[c*x])/(12*x^4)

Maple [A] time = 0.004, size = 62, normalized size = 0.9

$$c^4 \left(-\frac{a}{4c^4x^4} + b \left(-\frac{\operatorname{arccosh}(cx)}{4c^4x^4} + \frac{2c^2x^2+1}{12c^3x^3} \sqrt{cx-1} \sqrt{cx+1} \right) \right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))/x^5,x)

[Out] c^4*(-1/4*a/c^4/x^4+b*(-1/4/c^4/x^4*arccosh(c*x)+1/12*(c*x-1)^(1/2)*(c*x+1)^(1/2)*(2*c^2*x^2+1)/c^3/x^3))

Maxima [A] time = 1.64523, size = 77, normalized size = 1.07

$$\frac{1}{12} \left(\left(\frac{2\sqrt{c^2x^2-1}c^2}{x} + \frac{\sqrt{c^2x^2-1}}{x^3} \right) c - \frac{3 \operatorname{arccosh}(cx)}{x^4} \right) b - \frac{a}{4x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^5,x, algorithm="maxima")

[Out] 1/12*((2*sqrt(c^2*x^2 - 1)*c^2/x + sqrt(c^2*x^2 - 1)/x^3)*c - 3*arccosh(c*x)/x^4)*b - 1/4*a/x^4

Fricas [A] time = 2.5122, size = 139, normalized size = 1.93

$$\frac{3ax^4 - 3b \log\left(cx + \sqrt{c^2x^2 - 1}\right) + (2bc^3x^3 + bcx)\sqrt{c^2x^2 - 1} - 3a}{12x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^5,x, algorithm="fricas")

[Out] 1/12*(3*a*x^4 - 3*b*log(c*x + sqrt(c^2*x^2 - 1)) + (2*b*c^3*x^3 + b*c*x)*sqrt(c^2*x^2 - 1) - 3*a)/x^4

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{a + b \operatorname{acosh}(cx)}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*acosh(c*x))/x**5,x)

[Out] Integral((a + b*acosh(c*x))/x**5, x)

Giac [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{b \operatorname{arcosh}(cx) + a}{x^5} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))/x^5,x, algorithm="giac")

[Out] integrate((b*arccosh(c*x) + a)/x^5, x)

3.142 $\int x^2 \sqrt{a + b \cosh^{-1}(cx)} dx$

Optimal. Leaf size=213

$$\frac{\sqrt{\pi} \sqrt{b} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^3} - \frac{\sqrt{\frac{\pi}{3}} \sqrt{b} e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{48c^3} - \frac{\sqrt{\pi} \sqrt{b} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^3} - \frac{\sqrt{\frac{\pi}{3}} \sqrt{b} e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{48c^3}$$

[Out] $(x^3 \sqrt{a + b \operatorname{ArcCosh}[c x]})/3 - (\sqrt{b} E^{(a/b)} \sqrt{\pi} \operatorname{Erf}[\sqrt{a + b \operatorname{ArcCosh}[c x]}/\sqrt{b}])/(16 c^3) - (\sqrt{b} E^{((3 a)/b)} \sqrt{\pi/3} \operatorname{Erf}[(\sqrt{3} \sqrt{a + b \operatorname{ArcCosh}[c x]})/\sqrt{b}])/(48 c^3) - (\sqrt{b} \sqrt{\pi} \operatorname{Erfi}[\sqrt{a + b \operatorname{ArcCosh}[c x]}/\sqrt{b}])/(16 c^3 E^{(a/b)}) - (\sqrt{b} \sqrt{\pi/3} \operatorname{Erfi}[(\sqrt{3} \sqrt{a + b \operatorname{ArcCosh}[c x]})/\sqrt{b}])/(48 c^3 E^{((3 a)/b)})$

Rubi [A] time = 0.78825, antiderivative size = 213, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 7, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.438$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi} \sqrt{b} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^3} - \frac{\sqrt{\frac{\pi}{3}} \sqrt{b} e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{48c^3} - \frac{\sqrt{\pi} \sqrt{b} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^3} - \frac{\sqrt{\frac{\pi}{3}} \sqrt{b} e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{48c^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2 \sqrt{a + b \operatorname{ArcCosh}[c x]}, x]$

[Out] $(x^3 \sqrt{a + b \operatorname{ArcCosh}[c x]})/3 - (\sqrt{b} E^{(a/b)} \sqrt{\pi} \operatorname{Erf}[\sqrt{a + b \operatorname{ArcCosh}[c x]}/\sqrt{b}])/(16 c^3) - (\sqrt{b} E^{((3 a)/b)} \sqrt{\pi/3} \operatorname{Erf}[(\sqrt{3} \sqrt{a + b \operatorname{ArcCosh}[c x]})/\sqrt{b}])/(48 c^3) - (\sqrt{b} \sqrt{\pi} \operatorname{Erfi}[\sqrt{a + b \operatorname{ArcCosh}[c x]}/\sqrt{b}])/(16 c^3 E^{(a/b)}) - (\sqrt{b} \sqrt{\pi/3} \operatorname{Erfi}[(\sqrt{3} \sqrt{a + b \operatorname{ArcCosh}[c x]})/\sqrt{b}])/(48 c^3 E^{((3 a)/b)})$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c x])^n (b + x)^m, x_{\text{Symbol}}] \rightarrow \operatorname{Simp}[(x^{m+1} (a + b \operatorname{ArcCosh}[c x])^n)/(m+1), x] - \operatorname{Dist}[(b c^n)/(m+1), \operatorname{Int}[(x^{m+1} (a + b \operatorname{ArcCosh}[c x])^{n-1})/(\sqrt{-1 + c x} \sqrt{1 + c x}), x], x] /;$ $\text{FreeQ}\{a, b, c, x\} \ \&\& \ \text{IGtQ}[m, 0] \ \&\& \ \text{GtQ}[n, 0]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c x])^n (b + x)^m ((d_1 + (e_1 + x)^{p_1})^{d_2} + (e_2 + x)^{p_2}), x_{\text{Symbol}}] \rightarrow \operatorname{Dist}[(d_1 d_2)^p / c^m + 1, \operatorname{Subst}[\operatorname{Int}[(a + b x)^n \operatorname{Cosh}[x]^m \operatorname{Sinh}[x]^{(2p+1)}, x], x, \operatorname{ArcCosh}[c x]], x] /;$ $\text{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, n\}, x \ \&\& \ \text{EqQ}[e_1 - c d_1, 0] \ \&\& \ \text{EqQ}[e_2 + c d_2, 0] \ \&\& \ \text{IntegerQ}[p + 1/2] \ \&\& \ \text{GtQ}[p, -1] \ \&\& \ \text{IGtQ}[m, 0] \ \&\& \ (\text{GtQ}[d_1, 0] \ \&\& \ \text{LtQ}[d_2, 0])$

Rule 3312

$\operatorname{Int}[(c + d x)^m \sin[e + f x]^n, x_{\text{Symbol}}] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d x)^m \sin[e + f x]^n, x], x] /;$ $\text{FreeQ}\{c, d, e, f, m\}, x \ \&\& \ \text{IGtQ}[n, 1] \ \&\& \ (\text{!RationalQ}[m] \ \|\ (\text{GeQ}[m, -1] \ \&\& \ \text{LtQ}[m, 1]))$

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol]
] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x^2 \sqrt{a + b \cosh^{-1}(cx)} dx &= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{1}{6} (bc) \int \frac{x^3}{\sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}} dx \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \operatorname{Subst} \left(\int \frac{\cosh^3(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx) \right)}{6c^3} \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \operatorname{Subst} \left(\int \left(\frac{3 \cosh(x)}{4\sqrt{a+bx}} + \frac{\cosh(3x)}{4\sqrt{a+bx}} \right) dx, x, \cosh^{-1}(cx) \right)}{6c^3} \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \operatorname{Subst} \left(\int \frac{\cosh(3x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx) \right)}{24c^3} - \frac{b \operatorname{Subst} \left(\int \frac{\cosh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx) \right)}{8c^3} \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \operatorname{Subst} \left(\int \frac{e^{-3x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx) \right)}{48c^3} - \frac{b \operatorname{Subst} \left(\int \frac{e^{3x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx) \right)}{48c^3} \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{\operatorname{Subst} \left(\int e^{\frac{3a}{b} - \frac{3x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)} \right)}{24c^3} - \frac{\operatorname{Subst} \left(\int e^{-\frac{3a}{b} + 3x} dx, x, \sqrt{a + b \cosh^{-1}(cx)} \right)}{24c^3} \\
&= \frac{1}{3} x^3 \sqrt{a + b \cosh^{-1}(cx)} - \frac{\sqrt{b} e^{a/b} \sqrt{\pi} \operatorname{erf} \left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}} \right)}{16c^3} - \frac{\sqrt{b} e^{\frac{3a}{b}} \sqrt{\frac{\pi}{3}} \operatorname{erf} \left(\frac{\sqrt{3} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}} \right)}{48c^3}
\end{aligned}$$

Mathematica [A] time = 0.480813, size = 214, normalized size = 1.

$$\frac{e^{-\frac{3a}{b}} \sqrt{a + b \cosh^{-1}(cx)} \left(9e^{\frac{4a}{b}} \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}} \operatorname{Gamma} \left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx) \right) + \sqrt{3} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \operatorname{Gamma} \left(\frac{3}{2}, -\frac{3(a+b \cosh^{-1}(cx))}{b} \right) \right)}{72c^3 \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*Sqrt[a + b*ArcCosh[c*x]],x]

[Out] (Sqrt[a + b*ArcCosh[c*x]]*(9*E^((4*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, a/b + ArcCosh[c*x]] + Sqrt[3]*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, (-3*(a + b*ArcCosh[c*x]))/b] + 9*E^((2*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, -((a + b*ArcCosh[c*x])/b)] + Sqrt[3]*E^((6*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, (3*(a + b*ArcCosh[c*x]))/b])/((72*c^3*E^((3*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])^2/b^2)])

Maple [F] time = 0.109, size = 0, normalized size = 0.

$$\int x^2 \sqrt{a + b \operatorname{arccosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*(a+b*arccosh(c*x))^(1/2),x)

[Out] int(x^2*(a+b*arccosh(c*x))^(1/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{b \operatorname{arccosh}(cx) + ax^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*(a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(b*arccosh(c*x) + a)*x^2, x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*(a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 \sqrt{a + b \operatorname{acosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2*(a+b*acosh(c*x))**(1/2),x)

```
[Out] Integral(x**2*sqrt(a + b*acosh(c*x)), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*(a+b*arccosh(c*x))^(1/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.143 $\int x \sqrt{a + b \cosh^{-1}(cx)} dx$

Optimal. Leaf size=145

$$\frac{\sqrt{\frac{\pi}{2}} \sqrt{b} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} - \frac{\sqrt{\frac{\pi}{2}} \sqrt{b} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} - \frac{\sqrt{a+b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a+b \cosh^{-1}(cx)}$$

[Out] $-\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/(4*c^2) + (x^2*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/2 - (\operatorname{Sqrt}[b]*E^{((2*a)/b)}*\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(16*c^2) - (\operatorname{Sqrt}[b]*\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(16*c^2)*E^{((2*a)/b)}$

Rubi [A] time = 0.649158, antiderivative size = 145, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5664, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\frac{\pi}{2}} \sqrt{b} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} - \frac{\sqrt{\frac{\pi}{2}} \sqrt{b} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2} \sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} - \frac{\sqrt{a+b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a+b \cosh^{-1}(cx)}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]], x]$

[Out] $-\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/(4*c^2) + (x^2*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/2 - (\operatorname{Sqrt}[b]*E^{((2*a)/b)}*\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(16*c^2) - (\operatorname{Sqrt}[b]*\operatorname{Sqrt}[\operatorname{Pi}/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(16*c^2)*E^{((2*a)/b)}$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n)/(m+1), x] - \operatorname{Dist}[(b*c^n)/(m+1), \operatorname{Int}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m*((d_1) + (e_1)*(x))^p*((d_2) + (e_2)*(x))^q, x_Symbol] \rightarrow \operatorname{Dist}[(d_1*d_2)^p/c^{m+1}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x]^{2*p+1}, x], x, \operatorname{ArcCosh}[c*x]], x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3312

$\operatorname{Int}[(c + d*x)^m*\sin[(e + f*x)^n], x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sin}[e + f*x]^n, x], x] /;$ FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))

Rule 3307

$\operatorname{Int}[(c + d*x)^m*\sin[(e + \operatorname{Pi}*(k*x) + f*x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/(E^{I*k*\operatorname{Pi}}*E^{I*(e + f*x)}), x], x] - \operatorname{Dist}[-I/2, \operatorname{Int}[(c + d*x)^m/(E^{-I*k*\operatorname{Pi}}*E^{I*(e + f*x)}), x], x]$

$I/2, \text{Int}[(c + d*x)^m * E^{(I*k*Pi)} * E^{(I*(e + f*x))}, x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x] \&\& \text{IntegerQ}[2*k]$

Rule 2180

$\text{Int}[(F_)^{((g_.) * ((e_.) + (f_.) * (x_)))} / \text{Sqrt}[(c_.) + (d_.) * (x_)], x_Symbol] :> \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x] \&\& !\$UseGamma == True$

Rule 2204

$\text{Int}[(F_)^{((a_.) + (b_.) * ((c_.) + (d_.) * (x_)) ^ 2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erfi}[(c + d*x) * \text{Rt}[b * \text{Log}[F], 2]]) / (2 * d * \text{Rt}[b * \text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^{((a_.) + (b_.) * ((c_.) + (d_.) * (x_)) ^ 2)}, x_Symbol] :> \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erf}[(c + d*x) * \text{Rt}[-(b * \text{Log}[F]), 2]]) / (2 * d * \text{Rt}[-(b * \text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int x \sqrt{a + b \cosh^{-1}(cx)} dx &= \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{1}{4} (bc) \int \frac{x^2}{\sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}} dx \\ &= \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \frac{\cosh^2(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c^2} \\ &= \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \left(\frac{1}{2\sqrt{a+bx}} + \frac{\cosh(2x)}{2\sqrt{a+bx}}\right) dx, x, \cosh^{-1}(cx)\right)}{4c^2} \\ &= -\frac{\sqrt{a + b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \frac{\cosh(2x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{8c^2} \\ &= -\frac{\sqrt{a + b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \frac{e^{-2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{16c^2} - \frac{b \text{Subst}\left(\int \frac{e^{2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{16c^2} \\ &= -\frac{\sqrt{a + b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{\text{Subst}\left(\int e^{\frac{2a}{b} - \frac{2x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{8c^2} \\ &= -\frac{\sqrt{a + b \cosh^{-1}(cx)}}{4c^2} + \frac{1}{2} x^2 \sqrt{a + b \cosh^{-1}(cx)} - \frac{\sqrt{b} e^{\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \text{erf}\left(\frac{\sqrt{2} \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} - \frac{\sqrt{b} e^{\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \text{erf}\left(\frac{\sqrt{2} \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c^2} \end{aligned}$$

Mathematica [A] time = 0.380288, size = 136, normalized size = 0.94

$$\frac{-\sqrt{2\pi}\sqrt{b}\left(\sinh\left(\frac{2a}{b}\right) + \cosh\left(\frac{2a}{b}\right)\right)\text{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right) + \sqrt{2\pi}\sqrt{b}\left(\sinh\left(\frac{2a}{b}\right) - \cosh\left(\frac{2a}{b}\right)\right)\text{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{32c^2}$$

Antiderivative was successfully verified.

[In] Integrate[x*Sqrt[a + b*ArcCosh[c*x]], x]

[Out] (8*Sqrt[a + b*ArcCosh[c*x]]*Cosh[2*ArcCosh[c*x]] + Sqrt[b]*Sqrt[2*Pi]*Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(-Cosh[(2*a)/b] + Sinh[(2*a)/b])

) - Sqrt[b]*Sqrt[2*Pi]*Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b])/(32*c^2)

Maple [F] time = 0.108, size = 0, normalized size = 0.

$$\int x\sqrt{a + b\operatorname{arccosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*(a+b*arccosh(c*x))^(1/2),x)

[Out] int(x*(a+b*arccosh(c*x))^(1/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{b \operatorname{arcosh}(cx) + ax} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(b*arccosh(c*x) + a)*x, x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x\sqrt{a + b \operatorname{acosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*acosh(c*x))**(1/2),x)

[Out] Integral(x*sqrt(a + b*acosh(c*x)), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*(a+b*arccosh(c*x))^(1/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.144 $\int \sqrt{a + b \cosh^{-1}(cx)} dx$

Optimal. Leaf size=102

$$\frac{\sqrt{\pi}\sqrt{b}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} - \frac{\sqrt{\pi}\sqrt{b}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} + x\sqrt{a+b\cosh^{-1}(cx)}$$

[Out] x*Sqrt[a + b*ArcCosh[c*x]] - (Sqrt[b]*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(4*c) - (Sqrt[b]*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(4*c*E^(a/b))

Rubi [A] time = 0.412052, antiderivative size = 102, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5654, 5781, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}\sqrt{b}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} - \frac{\sqrt{\pi}\sqrt{b}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} + x\sqrt{a+b\cosh^{-1}(cx)}$$

Antiderivative was successfully verified.

[In] Int[Sqrt[a + b*ArcCosh[c*x]], x]

[Out] x*Sqrt[a + b*ArcCosh[c*x]] - (Sqrt[b]*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(4*c) - (Sqrt[b]*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(4*c*E^(a/b))

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^ (n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(q_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !UseGamma == True

Rule 2204

$\text{Int}[(F_)^{(a_)} + (b_)*((c_)+ (d_)*(x_))^2], x_Symbol] \rightarrow \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erfi}[(c + d*x)*\text{Rt}[b*\text{Log}[F], 2]])/(2*d*\text{Rt}[b*\text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^{(a_)} + (b_)*((c_)+ (d_)*(x_))^2], x_Symbol] \rightarrow \text{Simp}[(F^a*\text{Sqrt}[\text{Pi}]*\text{Erf}[(c + d*x)*\text{Rt}[-(b*\text{Log}[F]), 2]])/(2*d*\text{Rt}[-(b*\text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \int \sqrt{a + b \cosh^{-1}(cx)} dx &= x\sqrt{a + b \cosh^{-1}(cx)} - \frac{1}{2}(bc) \int \frac{x}{\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}} dx \\ &= x\sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \frac{\cosh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{2c} \\ &= x\sqrt{a + b \cosh^{-1}(cx)} - \frac{b \text{Subst}\left(\int \frac{e^{-x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c} - \frac{b \text{Subst}\left(\int \frac{e^x}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c} \\ &= x\sqrt{a + b \cosh^{-1}(cx)} - \frac{\text{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2c} - \frac{\text{Subst}\left(\int e^{-\frac{a}{b} + \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2c} \\ &= x\sqrt{a + b \cosh^{-1}(cx)} - \frac{\sqrt{b}e^{a/b}\sqrt{\pi}\text{erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} - \frac{\sqrt{b}e^{-a/b}\sqrt{\pi}\text{erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4c} \end{aligned}$$

Mathematica [A] time = 0.222177, size = 100, normalized size = 0.98

$$\frac{e^{-\frac{a}{b}}\sqrt{a + b \cosh^{-1}(cx)}\left(\frac{e^{\frac{2a}{b}}\text{Gamma}\left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right)}{\sqrt{\frac{a}{b} + \cosh^{-1}(cx)}} + \frac{\text{Gamma}\left(\frac{3}{2}, -\frac{a+b \cosh^{-1}(cx)}{b}\right)}{\sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}}}\right)}{2c}$$

Warning: Unable to verify antiderivative.

[In] Integrate[Sqrt[a + b*ArcCosh[c*x]], x]

[Out] (Sqrt[a + b*ArcCosh[c*x]]*(E^((2*a)/b)*Gamma[3/2, a/b + ArcCosh[c*x]])/Sqrt[a/b + ArcCosh[c*x]] + Gamma[3/2, -((a + b*ArcCosh[c*x])/b)]/Sqrt[-((a + b*ArcCosh[c*x])/b)))/(2*c*E^(a/b))

Maple [F] time = 0.092, size = 0, normalized size = 0.

$$\int \sqrt{a + b \text{arccosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))^(1/2), x)

[Out] `int((a+b*arccosh(c*x))^(1/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{b \operatorname{arccosh}(cx) + a} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")`

[Out] `integrate(sqrt(b*arccosh(c*x) + a), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{a + b \operatorname{acosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*acosh(c*x))**(1/2),x)`

[Out] `Integral(sqrt(a + b*acosh(c*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate((a+b*arccosh(c*x))^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

3.145 $\int x^2 (a + b \cosh^{-1}(cx))^{3/2} dx$

Optimal. Leaf size=292

$$\frac{3\sqrt{\pi}b^{3/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{32c^3} - \frac{\sqrt{\frac{\pi}{3}}b^{3/2}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{96c^3} + \frac{3\sqrt{\pi}b^{3/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{32c^3} + \frac{\sqrt{\frac{\pi}{3}}b^{3/2}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{96c^3}$$

```
[Out] -(b*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*Sqrt[a + b*ArcCosh[c*x]])/(3*c^3) - (b*x^2
*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*Sqrt[a + b*ArcCosh[c*x]])/(6*c) + (x^3*(a + b
*ArcCosh[c*x])^(3/2))/3 - (3*b^(3/2)*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCos
h[c*x]]/Sqrt[b]])/(32*c^3) - (b^(3/2)*E^((3*a)/b)*Sqrt[Pi/3]*Erf[(Sqrt[3]*S
qrt[a + b*ArcCosh[c*x]])/Sqrt[b]])/(96*c^3) + (3*b^(3/2)*Sqrt[Pi]*Erfi[Sqrt
[a + b*ArcCosh[c*x]]/Sqrt[b]])/(32*c^3*E^(a/b)) + (b^(3/2)*Sqrt[Pi/3]*Erfi[
(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]])/(96*c^3*E^((3*a)/b))
```

Rubi [A] time = 1.25055, antiderivative size = 292, normalized size of antiderivative = 1, number of steps used = 22, number of rules used = 10, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5664, 5759, 5718, 5658, 3308, 2180, 2205, 2204, 5670, 5448}

$$\frac{3\sqrt{\pi}b^{3/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{32c^3} - \frac{\sqrt{\frac{\pi}{3}}b^{3/2}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{96c^3} + \frac{3\sqrt{\pi}b^{3/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{32c^3} + \frac{\sqrt{\frac{\pi}{3}}b^{3/2}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{96c^3}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*(a + b*ArcCosh[c*x])^(3/2), x]
```

```
[Out] -(b*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*Sqrt[a + b*ArcCosh[c*x]])/(3*c^3) - (b*x^2
*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*Sqrt[a + b*ArcCosh[c*x]])/(6*c) + (x^3*(a + b
*ArcCosh[c*x])^(3/2))/3 - (3*b^(3/2)*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCos
h[c*x]]/Sqrt[b]])/(32*c^3) - (b^(3/2)*E^((3*a)/b)*Sqrt[Pi/3]*Erf[(Sqrt[3]*S
qrt[a + b*ArcCosh[c*x]])/Sqrt[b]])/(96*c^3) + (3*b^(3/2)*Sqrt[Pi]*Erfi[Sqrt
[a + b*ArcCosh[c*x]]/Sqrt[b]])/(32*c^3*E^(a/b)) + (b^(3/2)*Sqrt[Pi/3]*Erfi[
(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]])/(96*c^3*E^((3*a)/b))
```

Rule 5664

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] :> Simp[
(x^(m + 1)*(a + b*ArcCosh[c*x])^n)/(m + 1), x] - Dist[(b*c^n)/(m + 1), Int[
(x^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x]
, x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]
```

Rule 5759

```
Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((f_.)*(x_.))^(m_.))/(Sqrt[(d1
_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[(f*(f*x)^(m
- 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]*(a + b*ArcCosh[c*x])^n)/(e1*e2^m), x]
+ (Dist[(f^2*(m - 1))/(c^2*m), Int[((f*x)^(m - 2)*(a + b*ArcCosh[c*x])^n)/
(Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x], x] + Dist[(b*f^n*Sqrt[d1 + e1*x]*Sqr
t[d2 + e2*x])/(c*d1*d2*m*Sqrt[1 + c*x]*Sqrt[-1 + c*x]), Int[(f*x)^(m - 1)*(
a + b*ArcCosh[c*x])^(n - 1), x], x]) /; FreeQ[{a, b, c, d1, e1, d2, e2, f},
x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] &&
IntegerQ[m]
```

Rule 5718

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)*(x_)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(p_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p])), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]
```

Rule 5658

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_), x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(2)), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(2)), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)*(x_)^(m_.), x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sinh[(a_.) + (b_.)*(x_)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]
```

Rubi steps

$$\begin{aligned}
\int x^2 (a + b \cosh^{-1}(cx))^{3/2} dx &= \frac{1}{3} x^3 (a + b \cosh^{-1}(cx))^{3/2} - \frac{1}{2} (bc) \int \frac{x^3 \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= -\frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \frac{1}{3} x^3 (a + b \cosh^{-1}(cx))^{3/2} + \frac{1}{12} b^2 \int \frac{1}{\sqrt{a}} \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} + \\
&= -\frac{b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{3c^3} - \frac{bx^2 \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{6c} +
\end{aligned}$$

Mathematica [A] time = 2.25499, size = 540, normalized size = 1.85

$$\frac{ae^{-\frac{3a}{b}} \sqrt{a + b \cosh^{-1}(cx)} \left(9e^{\frac{4a}{b}} \sqrt{-\frac{a + b \cosh^{-1}(cx)}{b}} \text{Gamma}\left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{3} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \text{Gamma}\left(\frac{3}{2}, -\frac{3(a+b)}{b}\right) \right)}{72c^3 \sqrt{-\frac{a+b}{b}}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*(a + b*ArcCosh[c*x])^(3/2), x]

[Out] (a*Sqrt[a + b*ArcCosh[c*x]]*(9*E^((4*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, a/b + ArcCosh[c*x]] + Sqrt[3]*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, (-3*(a + b*ArcCosh[c*x]))/b] + 9*E^((2*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, -((a + b*ArcCosh[c*x])/b)] + Sqrt[3]*E^((6*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, (3*(a + b*ArcCosh[c*x]))/b])/ (72*c^3*E^((3*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])^2/b^2)]) + (Sqrt[b]*(9*(-12*Sqrt[b]*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)*Sqrt[a + b*ArcCosh[c*x]] + 8*Sqrt[b]*c*x*ArcCosh[c*x]*Sqrt[a + b*ArcCosh[c*x]] + (2*a + 3*b)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] - Sinh[a/b]) + (2*a - 3*b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b])) + (2*a + b)*Sqrt[3*Pi]*Erfi[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(3*a)/b] - Sinh[(3*a)/b]) + (2*a - b)*Sqrt[3*Pi]*Erf[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(3*a)/b] + Sinh[(3*a)/b]) + 12*Sqrt[b]*Sqrt[a + b*ArcCosh[c*x]]*(2*ArcCosh[c*x]*Cosh[3*ArcCosh[c*x]] - Sinh[3*ArcCosh[c*x]]))/ (288*c^3)

Maple [F] time = 0.099, size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{arccosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^2*(a+b*arccosh(c*x))^(3/2),x)`

[Out] `int(x^2*(a+b*arccosh(c*x))^(3/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arcosh}(cx) + a)^{\frac{3}{2}} x^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2*(a+b*arccosh(c*x))^(3/2),x, algorithm="maxima")`

[Out] `integrate((b*arccosh(c*x) + a)^(3/2)*x^2, x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2*(a+b*arccosh(c*x))^(3/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{acosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2*(a+b*acosh(c*x))**(3/2),x)`

[Out] `Integral(x**2*(a + b*acosh(c*x))**(3/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2*(a+b*arccosh(c*x))^(3/2),x, algorithm="giac")`

[Out] `sage0*x`

3.146 $\int x \left(a + b \cosh^{-1}(cx) \right)^{3/2} dx$

Optimal. Leaf size=184

$$-\frac{3\sqrt{\frac{\pi}{2}}b^{3/2}e^{\frac{2a}{b}}\operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^2} + \frac{3\sqrt{\frac{\pi}{2}}b^{3/2}e^{-\frac{2a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^2} - \frac{(a+b\cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2(a+b\cosh^{-1}(cx))$$

[Out] $(-3*b*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/(8*c) - (a+b*\operatorname{ArcCosh}[c*x])^{3/2}/(4*c^2) + (x^2*(a+b*\operatorname{ArcCosh}[c*x])^{3/2})/2 - (3*b^{3/2}*E^{(2*a)/b}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(64*c^2) + (3*b^{3/2}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(64*c^2*E^{(2*a)/b})$

Rubi [A] time = 0.816092, antiderivative size = 184, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {5664, 5759, 5676, 5670, 5448, 12, 3308, 2180, 2204, 2205}

$$-\frac{3\sqrt{\frac{\pi}{2}}b^{3/2}e^{\frac{2a}{b}}\operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^2} + \frac{3\sqrt{\frac{\pi}{2}}b^{3/2}e^{-\frac{2a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^2} - \frac{(a+b\cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2(a+b\cosh^{-1}(cx))$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x*(a+b*\operatorname{ArcCosh}[c*x])^{3/2},x]$

[Out] $(-3*b*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/(8*c) - (a+b*\operatorname{ArcCosh}[c*x])^{3/2}/(4*c^2) + (x^2*(a+b*\operatorname{ArcCosh}[c*x])^{3/2})/2 - (3*b^{3/2}*E^{(2*a)/b}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(64*c^2) + (3*b^{3/2}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(64*c^2*E^{(2*a)/b})$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * x^m, x] \rightarrow \operatorname{Simp}[x^{m+1} * (a + b*\operatorname{ArcCosh}[c*x])^n / (m+1), x] - \operatorname{Dist}[(b*c*n)/(m+1), \operatorname{Int}[x^{m+1} * (a + b*\operatorname{ArcCosh}[c*x])^{n-1} / (\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]), x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5759

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (d1 + e1*x)^m * (d2 + e2*x)^n, x] \rightarrow \operatorname{Simp}[(f*(f*x)^{m-1} * \operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x] * (a + b*\operatorname{ArcCosh}[c*x])^n) / (e1*e2*m), x] + (\operatorname{Dist}[(f^2*(m-1))/(c^2*m), \operatorname{Int}[(f*x)^{m-2} * (a + b*\operatorname{ArcCosh}[c*x])^n / (\operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]), x], x] + \operatorname{Dist}[(b*f*n * \operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]) / (c*d1*d2*m * \operatorname{Sqrt}[1+c*x]*\operatorname{Sqrt}[-1+c*x]), \operatorname{Int}[(f*x)^{m-1} * (a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x]) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n / (\operatorname{Sqrt}[d1 + e1*x] * \operatorname{Sqrt}[d2 + e2*x]), x] \rightarrow \operatorname{Simp}[(a + b*\operatorname{ArcCosh}[c*x])^{n+1} / (b*c*\operatorname{Sqrt}[-(d1*d2)] * (n+1)), x] /;$ FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] &&

```
EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
]
```

Rule 5670

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[
1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]
```

Rule 5448

```
Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) +
(b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a +
b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] &
& IGtQ[p, 0]
```

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !Match
Q[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 3308

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x (a + b \cosh^{-1}(cx))^{3/2} dx &= \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} - \frac{1}{4}(3bc) \int \frac{x^2 \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} + \frac{1}{16}(3b^2) \int \frac{x^2 \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2} \\
&= -\frac{3bx\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{3/2}}{4c^2} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{3/2}
\end{aligned}$$

Mathematica [A] time = 1.00846, size = 165, normalized size = 0.9

$$-3\sqrt{2\pi}b^{3/2} \left(\sinh\left(\frac{2a}{b}\right) + \cosh\left(\frac{2a}{b}\right) \right) \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right) + 3\sqrt{2\pi}b^{3/2} \left(\cosh\left(\frac{2a}{b}\right) - \sinh\left(\frac{2a}{b}\right) \right) \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)$$

128c²

Warning: Unable to verify antiderivative.

[In] Integrate[x*(a + b*ArcCosh[c*x])^(3/2), x]

[Out] (3*b^(3/2)*Sqrt[2*Pi]*Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] - Sinh[(2*a)/b]) - 3*b^(3/2)*Sqrt[2*Pi]*Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b]) + 8*Sqrt[a + b*ArcCosh[c*x]]*(4*a*Cosh[2*ArcCosh[c*x]] + 4*b*ArcCosh[c*x]*Cosh[2*ArcCosh[c*x]] - 3*b*Sinh[2*ArcCosh[c*x]]))/(128*c^2)

Maple [F] time = 0.106, size = 0, normalized size = 0.

$$\int x (a + b \operatorname{arccosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*(a+b*arccosh(c*x))^(3/2), x)

[Out] int(x*(a+b*arccosh(c*x))^(3/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arccosh}(cx) + a)^{\frac{3}{2}} x dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x))^(3/2),x, algorithm="maxima")

[Out] integrate((b*arccosh(c*x) + a)^(3/2)*x, x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x))^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int x (a + b \operatorname{acosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*acosh(c*x))**(3/2),x)

[Out] Integral(x*(a + b*acosh(c*x))**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage0*x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*(a+b*arccosh(c*x))^(3/2),x, algorithm="giac")

[Out] sage0*x

3.147 $\int (a + b \cosh^{-1}(cx))^{3/2} dx$

Optimal. Leaf size=140

$$\frac{3\sqrt{\pi}b^{3/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8c} + \frac{3\sqrt{\pi}b^{3/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8c} - \frac{3b\sqrt{cx-1}\sqrt{cx+1}\sqrt{a+b\cosh^{-1}(cx)}}{2c} + x(a +$$

[Out] $(-3*b*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/(2*c) + x*(a + b*\operatorname{ArcCosh}[c*x])^{3/2} - (3*b^{3/2}*E^{(a/b)}*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*c) + (3*b^{3/2}*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*c*E^{(a/b)})$

Rubi [A] time = 0.427901, antiderivative size = 140, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5654, 5718, 5658, 3308, 2180, 2205, 2204}

$$\frac{3\sqrt{\pi}b^{3/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8c} + \frac{3\sqrt{\pi}b^{3/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8c} - \frac{3b\sqrt{cx-1}\sqrt{cx+1}\sqrt{a+b\cosh^{-1}(cx)}}{2c} + x(a +$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[(a + b*\operatorname{ArcCosh}[c*x])^{3/2}, x]$

[Out] $(-3*b*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/(2*c) + x*(a + b*\operatorname{ArcCosh}[c*x])^{3/2} - (3*b^{3/2}*E^{(a/b)}*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*c) + (3*b^{3/2}*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*c*E^{(a/b)})$

Rule 5654

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n, x] \rightarrow \operatorname{Simp}[x*(a + b*\operatorname{ArcCosh}[c*x])^n, x] - \operatorname{Dist}[b*c^n, \operatorname{Int}[(x*(a + b*\operatorname{ArcCosh}[c*x])^{n-1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /; \operatorname{FreeQ}\{a, b, c, x\} \ \&\& \operatorname{GtQ}[n, 0]$

Rule 5718

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (d1 + e1*x)^p * (d2 + e2*x)^q, x] \rightarrow \operatorname{Simp}[(d1 + e1*x)^{p+1} * (d2 + e2*x)^{q+1} * (a + b*\operatorname{ArcCosh}[c*x])^n / (2*e1*e2*(p+1)), x] - \operatorname{Dist}[(b*n * (-d1*d2))^{IntPart[p]} * (d1 + e1*x)^{FracPart[p]} * (d2 + e2*x)^{FracPart[p]}] / (2*c * (p+1) * (1 + c*x)^{FracPart[p]} * (-1 + c*x)^{FracPart[p]}), \operatorname{Int}[(-1 + c^2*x^2)^{p+1/2} * (a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, p\}, x \ \&\& \operatorname{EqQ}[e1 - c*d1, 0] \ \&\& \operatorname{EqQ}[e2 + c*d2, 0] \ \&\& \operatorname{GtQ}[n, 0] \ \&\& \operatorname{NeQ}[p, -1] \ \&\& \operatorname{IntegerQ}[p + 1/2]$

Rule 5658

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n, x] \rightarrow -\operatorname{Dist}[(b*c)^{-1}], \operatorname{Subst}[\operatorname{Int}[x^n * \operatorname{Sinh}[a/b - x/b], x], x, a + b*\operatorname{ArcCosh}[c*x]], x] /; \operatorname{FreeQ}\{a, b, c, n\}, x$

Rule 3308

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\int (a + b \cosh^{-1}(cx))^{3/2} dx &= x (a + b \cosh^{-1}(cx))^{3/2} - \frac{1}{2}(3bc) \int \frac{x \sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{-1 + cx} \sqrt{1 + cx}} dx \\
&= -\frac{3b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{2c} + x (a + b \cosh^{-1}(cx))^{3/2} + \frac{1}{4} (3b^2) \int \frac{1}{\sqrt{a + b \cosh^{-1}(cx)}} dx \\
&= -\frac{3b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{2c} + x (a + b \cosh^{-1}(cx))^{3/2} - \frac{(3b) \operatorname{Subst} \left(\int \frac{\sinh(\frac{a}{b} - \frac{ix}{\sqrt{x}})}{\sqrt{x}} dx \right)}{4} \\
&= -\frac{3b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{2c} + x (a + b \cosh^{-1}(cx))^{3/2} - \frac{(3b) \operatorname{Subst} \left(\int \frac{e^{-i(\frac{ia}{b} - \frac{ix}{\sqrt{x}})}}{\sqrt{x}} dx \right)}{4} \\
&= -\frac{3b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{2c} + x (a + b \cosh^{-1}(cx))^{3/2} - \frac{(3b) \operatorname{Subst} \left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx \right)}{4} \\
&= -\frac{3b \sqrt{-1 + cx} \sqrt{1 + cx} \sqrt{a + b \cosh^{-1}(cx)}}{2c} + x (a + b \cosh^{-1}(cx))^{3/2} - \frac{3b^{3/2} e^{a/b} \sqrt{\pi} \operatorname{erf} \left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}} \right)}{8c}
\end{aligned}$$

Mathematica [A] time = 0.6246, size = 269, normalized size = 1.92

$$\frac{ae^{-\frac{a}{b}} \sqrt{a + b \cosh^{-1}(cx)} \left(\frac{e^{\frac{2a}{b}} \operatorname{Gamma} \left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx) \right)}{\sqrt{\frac{a}{b} + \cosh^{-1}(cx)}} + \frac{\operatorname{Gamma} \left(\frac{3}{2}, -\frac{a + b \cosh^{-1}(cx)}{b} \right)}{\sqrt{-\frac{a + b \cosh^{-1}(cx)}{b}}} \right)}{2c} + \frac{b \left(\frac{\sqrt{\pi} (2a - 3b) \left(\sinh \left(\frac{a}{b} \right) + \cosh \left(\frac{a}{b} \right) \right) \operatorname{Erf} \left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}} \right)}{\sqrt{b}} \right)}{8c}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[(a + b*ArcCosh[c*x])^(3/2), x]
```

```
[Out] (a*Sqrt[a + b*ArcCosh[c*x]]*(E^((2*a)/b)*Gamma[3/2, a/b + ArcCosh[c*x]])/Sqrt[a/b + ArcCosh[c*x]] + Gamma[3/2, -((a + b*ArcCosh[c*x])/b)]/Sqrt[-((a + b*ArcCosh[c*x])/b)))/(2*c*E^(a/b)) + (b*(-12*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)*Sqrt[a + b*ArcCosh[c*x]] + 8*c*x*ArcCosh[c*x]*Sqrt[a + b*ArcCosh[c*x]]) + ((2*a + 3*b)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] - Sinh[a/b]))/Sqrt[b] + ((2*a - 3*b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b]))/Sqrt[b]))/(8*c)
```

Maple [F] time = 0.094, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((a+b*arccosh(c*x))^(3/2), x)
```

```
[Out] int((a+b*arccosh(c*x))^(3/2), x)
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arcosh}(cx) + a)^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((a+b*arccosh(c*x))^(3/2), x, algorithm="maxima")
```

```
[Out] integrate((b*arccosh(c*x) + a)^(3/2), x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((a+b*arccosh(c*x))^(3/2), x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int (a + b \operatorname{acosh}(cx))^{\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((a+b*acosh(c*x))**(3/2), x)
```

```
[Out] Integral((a + b*acosh(c*x))**(3/2), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^(3/2),x, algorithm="giac")

[Out] sage₀*x

3.148 $\int x^2 (a + b \cosh^{-1}(cx))^{5/2} dx$

Optimal. Leaf size=337

$$\frac{15\sqrt{\pi}b^{5/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^3} - \frac{5\sqrt{\frac{\pi}{3}}b^{5/2}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{576c^3} - \frac{15\sqrt{\pi}b^{5/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^3} - 5\sqrt{\frac{\pi}{3}}b^{5/2}$$

[Out] $(5*b^2*x*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/(6*c^2) + (5*b^2*x^3*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/36 - (5*b*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)})/(9*c^3) - (5*b*x^2*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)})/(18*c) + (x^3*(a + b*\operatorname{ArcCosh}[c*x])^{(5/2)})/3 - (15*b^{(5/2)}*E^{(a/b)}*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(64*c^3) - (5*b^{(5/2)}*E^{((3*a)/b)}*\operatorname{Sqrt}[\pi/3]*\operatorname{Erf}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(576*c^3) - (15*b^{(5/2)}*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(64*c^3*E^{(a/b)}) - (5*b^{(5/2)}*\operatorname{Sqrt}[\pi/3]*\operatorname{Erfi}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(576*c^3*E^{((3*a)/b)})$

Rubi [A] time = 2.08993, antiderivative size = 337, normalized size of antiderivative = 1., number of steps used = 24, number of rules used = 10, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {5664, 5759, 5718, 5654, 5781, 3307, 2180, 2204, 2205, 3312}

$$\frac{15\sqrt{\pi}b^{5/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^3} - \frac{5\sqrt{\frac{\pi}{3}}b^{5/2}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{576c^3} - \frac{15\sqrt{\pi}b^{5/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{64c^3} - 5\sqrt{\frac{\pi}{3}}b^{5/2}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2*(a + b*\operatorname{ArcCosh}[c*x])^{(5/2)}, x]$

[Out] $(5*b^2*x*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/(6*c^2) + (5*b^2*x^3*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/36 - (5*b*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)})/(9*c^3) - (5*b*x^2*\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)})/(18*c) + (x^3*(a + b*\operatorname{ArcCosh}[c*x])^{(5/2)})/3 - (15*b^{(5/2)}*E^{(a/b)}*\operatorname{Sqrt}[\pi]*\operatorname{Erf}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(64*c^3) - (5*b^{(5/2)}*E^{((3*a)/b)}*\operatorname{Sqrt}[\pi/3]*\operatorname{Erf}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(576*c^3) - (15*b^{(5/2)}*\operatorname{Sqrt}[\pi]*\operatorname{Erfi}[\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(64*c^3*E^{(a/b)}) - (5*b^{(5/2)}*\operatorname{Sqrt}[\pi/3]*\operatorname{Erfi}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(576*c^3*E^{((3*a)/b)})$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (x)^m, x] \rightarrow \operatorname{Simp}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n)/(m+1), x] - \operatorname{Dist}[(b*c^n)/(m+1), \operatorname{Int}[(x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1})/(\operatorname{Sqrt}[-1 + c*x]*\operatorname{Sqrt}[1 + c*x]), x], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5759

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (d_1 + e_1*x)^m * (d_2 + e_2*x)^m, x] \rightarrow \operatorname{Simp}[(f*(f*x)^{m-1}*\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x]*(a + b*\operatorname{ArcCosh}[c*x])^n)/(e_1*e_2^m), x] + (\operatorname{Dist}[(f^2*(m-1))/(c^2*m), \operatorname{Int}[(f*x)^{m-2}*(a + b*\operatorname{ArcCosh}[c*x])^n]/(\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x]), x], x) + \operatorname{Dist}[(b*f^n*\operatorname{Sqrt}[d_1 + e_1*x]*\operatorname{Sqrt}[d_2 + e_2*x])/(c*d_1*d_2*m*\operatorname{Sqrt}[1 + c*x]*\operatorname{Sqrt}[-1 + c*x]), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f},

x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)*((d1_.) + (e1_.)*(x_.))^(p_.)*((d2_.) + (e2_.)*(x_.))^(p_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(p + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_)^(m_.)*((d1_.) + (e1_.)*(x_.))^(p_.)*((d2_.) + (e2_.)*(x_.))^(p_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 3312

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f

, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))

Rubi steps

$$\begin{aligned}
 \int x^2 (a + b \cosh^{-1}(cx))^{5/2} dx &= \frac{1}{3}x^3 (a + b \cosh^{-1}(cx))^{5/2} - \frac{1}{6}(5bc) \int \frac{x^3 (a + b \cosh^{-1}(cx))^{3/2}}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx \\
 &= -\frac{5bx^2\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{18c} + \frac{1}{3}x^3 (a + b \cosh^{-1}(cx))^{5/2} + \frac{1}{12} (5b^2) \\
 &= \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} - \frac{5bx^2\sqrt{-1 + cx}}{18c} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3} \\
 &= \frac{5b^2x\sqrt{a + b \cosh^{-1}(cx)}}{6c^2} + \frac{5}{36}b^2x^3\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{9c^3}
 \end{aligned}$$

Mathematica [B] time = 10.694, size = 924, normalized size = 2.74

$$e^{-\frac{3a}{b}} \sqrt{a + b \cosh^{-1}(cx)} \left(9e^{\frac{4a}{b}} \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}} \text{Gamma}\left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{3} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \text{Gamma}\left(\frac{3}{2}, -\frac{3(a+b \cosh^{-1}(cx))}{b}\right) \right)$$

$$72c^3 \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2*(a + b*ArcCosh[c*x])^(5/2), x]

[Out] (a^2*Sqrt[a + b*ArcCosh[c*x]]*(9*E^((4*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, a/b + ArcCosh[c*x]] + Sqrt[3]*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, (-3*(a + b*ArcCosh[c*x]))/b] + 9*E^((2*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[3/2, -((a + b*ArcCosh[c*x])/b)] + Sqrt[3]*E^((6*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[3/2, (3*(a + b*ArcCosh[c*x]))/b]))/(72*c^3*E^((3*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])^2/b^2)]) + (a*Sqrt[b]*(9*(-12*Sqrt[b]*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)*Sqrt[a + b*ArcCosh[c*x]] + 8*Sqrt[b]*c*x*ArcCosh[c*x]*Sqrt[a + b*ArcCosh[c*x]] + (2*a + 3*b)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] - Sinh[a/b]) + (2*a - 3*b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b])) + (2*a + b)*Sqrt[3*Pi]*Erfi[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(3*a)/b] - Sinh[(3*a)/b]) + (2*a - b)*Sqrt[3*Pi]*Erf[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(3*a)/b] + Sinh[(3*a)/b])))/(72*c^3*E^((3*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)])

```
t[b]]*(Cosh[(3*a)/b] + Sinh[(3*a)/b]) + 12*Sqrt[b]*Sqrt[a + b*ArcCosh[c*x]]
*(2*ArcCosh[c*x]*Cosh[3*ArcCosh[c*x]] - Sinh[3*ArcCosh[c*x]])))/(144*c^3) -
(27*(-4*b*Sqrt[a + b*ArcCosh[c*x]]*(2*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)
*(a - 5*b*ArcCosh[c*x]) + b*c*x*(15 + 4*ArcCosh[c*x]^2)) + Sqrt[b]*(4*a^2 +
12*a*b + 15*b^2)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b]
- Sinh[a/b]) + Sqrt[b]*(4*a^2 - 12*a*b + 15*b^2)*Sqrt[Pi]*Erf[Sqrt[a + b*
ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b])) + Sqrt[b]*(12*a^2 + 12*a*b
+ 5*b^2)*Sqrt[3*Pi]*Erfi[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[
(3*a)/b] - Sinh[(3*a)/b]) + Sqrt[b]*(12*a^2 - 12*a*b + 5*b^2)*Sqrt[3*Pi]*Er
f[(Sqrt[3]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(3*a)/b] + Sinh[(3*a)/b
]) - 12*b*Sqrt[a + b*ArcCosh[c*x]]*(b*(5 + 12*ArcCosh[c*x]^2)*Cosh[3*ArcCos
h[c*x]] + 2*(a - 5*b*ArcCosh[c*x])*Sinh[3*ArcCosh[c*x]])))/(1728*c^3)
```

Maple [F] time = 0.102, size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{arccosh}(cx))^{5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*(a+b*arccosh(c*x))^(5/2),x)
```

```
[Out] int(x^2*(a+b*arccosh(c*x))^(5/2),x)
```

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arccosh}(cx) + a)^{5/2} x^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*(a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")
```

```
[Out] integrate((b*arccosh(c*x) + a)^(5/2)*x^2, x)
```

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*(a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")
```

```
[Out] Exception raised: UnboundLocalError
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*(a+b*acosh(c*x))**(5/2),x)
```

```
[Out] Timed out
```

Giac [F] time = 0., size = 0, normalized size = 0.

$\text{sage}_0 x$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*(a+b*arccosh(c*x))^(5/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.149 $\int x \left(a + b \cosh^{-1}(cx) \right)^{5/2} dx$

Optimal. Leaf size=228

$$\frac{15\sqrt{\frac{\pi}{2}}b^{5/2}e^{\frac{2a}{b}}\operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b}\cosh^{-1}(cx)}{\sqrt{b}}\right)}{256c^2} - \frac{15\sqrt{\frac{\pi}{2}}b^{5/2}e^{-\frac{2a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b}\cosh^{-1}(cx)}{\sqrt{b}}\right)}{256c^2} - \frac{15b^2\sqrt{a+b}\cosh^{-1}(cx)}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a+b}$$

[Out] $(-15*b^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/(64*c^2) + (15*b^2*x^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/32 - (5*b*x*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{3/2})/(8*c) - (a + b*\operatorname{ArcCosh}[c*x])^{5/2}/(4*c^2) + (x^2*(a + b*\operatorname{ArcCosh}[c*x])^{5/2})/2 - (15*b^{5/2}*E^{(2*a)/b}*\sqrt{\pi/2}*\operatorname{Erf}[(\sqrt{2}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(256*c^2) - (15*b^{5/2}*\sqrt{\pi/2}*\operatorname{Erfi}[(\sqrt{2}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(256*c^2*E^{(2*a)/b})$

Rubi [A] time = 1.3278, antiderivative size = 228, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 9, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.643$, Rules used = {5664, 5759, 5676, 5781, 3312, 3307, 2180, 2204, 2205}

$$\frac{15\sqrt{\frac{\pi}{2}}b^{5/2}e^{\frac{2a}{b}}\operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b}\cosh^{-1}(cx)}{\sqrt{b}}\right)}{256c^2} - \frac{15\sqrt{\frac{\pi}{2}}b^{5/2}e^{-\frac{2a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b}\cosh^{-1}(cx)}{\sqrt{b}}\right)}{256c^2} - \frac{15b^2\sqrt{a+b}\cosh^{-1}(cx)}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a+b}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x*(a + b*\operatorname{ArcCosh}[c*x])^{5/2}, x]$

[Out] $(-15*b^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/(64*c^2) + (15*b^2*x^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/32 - (5*b*x*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{3/2})/(8*c) - (a + b*\operatorname{ArcCosh}[c*x])^{5/2}/(4*c^2) + (x^2*(a + b*\operatorname{ArcCosh}[c*x])^{5/2})/2 - (15*b^{5/2}*E^{(2*a)/b}*\sqrt{\pi/2}*\operatorname{Erf}[(\sqrt{2}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(256*c^2) - (15*b^{5/2}*\sqrt{\pi/2}*\operatorname{Erfi}[(\sqrt{2}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(256*c^2*E^{(2*a)/b})$

Rule 5664

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * x^m, x] \rightarrow \operatorname{Simp}[x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^n / (m+1), x] - \operatorname{Dist}[(b*c^n)/(m+1), \operatorname{Int}[x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1} / (\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] /;$ FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GtQ[n, 0]

Rule 5759

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (f*x)^m / (\sqrt{d1 + e1*x}*\sqrt{d2 + e2*x}), x] \rightarrow \operatorname{Simp}[(f*(f*x)^{m-1}*\sqrt{d1 + e1*x}*\sqrt{d2 + e2*x}*(a + b*\operatorname{ArcCosh}[c*x])^n) / (e1*e2^m), x] + (\operatorname{Dist}[(f^2*(m-1))/(c^2*m), \operatorname{Int}[(f*x)^{m-2}*(a + b*\operatorname{ArcCosh}[c*x])^n / (\sqrt{d1 + e1*x}*\sqrt{d2 + e2*x}), x], x] + \operatorname{Dist}[(b*f^n*\sqrt{d1 + e1*x}*\sqrt{d2 + e2*x}) / (c*d1*d2*m*\sqrt{1 + c*x}*\sqrt{-1 + c*x}), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n-1}, x], x]) /;$ FreeQ[{a, b, c, d1, e1, d2, e2, f}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && GtQ[m, 1] && IntegerQ[m]

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)/(Sqrt[(d1_) + (e1_.)*(x_)]*Sqrt[(d2_) + (e2_.)*(x_)]), x_Symbol] := Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1]
```

Rule 5781

```
Int[((a_.) + ArcCosh[(c_.)*(x_)]*(b_.))^(n_.)*(x_)^(m_.)*((d1_) + (e1_.)*(x_))^(p_.)*((d2_) + (e2_.)*(x_))^(p_.), x_Symbol] := Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])
```

Rule 3312

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f, m}, x] && IGtQ[n, 1] && (!RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned}
\int x (a + b \cosh^{-1}(cx))^{5/2} dx &= \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{5/2} - \frac{1}{4}(5bc) \int \frac{x^2 (a + b \cosh^{-1}(cx))^{3/2}}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx \\
&= -\frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} + \frac{1}{2}x^2 (a + b \cosh^{-1}(cx))^{5/2} + \frac{1}{16} (15b^2) \int \\
&= \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{5/2}}{4c^2} \\
&= \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{5/2}}{4c^2} \\
&= \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} - \frac{(a + b \cosh^{-1}(cx))^{5/2}}{4c^2} \\
&= -\frac{15b^2\sqrt{a + b \cosh^{-1}(cx)}}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} \\
&= -\frac{15b^2\sqrt{a + b \cosh^{-1}(cx)}}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} \\
&= -\frac{15b^2\sqrt{a + b \cosh^{-1}(cx)}}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c} \\
&= -\frac{15b^2\sqrt{a + b \cosh^{-1}(cx)}}{64c^2} + \frac{15}{32}b^2x^2\sqrt{a + b \cosh^{-1}(cx)} - \frac{5bx\sqrt{-1 + cx}\sqrt{1 + cx} (a + b \cosh^{-1}(cx))^{3/2}}{8c}
\end{aligned}$$

Mathematica [A] time = 1.87998, size = 207, normalized size = 0.91

$$8\sqrt{a + b \cosh^{-1}(cx)} \left((16a^2 + 15b^2) \cosh(2 \cosh^{-1}(cx)) + 4b \cosh^{-1}(cx) (8a \cosh(2 \cosh^{-1}(cx)) - 5b \sinh(2 \cosh^{-1}(cx))) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x*(a + b*ArcCosh[c*x])^(5/2), x]

[Out] $(-15*b^{(5/2)}*\text{Sqrt}[2*\text{Pi}]*\text{Erfi}[(\text{Sqrt}[2]*\text{Sqrt}[a + b*\text{ArcCosh}[c*x]])/\text{Sqrt}[b]]*(\text{Cosh}[(2*a)/b] - \text{Sinh}[(2*a)/b]) - 15*b^{(5/2)}*\text{Sqrt}[2*\text{Pi}]*\text{Erf}[(\text{Sqrt}[2]*\text{Sqrt}[a + b*\text{ArcCosh}[c*x]])/\text{Sqrt}[b]]*(\text{Cosh}[(2*a)/b] + \text{Sinh}[(2*a)/b]) + 8*\text{Sqrt}[a + b*\text{ArcCosh}[c*x]]*((16*a^2 + 15*b^2)*\text{Cosh}[2*\text{ArcCosh}[c*x]] + 16*b^2*\text{ArcCosh}[c*x]^2*\text{Cosh}[2*\text{ArcCosh}[c*x]] - 20*a*b*\text{Sinh}[2*\text{ArcCosh}[c*x]] + 4*b*\text{ArcCosh}[c*x]*(8*a*\text{Cosh}[2*\text{ArcCosh}[c*x]] - 5*b*\text{Sinh}[2*\text{ArcCosh}[c*x]])))/(512*c^2)$

Maple [F] time = 0.124, size = 0, normalized size = 0.

$$\int x (a + b \operatorname{arccosh}(cx))^{5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*(a+b*arccosh(c*x))^(5/2), x)

[Out] `int(x*(a+b*arccosh(c*x))^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arcosh}(cx) + a)^{\frac{5}{2}} x dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*(a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")`

[Out] `integrate((b*arccosh(c*x) + a)^(5/2)*x, x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*(a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*(a+b*acosh(c*x))**(5/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x*(a+b*arccosh(c*x))^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

3.150 $\int (a + b \cosh^{-1}(cx))^{5/2} dx$

Optimal. Leaf size=160

$$\frac{15\sqrt{\pi}b^{5/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c} - \frac{15\sqrt{\pi}b^{5/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c} + \frac{15}{4}b^2x\sqrt{a+b\cosh^{-1}(cx)} - \frac{5b\sqrt{cx-1}\sqrt{cx+1}}{2}$$

[Out] (15*b^2*x*Sqrt[a + b*ArcCosh[c*x]])/4 - (5*b*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(3/2))/(2*c) + x*(a + b*ArcCosh[c*x])^(5/2) - (15*b^(5/2)*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(16*c) - (15*b^(5/2)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(16*c*E^(a/b))

Rubi [A] time = 0.750641, antiderivative size = 160, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5654, 5718, 5781, 3307, 2180, 2204, 2205}

$$\frac{15\sqrt{\pi}b^{5/2}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c} - \frac{15\sqrt{\pi}b^{5/2}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{16c} + \frac{15}{4}b^2x\sqrt{a+b\cosh^{-1}(cx)} - \frac{5b\sqrt{cx-1}\sqrt{cx+1}}{2}$$

Antiderivative was successfully verified.

[In] Int[(a + b*ArcCosh[c*x])^(5/2), x]

[Out] (15*b^2*x*Sqrt[a + b*ArcCosh[c*x]])/4 - (5*b*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(3/2))/(2*c) + x*(a + b*ArcCosh[c*x])^(5/2) - (15*b^(5/2)*E^(a/b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(16*c) - (15*b^(5/2)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]])/(16*c*E^(a/b))

Rule 5654

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c^n, Int[(x*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]

Rule 5718

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol] := Simp[((d1 + e1*x)^(p + 1)*(d2 + e2*x)^(q + 1)*(a + b*ArcCosh[c*x])^n)/(2*e1*e2*(p + 1)), x] - Dist[(b*n*(-(d1*d2))^(n-1)*IntPart[p]*(d1 + e1*x)^FracPart[p]*(d2 + e2*x)^FracPart[p])/(2*c*(p + 1)*(1 + c*x)^FracPart[p]*(-1 + c*x)^FracPart[p]), Int[(-1 + c^2*x^2)^(p + 1/2)*(a + b*ArcCosh[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, p}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[n, 0] && NeQ[p, -1] && IntegerQ[p + 1/2]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.)*(x_)^(m_.)*((d1_.) + (e1_.)*(x_))^(p_.)*((d2_.) + (e2_.)*(x_))^(q_.), x_Symbol] := Dist[(-(d1*d2))^(n-1)*c^m*(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x, ArcCosh[c*x]] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned}
 \int (a + b \cosh^{-1}(cx))^{5/2} dx &= x(a + b \cosh^{-1}(cx))^{5/2} - \frac{1}{2}(5bc) \int \frac{x(a + b \cosh^{-1}(cx))^{3/2}}{\sqrt{-1 + cx}\sqrt{1 + cx}} dx \\
 &= -\frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2} + \frac{1}{4}(15b^2) \int \sqrt{a + b \cosh^{-1}(cx)} dx \\
 &= \frac{15}{4}b^2x\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2} \\
 &= \frac{15}{4}b^2x\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2} \\
 &= \frac{15}{4}b^2x\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2} \\
 &= \frac{15}{4}b^2x\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2} \\
 &= \frac{15}{4}b^2x\sqrt{a + b \cosh^{-1}(cx)} - \frac{5b\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}}{2c} + x(a + b \cosh^{-1}(cx))^{5/2}
 \end{aligned}$$

Mathematica [B] time = 2.3507, size = 452, normalized size = 2.82

$$8a^2e^{-\frac{a}{b}}\sqrt{a + b \cosh^{-1}(cx)} \left(\frac{e^{\frac{2a}{b}} \Gamma\left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right)}{\sqrt{\frac{a}{b} + \cosh^{-1}(cx)}} + \frac{\Gamma\left(\frac{3}{2}, -\frac{a + b \cosh^{-1}(cx)}{b}\right)}{\sqrt{-\frac{a + b \cosh^{-1}(cx)}{b}}}\right) - \sqrt{\pi}\sqrt{b}(4a^2 - 12ab + 15b^2) \left(\sinh\left(\frac{a}{b}\right)\right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[(a + b*ArcCosh[c*x])^(5/2),x]

[Out] (4*b*Sqrt[a + b*ArcCosh[c*x]]*(2*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)*(a - 5*b*ArcCosh[c*x]) + b*c*x*(15 + 4*ArcCosh[c*x]^2)) + (8*a^2*Sqrt[a + b*ArcCosh[c*x]]*((E^((2*a)/b)*Gamma[3/2, a/b + ArcCosh[c*x]])/Sqrt[a/b + ArcCosh[c*x]] + Gamma[3/2, -(a + b*ArcCosh[c*x])/b])/Sqrt[-((a + b*ArcCosh[c*x])/b])))/E^(a/b) - Sqrt[b]*(4*a^2 + 12*a*b + 15*b^2)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] - Sinh[a/b]) - Sqrt[b]*(4*a^2 - 12*a*b + 15*b^2)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b]) + 4*a*b*(-12*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x)*Sqrt[a + b*ArcCosh[c*x]] + 8*c*x*ArcCosh[c*x]*Sqrt[a + b*ArcCosh[c*x]] + ((2*a + 3*b)*Sqrt[Pi]*Erfi[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] - Sinh[a/b]))/Sqrt[b] + ((2*a - 3*b)*Sqrt[Pi]*Erf[Sqrt[a + b*ArcCosh[c*x]]/Sqrt[b]]*(Cosh[a/b] + Sinh[a/b]))/Sqrt[b]))/(16*c)

Maple [F] time = 0.095, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))^(5/2),x)

[Out] int((a+b*arccosh(c*x))^(5/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int (b \operatorname{arccosh}(cx) + a)^{\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")

[Out] integrate((b*arccosh(c*x) + a)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((a+b*acosh(c*x))**(5/2),x)
```

```
[Out] Timed out
```

Giac [F] time = 0., size = 0, normalized size = 0.

$\text{sage}_0 x$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((a+b*arccosh(c*x))^(5/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.151 \quad \int \frac{x^2}{\sqrt{a+b \cosh^{-1}(cx)}} dx$$

Optimal. Leaf size=194

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} - \frac{\sqrt{\frac{\pi}{3}}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} + \frac{\sqrt{\frac{\pi}{3}}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}}$$

[Out] $-(E^{(a/b)}\operatorname{Sqrt}[\operatorname{Pi}]\operatorname{Erf}[\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3) - (E^{((3*a)/b)}\operatorname{Sqrt}[\operatorname{Pi}/3]\operatorname{Erf}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3) + (\operatorname{Sqrt}[\operatorname{Pi}]\operatorname{Erfi}[\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3*E^{(a/b)}) + (\operatorname{Sqrt}[\operatorname{Pi}/3]\operatorname{Erfi}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3*E^{((3*a)/b)})$

Rubi [A] time = 0.360347, antiderivative size = 194, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 6, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {5670, 5448, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} - \frac{\sqrt{\frac{\pi}{3}}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} + \frac{\sqrt{\frac{\pi}{3}}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]], x]$

[Out] $-(E^{(a/b)}\operatorname{Sqrt}[\operatorname{Pi}]\operatorname{Erf}[\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3) - (E^{((3*a)/b)}\operatorname{Sqrt}[\operatorname{Pi}/3]\operatorname{Erf}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3) + (\operatorname{Sqrt}[\operatorname{Pi}]\operatorname{Erfi}[\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3*E^{(a/b)}) + (\operatorname{Sqrt}[\operatorname{Pi}/3]\operatorname{Erfi}[(\operatorname{Sqrt}[3]*\operatorname{Sqrt}[a + b\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(8*\operatorname{Sqrt}[b]*c^3*E^{((3*a)/b)})$

Rule 5670

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[(c_.)*(x_.)]*(b_.))^n*(x_.)^m, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c, n, x\} \ \&\& \ \operatorname{IGtQ}[m, 0]$

Rule 5448

$\operatorname{Int}[\operatorname{Cosh}[(a_.) + (b_.)*(x_.)]^{(p_.)}*((c_.) + (d_.)*(x_.))^{(m_.)}*\operatorname{Sinh}[(a_.) + (b_.)*(x_.)]^{(n_.)}, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sinh}[a + b*x]^n*\operatorname{Cosh}[a + b*x]^p, x], x] /;$ $\operatorname{FreeQ}\{a, b, c, d, m, x\} \ \&\& \ \operatorname{IGtQ}[n, 0] \ \& \ \operatorname{IGtQ}[p, 0]$

Rule 3308

$\operatorname{Int}[(c_.) + (d_.)*(x_.)]^{(m_.)}*\sin[(e_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/E^{I*(e + f*x)}, x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m*E^{I*(e + f*x)}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m, x\}$

Rule 2180

$\operatorname{Int}(F_.)^{((g_.)*(e_.) + (f_.)*(x_.))}/\operatorname{Sqrt}[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \operatorname{Sqrt}[c + d*$

x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma === True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x^2}{\sqrt{a + b \cosh^{-1}(cx)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh^2(x) \sinh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{c^3} \\ &= \frac{\text{Subst}\left(\int \left(\frac{\sinh(x)}{4\sqrt{a+bx}} + \frac{\sinh(3x)}{4\sqrt{a+bx}}\right) dx, x, \cosh^{-1}(cx)\right)}{c^3} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c^3} + \frac{\text{Subst}\left(\int \frac{\sinh(3x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c^3} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-3x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{8c^3} - \frac{\text{Subst}\left(\int \frac{e^{-x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{8c^3} + \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{8c^3} \\ &= -\frac{\text{Subst}\left(\int e^{\frac{3a}{b} - \frac{3x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{4bc^3} - \frac{\text{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{4bc^3} \\ &= -\frac{e^{a/b} \sqrt{\pi} \text{erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} - \frac{e^{\frac{3a}{b}} \sqrt{\frac{\pi}{3}} \text{erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} + \frac{e^{-\frac{a}{b}} \sqrt{\pi} \text{erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{8\sqrt{bc^3}} \end{aligned}$$

Mathematica [A] time = 0.346328, size = 195, normalized size = 1.01

$$\frac{e^{-\frac{3a}{b}} \left(3e^{\frac{4a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \Gamma\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{3} \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}} \Gamma\left(\frac{1}{2}, -\frac{3(a+b \cosh^{-1}(cx))}{b}\right) + 3e^{\frac{2a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \Gamma\left(\frac{3}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) \right)}{24c^3 \sqrt{a + b \cosh^{-1}(cx)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/Sqrt[a + b*ArcCosh[c*x]], x]

[Out] (3*E^((4*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, a/b + ArcCosh[c*x]] + Sqrt[3]*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, (-3*(a + b*ArcCosh[c*x]))/b] + 3*E^((2*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, -(a + b*ArcCosh[c*x])/b] + Sqrt[3]*E^((6*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, (3*(a + b*ArcCosh[c*x]))/b])/(24*c^3*E^((3*a)/b)*Sqrt[a + b*ArcCosh[c*x]])

Maple [F] time = 0.108, size = 0, normalized size = 0.

$$\int x^2 \frac{1}{\sqrt{a + b \operatorname{arccosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^2/(a+b*arccosh(c*x))^(1/2),x)`

[Out] `int(x^2/(a+b*arccosh(c*x))^(1/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\sqrt{b \operatorname{arcosh}(cx) + a}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")`

[Out] `integrate(x^2/sqrt(b*arccosh(c*x) + a), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{\sqrt{a + b \operatorname{acosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2/(a+b*acosh(c*x))**(1/2),x)`

[Out] `Integral(x**2/sqrt(a + b*acosh(c*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.152 \quad \int \frac{x}{\sqrt{a+b \cosh^{-1}(cx)}} dx$$

Optimal. Leaf size=107

$$\frac{\sqrt{\frac{\pi}{2}} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}} - \frac{\sqrt{\frac{\pi}{2}} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}}$$

[Out] $-(E^{((2*a)/b)}*\operatorname{Sqrt}[Pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(4*\operatorname{Sqrt}[b]*c^2) + (\operatorname{Sqrt}[Pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(4*\operatorname{Sqrt}[b]*c^2*E^{((2*a)/b)})$

Rubi [A] time = 0.184953, antiderivative size = 107, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5670, 5448, 12, 3308, 2180, 2204, 2205}

$$\frac{\sqrt{\frac{\pi}{2}} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}} - \frac{\sqrt{\frac{\pi}{2}} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]], x]$

[Out] $-(E^{((2*a)/b)}*\operatorname{Sqrt}[Pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(4*\operatorname{Sqrt}[b]*c^2) + (\operatorname{Sqrt}[Pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a + b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(4*\operatorname{Sqrt}[b]*c^2*E^{((2*a)/b)})$

Rule 5670

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[(c_.)*(x_.)]*(b_.)]^{(n_.)}*(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a + b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c, n\}, x\} \ \&\& \ \operatorname{IGtQ}[m, 0]$

Rule 5448

$\operatorname{Int}[\operatorname{Cosh}[(a_.) + (b_.)*(x_.)]^{(p_.)}*((c_.) + (d_.)*(x_.))^{(m_.)}*\operatorname{Sinh}[(a_.) + (b_.)*(x_.)]^{(n_.)}, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandTrigReduce}[(c + d*x)^m, \operatorname{Sinh}[a + b*x]^n*\operatorname{Cosh}[a + b*x]^p, x], x] /;$ $\operatorname{FreeQ}\{a, b, c, d, m\}, x\} \ \&\& \ \operatorname{IGtQ}[n, 0] \ \& \ \operatorname{IGtQ}[p, 0]$

Rule 12

$\operatorname{Int}[(a_.)*(u_.), x_Symbol] \rightarrow \operatorname{Dist}[a, \operatorname{Int}[u, x], x] /;$ $\operatorname{FreeQ}[a, x] \ \&\& \ !\operatorname{Match}Q[u, (b_.)*(v_.)] /;$ $\operatorname{FreeQ}[b, x]$

Rule 3308

$\operatorname{Int}[(c_.) + (d_.)*(x_.)]^{(m_.)}*\sin[(e_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/E^{(I*(e + f*x))}, x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m*E^{(I*(e + f*x))}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x]$

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \int \frac{x}{\sqrt{a + b \cosh^{-1}(cx)}} dx &= \frac{\text{Subst}\left(\int \frac{\cosh(x) \sinh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{c^2} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{2\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{c^2} \\ &= \frac{\text{Subst}\left(\int \frac{\sinh(2x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{2c^2} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c^2} + \frac{\text{Subst}\left(\int \frac{e^{2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4c^2} \\ &= -\frac{\text{Subst}\left(\int e^{\frac{2a}{b} - \frac{2x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2bc^2} + \frac{\text{Subst}\left(\int e^{-\frac{2a}{b} + \frac{2x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2bc^2} \\ &= -\frac{e^{\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \text{erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}} + \frac{e^{-\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \text{erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4\sqrt{bc^2}} \end{aligned}$$

Mathematica [A] time = 0.219912, size = 104, normalized size = 0.97

$$\frac{\sqrt{\frac{\pi}{2}} \left(\left(\sinh\left(\frac{2a}{b}\right) + \cosh\left(\frac{2a}{b}\right) \right) \text{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right) + \left(\sinh\left(\frac{2a}{b}\right) - \cosh\left(\frac{2a}{b}\right) \right) \text{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right) \right)}{4\sqrt{bc^2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[x/Sqrt[a + b*ArcCosh[c*x]], x]
```

```
[Out] -(Sqrt[Pi/2]*(Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(-Cosh[(2*a)/b] + Sinh[(2*a)/b]) + Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b]))) / (4*Sqrt[b]*c^2)
```

Maple [F] time = 0.115, size = 0, normalized size = 0.

$$\int x \frac{1}{\sqrt{a + b \text{arccosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x/(a+b*arccosh(c*x))^(1/2),x)`

[Out] `int(x/(a+b*arccosh(c*x))^(1/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\sqrt{b \operatorname{arccosh}(cx) + a}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")`

[Out] `integrate(x/sqrt(b*arccosh(c*x) + a), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{\sqrt{a + b \operatorname{acosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*acosh(c*x))**(1/2),x)`

[Out] `Integral(x/sqrt(a + b*acosh(c*x)), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(1/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.153 \quad \int \frac{1}{\sqrt{a+b \cosh^{-1}(cx)}} dx$$

Optimal. Leaf size=88

$$\frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}} - \frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}}$$

[Out] $-(E^{(a/b)} \operatorname{Sqrt}[\operatorname{Pi}] \operatorname{Erf}[\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(2 \operatorname{Sqrt}[b]*c) + (\operatorname{Sqrt}[\operatorname{Pi}] \operatorname{Erfi}[\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(2 \operatorname{Sqrt}[b]*c * E^{(a/b)})$

Rubi [A] time = 0.104876, antiderivative size = 88, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {5658, 3308, 2180, 2205, 2204}

$$\frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}} - \frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}}$$

Antiderivative was successfully verified.

[In] `Int[1/Sqrt[a + b*ArcCosh[c*x]],x]`

[Out] $-(E^{(a/b)} \operatorname{Sqrt}[\operatorname{Pi}] \operatorname{Erf}[\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(2 \operatorname{Sqrt}[b]*c) + (\operatorname{Sqrt}[\operatorname{Pi}] \operatorname{Erfi}[\operatorname{Sqrt}[a + b \operatorname{ArcCosh}[c*x]]/\operatorname{Sqrt}[b]])/(2 \operatorname{Sqrt}[b]*c * E^{(a/b)})$

Rule 5658

`Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_), x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]`

Rule 3308

`Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m * E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]`

Rule 2180

`Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True`

Rule 2205

`Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]`

Rule 2204

`Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{`

F, a, b, c, d}, x] && PosQ[b]

Rubi steps

$$\begin{aligned} \int \frac{1}{\sqrt{a + b \cosh^{-1}(cx)}} dx &= -\frac{\text{Subst}\left(\int \frac{\sinh\left(\frac{a}{b} - \frac{x}{b}\right)}{\sqrt{x}} dx, x, a + b \cosh^{-1}(cx)\right)}{bc} \\ &= -\frac{\text{Subst}\left(\int \frac{e^{-i\left(\frac{ia}{b} - \frac{ix}{b}\right)}}{\sqrt{x}} dx, x, a + b \cosh^{-1}(cx)\right)}{2bc} + \frac{\text{Subst}\left(\int \frac{e^{i\left(\frac{ia}{b} - \frac{ix}{b}\right)}}{\sqrt{x}} dx, x, a + b \cosh^{-1}(cx)\right)}{2bc} \\ &= -\frac{\text{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{bc} + \frac{\text{Subst}\left(\int e^{-\frac{a}{b} + \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{bc} \\ &= -\frac{e^{a/b} \sqrt{\pi} \operatorname{erf}\left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}} + \frac{e^{-a/b} \sqrt{\pi} \operatorname{erfi}\left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2\sqrt{bc}} \end{aligned}$$

Mathematica [A] time = 0.100201, size = 100, normalized size = 1.14

$$\frac{e^{-\frac{a}{b}} \left(e^{\frac{2a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \operatorname{Gamma}\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{-\frac{a + b \cosh^{-1}(cx)}{b}} \operatorname{Gamma}\left(\frac{1}{2}, -\frac{a + b \cosh^{-1}(cx)}{b}\right) \right)}{2c \sqrt{a + b \cosh^{-1}(cx)}}$$

Warning: Unable to verify antiderivative.

[In] Integrate[1/Sqrt[a + b*ArcCosh[c*x]], x]

[Out] (E^((2*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, a/b + ArcCosh[c*x]] + Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, -((a + b*ArcCosh[c*x])/b)])/(2*c*E^(a/b)*Sqrt[a + b*ArcCosh[c*x]])

Maple [F] time = 0.094, size = 0, normalized size = 0.

$$\int \frac{1}{\sqrt{a + b \operatorname{arccosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/(a+b*arccosh(c*x))^(1/2), x)

[Out] int(1/(a+b*arccosh(c*x))^(1/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\sqrt{b \operatorname{arcosh}(cx) + a}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(1/2),x, algorithm="maxima")

[Out] integrate(1/sqrt(b*arccosh(c*x) + a), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(1/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{\sqrt{a + b \operatorname{acosh}(cx)}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*acosh(c*x))**(1/2),x)

[Out] Integral(1/sqrt(a + b*acosh(c*x)), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(1/2),x, algorithm="giac")

[Out] sage0*x

$$3.154 \quad \int \frac{x^2}{(a+b \cosh^{-1}(cx))^{3/2}} dx$$

Optimal. Leaf size=231

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{3\pi}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{3\pi}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3}$$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(b*c*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}e^{a/b}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}e^{-a/b}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3)$

Rubi [A] time = 0.310078, antiderivative size = 231, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 5, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.312$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{3\pi}e^{\frac{3a}{b}}\operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{\sqrt{3\pi}e^{-\frac{3a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)}, x]$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(b*c*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}e^{a/b}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3) + (\sqrt{\pi}e^{-a/b}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(4*b^{(3/2)}*c^3)$

Rule 5666

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])^n * (x)^m, x] \rightarrow \operatorname{Simp}[x^m * \sqrt{-1 + c*x} * \sqrt{1 + c*x} * (a + b*\operatorname{ArcCosh}[c*x])^{n+1} / (b*c*(n+1)), x] + \operatorname{Dist}[1/(b*c^{n+1}*(n+1)), \operatorname{Subst}[\operatorname{Int}[\operatorname{ExpandTrigReduce}[(a + b*x)^{n+1} * \operatorname{Cosh}[x]^{m-1} * (m - (m+1)*\operatorname{Cosh}[x]^2)], x], x], x, \operatorname{ArcCosh}[c*x]] /;$ $\operatorname{FreeQ}\{a, b, c\}, x \&\amp; \operatorname{IGtQ}[m, 0] \&\amp; \operatorname{GeQ}[n, -2] \&\amp; \operatorname{LtQ}[n, -1]$

Rule 3307

$\operatorname{Int}[(c + d*x)^m * \sin[(e + \pi*k) + (f*x)], x] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m / (E^{I*k*\pi} * E^{I*(e + f*x)}), x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m * E^{I*k*\pi} * E^{I*(e + f*x)}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \&\amp; \operatorname{IntegerQ}[2*k]$

Rule 2180

$\operatorname{Int}[(F + (g + (e + f*x))/\sqrt{c + d*x}), x] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F*(e - (c*f)/d) + (f*g*x^2)/d], x], x, \sqrt{c + d*x}]$

x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))²), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))²), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x^2}{(a + b \cosh^{-1}(cx))^{3/2}} dx &= -\frac{2x^2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} - \frac{2 \operatorname{Subst}\left(\int \left(-\frac{\cosh(x)}{4\sqrt{a+bx}} - \frac{3 \cosh(3x)}{4\sqrt{a+bx}}\right) dx, x, \cosh^{-1}(cx)\right)}{bc^3} \\ &= -\frac{2x^2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{\operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{2bc^3} + \frac{3 \operatorname{Subst}\left(\int \frac{\cosh(3x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{2bc^3} \\ &= -\frac{2x^2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4bc^3} + \frac{\operatorname{Subst}\left(\int \frac{e^x}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{4bc^3} \\ &= -\frac{2x^2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{\operatorname{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2b^2c^3} + \frac{\operatorname{Subst}\left(\int e^{-\frac{a}{b} + \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{2b^2c^3} \\ &= -\frac{2x^2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{e^{a/b}\sqrt{\pi}\operatorname{erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \frac{e^{\frac{3a}{b}}\sqrt{3}\pi\operatorname{erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{4b^{3/2}c^3} + \dots \end{aligned}$$

Mathematica [A] time = 0.658086, size = 247, normalized size = 1.07

$$e^{-\frac{3a}{b}} \left(-e^{\frac{4a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \operatorname{Gamma}\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{3} \sqrt{-\frac{a+b \cosh^{-1}(cx)}{b}} \operatorname{Gamma}\left(\frac{1}{2}, -\frac{3(a+b \cosh^{-1}(cx))}{b}\right) + e^{\frac{2a}{b}} \sqrt{-\frac{a-b \cosh^{-1}(cx)}{b}} \operatorname{Gamma}\left(\frac{1}{2}, -\frac{3(a-b \cosh^{-1}(cx))}{b}\right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/(a + b*ArcCosh[c*x])^(3/2), x]

[Out] (-2*E^((3*a)/b)*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x) - E^((4*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, a/b + ArcCosh[c*x]] + Sqrt[3]*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, (-3*(a + b*ArcCosh[c*x]))/b] + E^((2*a)/b)*Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, -((a + b*ArcCosh[c*x])/b)] - Sqrt[3]*E^((6*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, (3*(a + b*ArcCosh[c*x]))/b] - 2*E^((3*a)/b)*Sinh[3*ArcCosh[c*x]]/(4*b*c^3*E^((3*a)/b)*Sqrt[a + b*ArcCosh[c*x]])

Maple [F] time = 0.105, size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{arccosh}(cx))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/(a+b*arccosh(c*x))^(3/2), x)

[Out] int(x^2/(a+b*arccosh(c*x))^(3/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{(b \operatorname{arcosh}(cx) + a)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/(a+b*arccosh(c*x))^(3/2), x, algorithm="maxima")

[Out] integrate(x^2/(b*arccosh(c*x) + a)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/(a+b*arccosh(c*x))^(3/2), x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{(a + b \operatorname{acosh}(cx))^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2/(a+b*acosh(c*x))**(3/2), x)

[Out] Integral(x**2/(a + b*acosh(c*x))**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2/(a+b*arccosh(c*x))^(3/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.155 \quad \int \frac{x}{(a+b \cosh^{-1}(cx))^{3/2}} dx$$

Optimal. Leaf size=140

$$\frac{\sqrt{\frac{\pi}{2}} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} + \frac{\sqrt{\frac{\pi}{2}} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} - \frac{2x\sqrt{cx-1}\sqrt{cx+1}}{bc\sqrt{a+b \cosh^{-1}(cx)}}$$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(b*c*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) + (E^{((2*a)/b)}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(b^{(3/2)}*c^2) + (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(b^{(3/2)}*c^2)*E^{((2*a)/b)}$

Rubi [A] time = 0.154964, antiderivative size = 140, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 5, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.357$, Rules used = {5666, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\frac{\pi}{2}} e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} + \frac{\sqrt{\frac{\pi}{2}} e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} - \frac{2x\sqrt{cx-1}\sqrt{cx+1}}{bc\sqrt{a+b \cosh^{-1}(cx)}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/(a+b*\operatorname{ArcCosh}[c*x])^{(3/2)}, x]$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(b*c*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) + (E^{((2*a)/b)}*\operatorname{Sqrt}[\pi/2]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(b^{(3/2)}*c^2) + (\operatorname{Sqrt}[\pi/2]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(b^{(3/2)}*c^2)*E^{((2*a)/b)}$

Rule 5666

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[x^m*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]*(a+b*\operatorname{ArcCosh}[c*x])^{n+1}/(b*c*(n+1)), x] + \operatorname{Dist}[1/(b*c^{m+1}*(n+1)), \operatorname{Subst}[\operatorname{Int}[\operatorname{ExpandTrigReduce}[(a+b*x)^{n+1}*\operatorname{Cosh}[x]^{m-1}*(m-(m+1)*\operatorname{Cosh}[x]^2), x], x], x, \operatorname{ArcCosh}[c*x]], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ \operatorname{GeQ}[n, -2] \ \&\& \ \operatorname{LtQ}[n, -1]$

Rule 3307

$\operatorname{Int}[(c + d*x)^m*\sin[(e + \pi*k) + (f*x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m/(E^{I*k*\pi}*E^{I*(e+f*x)}), x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c + d*x)^m*E^{I*k*\pi}*E^{I*(e+f*x)}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x] \ \&\& \ \operatorname{IntegerQ}[2*k]$

Rule 2180

$\operatorname{Int}[(F + (g + (e + f*x))/\operatorname{Sqrt}[c + d*x]), x_Symbol] \rightarrow \operatorname{Dist}[2/d, \operatorname{Subst}[\operatorname{Int}[F^{g*(e - (c*f)/d)} + (f*g*x^2)/d], x], x, \operatorname{Sqrt}[c + d*x]], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x] \ \&\& \ \operatorname{!}\$UseGamma == \operatorname{True}$

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned} \int \frac{x}{(a + b \cosh^{-1}(cx))^{3/2}} dx &= -\frac{2x\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{2 \operatorname{Subst}\left(\int \frac{\cosh(2x)}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{bc^2} \\ &= -\frac{2x\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{bc^2} + \frac{\operatorname{Subst}\left(\int \frac{e^{2x}}{\sqrt{a+bx}} dx, x, \cosh^{-1}(cx)\right)}{bc^2} \\ &= -\frac{2x\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{2 \operatorname{Subst}\left(\int e^{\frac{2a}{b} - \frac{2x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{b^2c^2} + \frac{2 \operatorname{Subst}\left(\int e^{-\frac{2a}{b} + \frac{2x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{b^2c^2} \\ &= -\frac{2x\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{e^{\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \operatorname{erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} + \frac{e^{-\frac{2a}{b}} \sqrt{\frac{\pi}{2}} \operatorname{erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c^2} \end{aligned}$$

Mathematica [A] time = 1.20243, size = 135, normalized size = 0.96

$$\frac{\sqrt{2\pi} \left(\sinh\left(\frac{2a}{b}\right) + \cosh\left(\frac{2a}{b}\right) \right) \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right) + \sqrt{2\pi} \left(\cosh\left(\frac{2a}{b}\right) - \sinh\left(\frac{2a}{b}\right) \right) \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right) - \frac{2\sqrt{b} \sinh(2 \operatorname{arccosh}(cx))}{\sqrt{a+b \cosh^{-1}(cx)}}}{2b^{3/2}c^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/(a + b*ArcCosh[c*x])^(3/2), x]

[Out] (Sqrt[2*Pi]*Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] - Sinh[(2*a)/b]) + Sqrt[2*Pi]*Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b]) - (2*Sqrt[b]*Sinh[2*ArcCosh[c*x]])/Sqrt[a + b*ArcCosh[c*x]]/(2*b^(3/2)*c^2)

Maple [F] time = 0.105, size = 0, normalized size = 0.

$$\int x (a + b \operatorname{arccosh}(cx))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/(a+b*arccosh(c*x))^(3/2), x)

[Out] int(x/(a+b*arccosh(c*x))^(3/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{(b \operatorname{arcosh}(cx) + a)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(3/2),x, algorithm="maxima")

[Out] integrate(x/(b*arccosh(c*x) + a)^(3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{(a + b \operatorname{acosh}(cx))^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*acosh(c*x))**(3/2),x)

[Out] Integral(x/(a + b*acosh(c*x))**(3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(3/2),x, algorithm="giac")

[Out] sage0*x

$$3.156 \quad \int \frac{1}{(a+b \cosh^{-1}(cx))^{3/2}} dx$$

Optimal. Leaf size=120

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} - \frac{2\sqrt{cx-1}\sqrt{cx+1}}{bc\sqrt{a+b \cosh^{-1}(cx)}}$$

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(b*c\sqrt{a+b\operatorname{ArcCosh}[cx]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(b^{(3/2)}*c) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(b^{(3/2)}*c*E^{(a/b)})$

Rubi [A] time = 0.410395, antiderivative size = 120, normalized size of antiderivative = 1., number of steps used = 7, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.5$, Rules used = {5656, 5781, 3307, 2180, 2204, 2205}

$$\frac{\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} + \frac{\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} - \frac{2\sqrt{cx-1}\sqrt{cx+1}}{bc\sqrt{a+b \cosh^{-1}(cx)}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[(a+b\operatorname{ArcCosh}[cx])^{(-3/2)}, x]$

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(b*c\sqrt{a+b\operatorname{ArcCosh}[cx]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(b^{(3/2)}*c) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(b^{(3/2)}*c*E^{(a/b)})$

Rule 5656

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n, x_Symbol] \rightarrow \operatorname{Simp}[(\sqrt{-1+cx}\sqrt{1+cx})(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b \cdot c \cdot (n+1)), x] - \operatorname{Dist}[c/(b \cdot (n+1)), \operatorname{Int}[(x \cdot (a+b\operatorname{ArcCosh}[cx]))^{(n+1)})/(\sqrt{-1+cx}\sqrt{1+cx}), x], x] /;$ $\operatorname{FreeQ}\{a, b, c\}, x \ \&\& \operatorname{LtQ}[n, -1]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c \cdot x]) \cdot (b \cdot x)^n \cdot (x)^m \cdot ((d_1) + (e_1) \cdot (x)^p) \cdot ((d_2) + (e_2) \cdot (x)^p), x_Symbol] \rightarrow \operatorname{Dist}[(-d_1 \cdot d_2)^p / c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a+b \cdot x)^n \cdot \cosh[x]^m \cdot \sinh[x]^{(2 \cdot p+1)}], x], x, \operatorname{ArcCosh}[cx]] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, n\}, x \ \&\& \operatorname{EqQ}[e_1 - c \cdot d_1, 0] \ \&\& \operatorname{EqQ}[e_2 + c \cdot d_2, 0] \ \&\& \operatorname{IntegerQ}[p + 1/2] \ \&\& \operatorname{GtQ}[p, -1] \ \&\& \operatorname{IGtQ}[m, 0] \ \&\& (\operatorname{GtQ}[d_1, 0] \ \&\& \operatorname{LtQ}[d_2, 0])$

Rule 3307

$\operatorname{Int}[(c + d \cdot x)^m \cdot \sin[(e) + \pi \cdot (k) + (f) \cdot (x)], x_Symbol] \rightarrow \operatorname{Dist}[I/2, \operatorname{Int}[(c+d \cdot x)^m / (E^{(I \cdot k \cdot \pi)} \cdot E^{(I \cdot (e+f \cdot x))})], x], x] - \operatorname{Dist}[I/2, \operatorname{Int}[(c+d \cdot x)^m \cdot E^{(I \cdot k \cdot \pi)} \cdot E^{(I \cdot (e+f \cdot x))}, x], x] /;$ $\operatorname{FreeQ}\{c, d, e, f, m\}, x \ \&\& \operatorname{IntegerQ}[2 \cdot k]$

Rule 2180

```
Int[(F_)^((g_.)*(e_.) + (f_.)*(x_))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \int \frac{1}{(a + b \cosh^{-1}(cx))^{3/2}} dx &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{(2c) \int \frac{x}{\sqrt{-1 + cx}\sqrt{1 + cx}\sqrt{a + b \cosh^{-1}(cx)}} dx}{b} \\ &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{2 \operatorname{Subst}\left(\int \frac{\cosh(x)}{\sqrt{a + bx}} dx, x, \cosh^{-1}(cx)\right)}{bc} \\ &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{\operatorname{Subst}\left(\int \frac{e^{-x}}{\sqrt{a + bx}} dx, x, \cosh^{-1}(cx)\right)}{bc} + \frac{\operatorname{Subst}\left(\int \frac{e^x}{\sqrt{a + bx}} dx, x, \cosh^{-1}(cx)\right)}{bc} \\ &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{2 \operatorname{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{b^2c} + \frac{2 \operatorname{Subst}\left(\int e^{-\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{b^2c} \\ &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{bc\sqrt{a + b \cosh^{-1}(cx)}} + \frac{e^{a/b} \sqrt{\pi} \operatorname{erf}\left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} + \frac{e^{-a/b} \sqrt{\pi} \operatorname{erfi}\left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{b^{3/2}c} \end{aligned}$$

Mathematica [A] time = 0.237044, size = 132, normalized size = 1.1

$$\frac{e^{-\frac{a}{b}} \left(-e^{\frac{2a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} \operatorname{Gamma}\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) + \sqrt{-\frac{a + b \cosh^{-1}(cx)}{b}} \operatorname{Gamma}\left(\frac{1}{2}, -\frac{a + b \cosh^{-1}(cx)}{b}\right) - 2e^{a/b} \sqrt{\frac{cx-1}{cx+1}} \right)}{bc\sqrt{a + b \cosh^{-1}(cx)}}$$

Warning: Unable to verify antiderivative.

```
[In] Integrate[(a + b*ArcCosh[c*x])^(-3/2), x]
```

```
[Out] (-2*E^(a/b)*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x) - E^((2*a)/b)*Sqrt[a/b + ArcCosh[c*x]]*Gamma[1/2, a/b + ArcCosh[c*x]] + Sqrt[-((a + b*ArcCosh[c*x])/b)]*Gamma[1/2, -(a + b*ArcCosh[c*x])/b])/(b*c*E^(a/b)*Sqrt[a + b*ArcCosh[c*x]])
```

Maple [F] time = 0.099, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^{-\frac{3}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/(a+b*arccosh(c*x))^(3/2),x)

[Out] int(1/(a+b*arccosh(c*x))^(3/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{(b \operatorname{arcosh}(cx) + a)^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(3/2),x, algorithm="maxima")

[Out] integrate((b*arccosh(c*x) + a)^(-3/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(3/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{(a + b \operatorname{acosh}(cx))^{\frac{3}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*acosh(c*x))**(3/2),x)

[Out] Integral((a + b*acosh(c*x))**(-3/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(3/2),x, algorithm="giac")

[Out] sage0*x

$$3.157 \quad \int \frac{x^2}{(a+b \cosh^{-1}(cx))^{5/2}} dx$$

Optimal. Leaf size=276

$$\frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{6b^{5/2}c^3} - \frac{\sqrt{3\pi} e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2b^{5/2}c^3} + \frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{6b^{5/2}c^3} + \frac{\sqrt{3\pi} e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2b^{5/2}c^3}$$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(3*b*c*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)}) + (8*x)/(3*b^2*c^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (4*x^3)/(b^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(6*b^{(5/2)}*c^3) - (E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(2*b^{(5/2)}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(6*b^{(5/2)}*c^3*E^{(a/b)}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(2*b^{(5/2)}*c^3*E^{((3*a)/b)})$

Rubi [A] time = 1.33041, antiderivative size = 276, normalized size of antiderivative = 1., number of steps used = 22, number of rules used = 9, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.562$, Rules used = {5668, 5775, 5670, 5448, 3308, 2180, 2204, 2205, 5658}

$$\frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{6b^{5/2}c^3} - \frac{\sqrt{3\pi} e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2b^{5/2}c^3} + \frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{6b^{5/2}c^3} + \frac{\sqrt{3\pi} e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{2b^{5/2}c^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/(a + b*\operatorname{ArcCosh}[c*x])^{(5/2)}, x]$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(3*b*c*(a + b*\operatorname{ArcCosh}[c*x])^{(3/2)}) + (8*x)/(3*b^2*c^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (4*x^3)/(b^2*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(6*b^{(5/2)}*c^3) - (E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(2*b^{(5/2)}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(6*b^{(5/2)}*c^3*E^{(a/b)}) + (\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(2*b^{(5/2)}*c^3*E^{((3*a)/b)})$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x] \rightarrow \operatorname{Simp}[x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x)^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] /; \operatorname{FreeQ}\{a, b, c, x\} \&\amp; \operatorname{IGtQ}[m, 0] \&\amp; \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*((f*x)^m)/(\sqrt{(d1*x + e1*x)*\sqrt{(d2*x + e2*x)}}, x] \rightarrow \operatorname{Simp}[(f*x)^m*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}/(b*c*\sqrt{-(d1*d2)}*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\sqrt{-(d1*d2)}*(n+1)), \operatorname{Int}[(f*x)^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{(n+1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x] \&\amp; \operatorname{EqQ}[e1 - c*d1, 0]$

&& EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5670

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Dist[1/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x] && IGtQ[m, 0]

Rule 5448

Int[Cosh[(a_.) + (b_.)*(x_.)]^(p_.)*((c_.) + (d_.)*(x_.))^(m_.)*Sinh[(a_.) + (b_.)*(x_.)]^(n_.), x_Symbol] := Int[ExpandTrigReduce[(c + d*x)^m, Sinh[a + b*x]^n*Cosh[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.), x_Symbol] := -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rubi steps

$$\begin{aligned}
\int \frac{x^2}{(a + b \cosh^{-1}(cx))^{5/2}} dx &= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4 \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{3bc} + \frac{(2c) \int \frac{x^2}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{12 \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{8 \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{4 \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{8 \int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{4e^{a/b}\sqrt{7}}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{4e^{a/b}\sqrt{7}}{b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{8x}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4x^3}{b^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{e^{a/b}\sqrt{7}}{b}
\end{aligned}$$

Mathematica [A] time = 2.04002, size = 340, normalized size = 1.23

$$e^{-3\left(\frac{a}{b} + \cosh^{-1}(cx)\right)} \left(-6\sqrt{3}be^{3\cosh^{-1}(cx)} \left(-\frac{a+b\cosh^{-1}(cx)}{b} \right)^{3/2} \text{Gamma} \left(\frac{1}{2}, -\frac{3(a+b\cosh^{-1}(cx))}{b} \right) - 2be^{\frac{2a}{b} + 3\cosh^{-1}(cx)} \left(-\frac{a+b\cosh^{-1}(cx)}{b} \right) \right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/(a + b*ArcCosh[c*x])^(5/2), x]

[Out] (2*E^((4*a)/b + 3*ArcCosh[c*x])*Sqrt[a/b + ArcCosh[c*x]]*(a + b*ArcCosh[c*x])*Gamma[1/2, a/b + ArcCosh[c*x]] - 6*Sqrt[3]*b*E^(3*ArcCosh[c*x])*(-(a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, (-3*(a + b*ArcCosh[c*x]))/b] - 2*b*E^((2*a)/b + 3*ArcCosh[c*x])*(-(a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, -(a + b*ArcCosh[c*x])/b] + E^((3*a)/b)*(-(1 + E^(2*ArcCosh[c*x]))*(a*(6 - 4*E^(2*ArcCosh[c*x]) + 6*E^(4*ArcCosh[c*x])) + b*(-1 + 6*ArcCosh[c*x] - 4*E^(2*ArcCosh[c*x])*ArcCosh[c*x] + E^(4*ArcCosh[c*x])*(1 + 6*ArcCosh[c*x]))) + 6*Sqrt[3]*E^(3*(a/b + ArcCosh[c*x]))*Sqrt[a/b + ArcCosh[c*x]]*(a + b*ArcCosh[c*x])*Gamma[1/2, (3*(a + b*ArcCosh[c*x]))/b]))/(12*b^2*c^3*E^(3*(a/b + ArcCosh[c*x]))*(a + b*ArcCosh[c*x])^(3/2))

Maple [F] time = 0.095, size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{arccosh}(cx))^{-\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2/(a+b*arccosh(c*x))^(5/2),x)

[Out] int(x^2/(a+b*arccosh(c*x))^(5/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{(b \operatorname{arcosh}(cx) + a)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/(a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")

[Out] integrate(x^2/(b*arccosh(c*x) + a)^(5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2/(a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{(a + b \operatorname{acosh}(cx))^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x**2/(a+b*acosh(c*x))**(5/2),x)

[Out] Integral(x**2/(a + b*acosh(c*x))**(5/2), x)

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2/(a+b*arccosh(c*x))^(5/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.158 \quad \int \frac{x}{(a+b \cosh^{-1}(cx))^{5/2}} dx$$

Optimal. Leaf size=188

$$-\frac{2\sqrt{2\pi}e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c^2} + \frac{2\sqrt{2\pi}e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c^2} + \frac{4}{3b^2c^2\sqrt{a+b \cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b \cosh^{-1}(cx)}}$$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(3*b*c*(a+b*\operatorname{ArcCosh}[c*x])^{(3/2)}) + 4/(3*b^2*c^2*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) - (8*x^2)/(3*b^2*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) - (2*E^{((2*a)/b)}*\operatorname{Sqrt}[2*Pi]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(3*b^{(5/2)}*c^2) + (2*\operatorname{Sqrt}[2*Pi]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(3*b^{(5/2)}*c^2*E^{((2*a)/b)})$

Rubi [A] time = 0.89348, antiderivative size = 188, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {5668, 5775, 5670, 5448, 12, 3308, 2180, 2204, 2205, 5676}

$$-\frac{2\sqrt{2\pi}e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c^2} + \frac{2\sqrt{2\pi}e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c^2} + \frac{4}{3b^2c^2\sqrt{a+b \cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b \cosh^{-1}(cx)}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/(a+b*\operatorname{ArcCosh}[c*x])^{(5/2)}, x]$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(3*b*c*(a+b*\operatorname{ArcCosh}[c*x])^{(3/2)}) + 4/(3*b^2*c^2*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) - (8*x^2)/(3*b^2*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) - (2*E^{((2*a)/b)}*\operatorname{Sqrt}[2*Pi]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(3*b^{(5/2)}*c^2) + (2*\operatorname{Sqrt}[2*Pi]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(3*b^{(5/2)}*c^2*E^{((2*a)/b)})$

Rule 5668

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x^{(m+1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x^{(m-1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*((f_.)*(x_.))^{(m_.)}]/(\operatorname{Sqrt}[(d1_. + (e1_.)*(x_.)]*\operatorname{Sqrt}[(d2_. + (e2_.)*(x_.))]), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), \operatorname{Int}[(f*x)^{(m-1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5670

$\operatorname{Int}[(a_. + \operatorname{ArcCosh}[c_.*(x_.)]*(b_.))^{(n_.)}*(x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Dist}[1/c^{(m+1)}, \operatorname{Subst}[\operatorname{Int}[(a+b*x)^n*\operatorname{Cosh}[x]^m*\operatorname{Sinh}[x], x], x, \operatorname{ArcCosh}[c*x]],$

$x] /; \text{FreeQ}\{a, b, c, n\}, x] \&\& \text{IGtQ}[m, 0]$

Rule 5448

$\text{Int}[\text{Cosh}[(a_.) + (b_.)(x_.)]^{(p_.)} * ((c_.) + (d_.)(x_.))^{(m_.)} * \text{Sinh}[(a_.) + (b_.)(x_.)]^{(n_.)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandTrigReduce}[(c + d*x)^m, \text{Sinh}[a + b*x]^n * \text{Cosh}[a + b*x]^p, x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x] \&\& \text{IGtQ}[n, 0] \&\& \text{IGtQ}[p, 0]$

Rule 12

$\text{Int}[(a_)*(u_), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /; \text{FreeQ}[a, x] \&\& \text{!MatchQ}[u, (b_)*(v_)] /; \text{FreeQ}[b, x]$

Rule 3308

$\text{Int}[(c_.) + (d_.)(x_.)]^{(m_.)} * \sin[(e_.) + (f_.)(x_.)], x_Symbol] \rightarrow \text{Dist}[I/2, \text{Int}[(c + d*x)^m/E^{(I*(e + f*x))}, x], x] - \text{Dist}[I/2, \text{Int}[(c + d*x)^m * E^{(I*(e + f*x))}, x], x] /; \text{FreeQ}\{c, d, e, f, m\}, x]$

Rule 2180

$\text{Int}[(F_)^{((g_.)((e_.) + (f_.)(x_.)))/\text{Sqrt}[(c_.) + (d_.)(x_.)]}, x_Symbol] \rightarrow \text{Dist}[2/d, \text{Subst}[\text{Int}[F^{(g*(e - (c*f)/d) + (f*g*x^2)/d)}, x], x, \text{Sqrt}[c + d*x]], x] /; \text{FreeQ}\{F, c, d, e, f, g\}, x] \&\& \text{!}\$UseGamma == \text{True}$

Rule 2204

$\text{Int}[(F_)^{((a_.) + (b_.)((c_.) + (d_.)(x_.))^2)}, x_Symbol] \rightarrow \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erfi}[(c + d*x) * \text{Rt}[b * \text{Log}[F], 2]]) / (2 * d * \text{Rt}[b * \text{Log}[F], 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{PosQ}[b]$

Rule 2205

$\text{Int}[(F_)^{((a_.) + (b_.)((c_.) + (d_.)(x_.))^2)}, x_Symbol] \rightarrow \text{Simp}[(F^a * \text{Sqrt}[\text{Pi}] * \text{Erf}[(c + d*x) * \text{Rt}[-(b * \text{Log}[F]), 2]]) / (2 * d * \text{Rt}[-(b * \text{Log}[F]), 2]), x] /; \text{FreeQ}\{F, a, b, c, d\}, x] \&\& \text{NegQ}[b]$

Rule 5676

$\text{Int}[(a_.) + \text{ArcCosh}[(c_.)(x_.)] * (b_.)]^{(n_.)} / (\text{Sqrt}[(d1_.) + (e1_.)(x_.)] * \text{Sqrt}[(d2_.) + (e2_.)(x_.)]), x_Symbol] \rightarrow \text{Simp}[(a + b * \text{ArcCosh}[c*x])^{(n + 1)} / (b * c * \text{Sqrt}[-(d1*d2)] * (n + 1)), x] /; \text{FreeQ}\{a, b, c, d1, e1, d2, e2, n\}, x] \&\& \text{EqQ}[e1, c*d1] \&\& \text{EqQ}[e2, -(c*d2)] \&\& \text{GtQ}[d1, 0] \&\& \text{LtQ}[d2, 0] \&\& \text{NeQ}[n, -1]$

Rubi steps

$$\begin{aligned}
\int \frac{x}{(a + b \cosh^{-1}(cx))^{5/2}} dx &= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} - \frac{2 \int \frac{1}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{3bc} + \frac{(4c) \int \frac{x^2}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{16 \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{16 \text{Subst} \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{16 \text{Subst} \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} + \frac{8 \text{Subst} \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{4 \text{Subst} \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8 \text{Subst} \int \frac{x^2}{\sqrt{a+b\cosh^{-1}(cx)}} dx}{3b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{3bc(a+b\cosh^{-1}(cx))^{3/2}} + \frac{4}{3b^2c^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{8x^2}{3b^2\sqrt{a+b\cosh^{-1}(cx)}} - \frac{2e^{\frac{2a}{b}}\sqrt{2}}{3b^{5/2}c^2}
\end{aligned}$$

Mathematica [A] time = 1.51707, size = 157, normalized size = 0.84

$$\frac{-2\sqrt{2\pi} \left(\sinh\left(\frac{2a}{b}\right) + \cosh\left(\frac{2a}{b}\right) \right) \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right) + 2\sqrt{2\pi} \left(\cosh\left(\frac{2a}{b}\right) - \sinh\left(\frac{2a}{b}\right) \right) \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right) - \frac{\sqrt{b}(4\cos)}{3b^{5/2}c^2}}{3b^{5/2}c^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/(a + b*ArcCosh[c*x])^(5/2), x]

[Out] (2*Sqrt[2*Pi]*Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] - Sinh[(2*a)/b]) - 2*Sqrt[2*Pi]*Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b]) - (Sqrt[b]*(4*(a + b*ArcCosh[c*x])*Cosh[2*ArcCosh[c*x]] + b*Sinh[2*ArcCosh[c*x]]))/(a + b*ArcCosh[c*x])^(3/2))/(3*b^(5/2)*c^2)

Maple [F] time = 0.118, size = 0, normalized size = 0.

$$\int x (a + b \operatorname{arccosh}(cx))^{-5/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x/(a+b*arccosh(c*x))^(5/2),x)`

[Out] `int(x/(a+b*arccosh(c*x))^(5/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{(b \operatorname{arcosh}(cx) + a)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")`

[Out] `integrate(x/(b*arccosh(c*x) + a)^(5/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{(a + b \operatorname{acosh}(cx))^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*acosh(c*x))**(5/2),x)`

[Out] `Integral(x/(a + b*acosh(c*x))**(5/2), x)`

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0*x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x/(a+b*arccosh(c*x))^(5/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.159 \quad \int \frac{1}{(a+b \cosh^{-1}(cx))^{5/2}} dx$$

Optimal. Leaf size=148

$$-\frac{2\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c} + \frac{2\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c} - \frac{4x}{3b^2\sqrt{a+b \cosh^{-1}(cx)}} - \frac{2\sqrt{cx-1}\sqrt{cx+1}}{3bc(a+b \cosh^{-1}(cx))^{3/2}}$$

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(3b^2c(a+b\operatorname{ArcCosh}[cx])^{3/2}) - (4x)/(3b^2\sqrt{a+b\operatorname{ArcCosh}[cx]}) - (2E^{a/b}\sqrt{\pi}\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(3b^{5/2}c) + (2\sqrt{\pi}\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(3b^{5/2}cE^{a/b})$

Rubi [A] time = 0.455902, antiderivative size = 148, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5656, 5775, 5658, 3308, 2180, 2205, 2204}

$$-\frac{2\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c} + \frac{2\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c} - \frac{4x}{3b^2\sqrt{a+b \cosh^{-1}(cx)}} - \frac{2\sqrt{cx-1}\sqrt{cx+1}}{3bc(a+b \cosh^{-1}(cx))^{3/2}}$$

Antiderivative was successfully verified.

[In] Int[(a + b*ArcCosh[c*x])^(-5/2), x]

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(3b^2c(a+b\operatorname{ArcCosh}[cx])^{3/2}) - (4x)/(3b^2\sqrt{a+b\operatorname{ArcCosh}[cx]}) - (2E^{a/b}\sqrt{\pi}\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(3b^{5/2}c) + (2\sqrt{\pi}\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(3b^{5/2}cE^{a/b})$

Rule 5656

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_), x_Symbol] :> Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]

Rule 5775

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_)*((f_.)*(x_.))^(m_.))/(Sqrt[(d1_) + (e1_.)*(x_.)]*Sqrt[(d2_) + (e2_.)*(x_.)]), x_Symbol] :> Simp[((f*x)^(m*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n + 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5658

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_), x_Symbol] :> -Dist[(b*c)^(-1), Subst[Int[x^n*Sinh[a/b - x/b], x], x, a + b*ArcCosh[c*x]], x] /; FreeQ[{a, b, c, n}, x]

Rule 3308

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + (f_.)*(x_.)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rubi steps

$$\begin{aligned}
 \int \frac{1}{(a + b \cosh^{-1}(cx))^{5/2}} dx &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} + \frac{(2c) \int \frac{x}{\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{3/2}} dx}{3b} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} - \frac{4x}{3b^2\sqrt{a + b \cosh^{-1}(cx)}} + \frac{4 \int \frac{1}{\sqrt{a + b \cosh^{-1}(cx)}} dx}{3b^2} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} - \frac{4x}{3b^2\sqrt{a + b \cosh^{-1}(cx)}} - \frac{4 \operatorname{Subst}\left(\int \frac{\sinh\left(\frac{a}{b} - \frac{x}{b}\right)}{\sqrt{x}} dx, x, a + b \cosh^{-1}(cx)\right)}{3b^3c} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} - \frac{4x}{3b^2\sqrt{a + b \cosh^{-1}(cx)}} - \frac{2 \operatorname{Subst}\left(\int \frac{e^{-i\left(\frac{ia}{b} - \frac{ix}{b}\right)}}{\sqrt{x}} dx, x, a + b \cosh^{-1}(cx)\right)}{3b^3c} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} - \frac{4x}{3b^2\sqrt{a + b \cosh^{-1}(cx)}} - \frac{4 \operatorname{Subst}\left(\int e^{\frac{a}{b} - \frac{x^2}{b}} dx, x, \sqrt{a + b \cosh^{-1}(cx)}\right)}{3b^3c} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{3bc(a + b \cosh^{-1}(cx))^{3/2}} - \frac{4x}{3b^2\sqrt{a + b \cosh^{-1}(cx)}} - \frac{2e^{a/b}\sqrt{\pi}\operatorname{erf}\left(\frac{\sqrt{a + b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{3b^{5/2}c} + \dots
 \end{aligned}$$

Mathematica [A] time = 1.01488, size = 192, normalized size = 1.3

$$e^{-\frac{a + b \cosh^{-1}(cx)}{b}} \left(2e^{\frac{2a}{b} + \cosh^{-1}(cx)} \sqrt{\frac{a}{b} + \cosh^{-1}(cx)} (a + b \cosh^{-1}(cx)) \operatorname{Gamma}\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(cx)\right) - 2 \left(b e^{\cosh^{-1}(cx)} \left(-\frac{a + b \cosh^{-1}(cx)}{b} \right) \right) \right)$$

$$3b^2c(a + b \cosh^{-1}(cx))$$

Warning: Unable to verify antiderivative.

[In] Integrate[(a + b*ArcCosh[c*x])^(-5/2),x]

[Out] (2*E^((2*a)/b + ArcCosh[c*x])*Sqrt[a/b + ArcCosh[c*x]]*(a + b*ArcCosh[c*x]) *Gamma[1/2, a/b + ArcCosh[c*x]] - 2*(E^(a/b)*(b*E^ArcCosh[c*x])*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x) + (1 + E^(2*ArcCosh[c*x]))*(a + b*ArcCosh[c*x])) + b*E^ArcCosh[c*x]*(-((a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, -((a + b*ArcCosh[c*x])/b)))/(3*b^2*c*E^((a + b*ArcCosh[c*x])/b)*(a + b*ArcCosh[c*x])^(3/2))

Maple [F] time = 0.094, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^{-\frac{5}{2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/(a+b*arccosh(c*x))^(5/2),x)

[Out] int(1/(a+b*arccosh(c*x))^(5/2),x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{(b \operatorname{arccosh}(cx) + a)^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(5/2),x, algorithm="maxima")

[Out] integrate((b*arccosh(c*x) + a)^(-5/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(5/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{(a + b \operatorname{acosh}(cx))^{\frac{5}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/(a+b*acosh(c*x))**(5/2),x)
```

```
[Out] Integral((a + b*acosh(c*x))**(-5/2), x)
```

Giac [F] time = 0., size = 0, normalized size = 0.

$\text{sage}_0 x$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/(a+b*arccosh(c*x))^(5/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

$$3.160 \quad \int \frac{x^2}{(a+b \cosh^{-1}(cx))^{7/2}} dx$$

Optimal. Leaf size=361

$$\frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^3} + \frac{3\sqrt{3}\pi e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{5b^{7/2}c^3} + \frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^3} + \frac{3\sqrt{3}\pi e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{5b^{7/2}c^3}$$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(5*b*c*(a + b*\operatorname{ArcCosh}[c*x])^{5/2}) + (8*x)/(15*b^2*c^2*(a + b*\operatorname{ArcCosh}[c*x])^{3/2}) - (4*x^3)/(5*b^2*(a + b*\operatorname{ArcCosh}[c*x])^{3/2}) + (16*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(15*b^3*c^3*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (24*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(5*b^3*c*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(15*b^{7/2}*c^3) + (3*E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(5*b^{7/2}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(15*b^{7/2}*c^3*E^{(a/b)}) + (3*\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(5*b^{7/2}*c^3*E^{((3*a)/b)})$

Rubi [A] time = 1.62671, antiderivative size = 361, normalized size of antiderivative = 1., number of steps used = 22, number of rules used = 9, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.562$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205, 5656, 5781}

$$\frac{\sqrt{\pi} e^{a/b} \operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^3} + \frac{3\sqrt{3}\pi e^{\frac{3a}{b}} \operatorname{Erf}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{5b^{7/2}c^3} + \frac{\sqrt{\pi} e^{-\frac{a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^3} + \frac{3\sqrt{3}\pi e^{-\frac{3a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{3}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{5b^{7/2}c^3}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x^2/(a + b*\operatorname{ArcCosh}[c*x])^{7/2}, x]$

[Out] $(-2*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(5*b*c*(a + b*\operatorname{ArcCosh}[c*x])^{5/2}) + (8*x)/(15*b^2*c^2*(a + b*\operatorname{ArcCosh}[c*x])^{3/2}) - (4*x^3)/(5*b^2*(a + b*\operatorname{ArcCosh}[c*x])^{3/2}) + (16*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(15*b^3*c^3*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) - (24*x^2*\sqrt{-1 + c*x}*\sqrt{1 + c*x})/(5*b^3*c*\sqrt{a + b*\operatorname{ArcCosh}[c*x]}) + (E^{(a/b)}*\sqrt{\pi}*\operatorname{Erf}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(15*b^{7/2}*c^3) + (3*E^{((3*a)/b)}*\sqrt{3*\pi}*\operatorname{Erf}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(5*b^{7/2}*c^3) + (\sqrt{\pi}*\operatorname{Erfi}[\sqrt{a + b*\operatorname{ArcCosh}[c*x]}/\sqrt{b}])/(15*b^{7/2}*c^3*E^{(a/b)}) + (3*\sqrt{3*\pi}*\operatorname{Erfi}[(\sqrt{3}*\sqrt{a + b*\operatorname{ArcCosh}[c*x]})/\sqrt{b}])/(5*b^{7/2}*c^3*E^{((3*a)/b)})$

Rule 5668

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*(x)^m, x_Symbol] \rightarrow \operatorname{Simp}[x^m*\sqrt{-1 + c*x}*\sqrt{1 + c*x}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[x^{m+1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[x^{m-1}*(a + b*\operatorname{ArcCosh}[c*x])^{n+1}/(\sqrt{-1 + c*x}*\sqrt{1 + c*x}), x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{IGtQ}[m, 0] \ \&\& \ \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c*x])*(b*x)^n*((f*x)^m)/(\sqrt{(d_1 + (e_1*x)^2)*\sqrt{(d_2 + (e_2*x)^2)}), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a$

+ b*ArcCosh[c*x]^(n + 1))/(b*c*Sqrt[-(d1*d2)]*(n + 1)), x] - Dist[(f*m)/(b*c*Sqrt[-(d1*d2)]*(n + 1)), Int[(f*x)^(m - 1)*(a + b*ArcCosh[c*x])^(n + 1), x], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && LtQ[n, -1] && GtQ[d1, 0] && LtQ[d2, 0]

Rule 5666

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] :> Simp[(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]

Rule 3307

Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] :> Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 5656

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.), x_Symbol] :> Simp[(Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1)), x] - Dist[c/(b*(n + 1)), Int[(x*(a + b*ArcCosh[c*x])^(n + 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c}, x] && LtQ[n, -1]

Rule 5781

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.)*((d1_.) + (e1_.)*(x_.))^(p_.)*((d2_.) + (e2_.)*(x_.))^(q_.), x_Symbol] :> Dist[(-(d1*d2))^p/c^(m + 1), Subst[Int[(a + b*x)^n*Cosh[x]^m*Sinh[x]^(2*p + 1), x], x, ArcCosh[c*x]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rubi steps

$$\begin{aligned}
\int \frac{x^2}{(a + b \cosh^{-1}(cx))^{7/2}} dx &= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} - \frac{4\int \frac{x}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{5/2}} dx}{5bc} + \frac{(6c)\int \frac{x^3}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{3/2}} dx}{5b} \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x^2\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{8x}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{4x^3}{5b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots
\end{aligned}$$

Mathematica [A] time = 2.46149, size = 394, normalized size = 1.09

$$-2e^{-\cosh^{-1}(cx)}(a+b\cosh^{-1}(cx))\left(2e^{\frac{a}{b}+\cosh^{-1}(cx)}\sqrt{\frac{a}{b}+\cosh^{-1}(cx)}(a+b\cosh^{-1}(cx))\Gamma\left(\frac{1}{2}, \frac{a}{b}+\cosh^{-1}(cx)\right)-2a-\dots\right)$$

Warning: Unable to verify antiderivative.

[In] Integrate[x^2/(a + b*ArcCosh[c*x])^(7/2), x]

[Out] (-6*b^2*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x) - (2*(a + b*ArcCosh[c*x])*(-2*a + b - 2*b*ArcCosh[c*x] + 2*E^(a/b + ArcCosh[c*x])*Sqrt[a/b + ArcCosh[c*x]])*(a + b*ArcCosh[c*x])*Gamma[1/2, a/b + ArcCosh[c*x]])/E^ArcCosh[c*x] - (2*(a + b*ArcCosh[c*x])*(E^(a/b + ArcCosh[c*x])*(2*a + b + 2*b*ArcCosh[c*x]) + 2*b*(-((a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, -((a + b*ArcCosh[c*x])/b)]))/E^(a/b) - 3*(a + b*ArcCosh[c*x])*((12*Sqrt[3]*b*(-((a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, (-3*(a + b*ArcCosh[c*x])/b)]/E^((3*a)/b) + (2*(b + 6*a*(-1 + E^(6*ArcCosh[c*x]))) - 6*b*ArcCosh[c*x] + b*E^(6*ArcCosh[c*x]))*(1 + 6*ArcCosh[c*x]) + 6*Sqrt[3]*E^(3*(a/b + ArcCosh[c*x]))*Sqrt[a/b + ArcCosh[c*x]])*(a + b*ArcCosh[c*x])*Gamma[1/2, (3*(a + b*ArcCosh[c*x])/b)]/E^(3*ArcCosh[c*x])) - 6*b^2*Sinh[3*ArcCosh[c*x]]/(60*b^3*c^3*(a + b*ArcCosh[c*x])^(5/2))

Maple [F] time = 0.099, size = 0, normalized size = 0.

$$\int x^2 (a + b \operatorname{arccosh}(cx))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `int(x^2/(a+b*arccosh(c*x))^(7/2),x)`

[Out] `int(x^2/(a+b*arccosh(c*x))^(7/2),x)`

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x^2}{(b \operatorname{arccosh}(cx) + a)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(7/2),x, algorithm="maxima")`

[Out] `integrate(x^2/(b*arccosh(c*x) + a)^(7/2), x)`

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(7/2),x, algorithm="fricas")`

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x**2/(a+b*acosh(c*x))**(7/2),x)`

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

`sage0x`

Verification of antiderivative is not currently implemented for this CAS.

[In] `integrate(x^2/(a+b*arccosh(c*x))^(7/2),x, algorithm="giac")`

[Out] `sage0*x`

$$3.161 \quad \int \frac{x}{(a+b \cosh^{-1}(cx))^{7/2}} dx$$

Optimal. Leaf size=229

$$\frac{8\sqrt{2\pi}e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^2} + \frac{8\sqrt{2\pi}e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^2} + \frac{4}{15b^2c^2(a+b \cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b \cosh^{-1}(cx))^{5/2}}$$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(5*b*c*(a+b*\operatorname{ArcCosh}[c*x])^{5/2}) + 4/(15*b^2*c^2*(a+b*\operatorname{ArcCosh}[c*x])^{3/2}) - (8*x^2)/(15*b^2*(a+b*\operatorname{ArcCosh}[c*x])^{5/2}) - (32*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(15*b^3*c*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) + (8*E^{((2*a)/b)}*\operatorname{Sqrt}[2*Pi]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(15*b^{(7/2)}*c^2) + (8*\operatorname{Sqrt}[2*Pi]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(15*b^{(7/2)}*c^2*E^{((2*a)/b)})$

Rubi [A] time = 0.870413, antiderivative size = 229, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 8, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.571$, Rules used = {5668, 5775, 5666, 3307, 2180, 2204, 2205, 5676}

$$\frac{8\sqrt{2\pi}e^{\frac{2a}{b}} \operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^2} + \frac{8\sqrt{2\pi}e^{-\frac{2a}{b}} \operatorname{Erfi}\left(\frac{\sqrt{2}\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^2} + \frac{4}{15b^2c^2(a+b \cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b \cosh^{-1}(cx))^{5/2}}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[x/(a+b*\operatorname{ArcCosh}[c*x])^{7/2}, x]$

[Out] $(-2*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(5*b*c*(a+b*\operatorname{ArcCosh}[c*x])^{5/2}) + 4/(15*b^2*c^2*(a+b*\operatorname{ArcCosh}[c*x])^{3/2}) - (8*x^2)/(15*b^2*(a+b*\operatorname{ArcCosh}[c*x])^{5/2}) - (32*x*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x])/(15*b^3*c*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]]) + (8*E^{((2*a)/b)}*\operatorname{Sqrt}[2*Pi]*\operatorname{Erf}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(15*b^{(7/2)}*c^2) + (8*\operatorname{Sqrt}[2*Pi]*\operatorname{Erfi}[(\operatorname{Sqrt}[2]*\operatorname{Sqrt}[a+b*\operatorname{ArcCosh}[c*x]])/\operatorname{Sqrt}[b]])/(15*b^{(7/2)}*c^2*E^{((2*a)/b)})$

Rule 5668

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[(c_.)*(x_)]*(b_.)^{(n_)}*(x_)^{(m_)}, x_Symbol] \rightarrow \operatorname{Simp}[(x^m*\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*(n+1)), x] + (-\operatorname{Dist}[(c*(m+1))/(b*(n+1)], \operatorname{Int}[(x^{(m+1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]), x], x] + \operatorname{Dist}[m/(b*c*(n+1)), \operatorname{Int}[(x^{(m-1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(\operatorname{Sqrt}[-1+c*x]*\operatorname{Sqrt}[1+c*x]), x], x]) /; \operatorname{FreeQ}\{a, b, c\}, x \&\& \operatorname{IGtQ}[m, 0] \&\& \operatorname{LtQ}[n, -2]$

Rule 5775

$\operatorname{Int}[(a_.) + \operatorname{ArcCosh}[(c_.)*(x_)]*(b_.)^{(n_)}*((f_.)*(x_))^{(m_)}]/(\operatorname{Sqrt}[(d1_.) + (e1_.)*(x_)]*\operatorname{Sqrt}[(d2_.) + (e2_.)*(x_)]), x_Symbol] \rightarrow \operatorname{Simp}[(f*x)^m*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)})/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), x] - \operatorname{Dist}[(f*m)/(b*c*\operatorname{Sqrt}[-(d1*d2)]*(n+1)), \operatorname{Int}[(f*x)^{(m-1)}*(a+b*\operatorname{ArcCosh}[c*x])^{(n+1)}, x], x] /; \operatorname{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \operatorname{EqQ}[e1 - c*d1, 0] \&\& \operatorname{EqQ}[e2 + c*d2, 0] \&\& \operatorname{LtQ}[n, -1] \&\& \operatorname{GtQ}[d1, 0] \&\& \operatorname{LtQ}[d2, 0]$

Rule 5666

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*(x_.)^(m_.), x_Symbol] := Simp[
(x^m*Sqrt[-1 + c*x]*Sqrt[1 + c*x]*(a + b*ArcCosh[c*x])^(n + 1))/(b*c*(n + 1
)), x] + Dist[1/(b*c^(m + 1)*(n + 1)), Subst[Int[ExpandTrigReduce[(a + b*x)
^(n + 1)*Cosh[x]^(m - 1)*(m - (m + 1)*Cosh[x]^2), x], x], x, ArcCosh[c*x]],
x] /; FreeQ[{a, b, c}, x] && IGtQ[m, 0] && GeQ[n, -2] && LtQ[n, -1]
```

Rule 3307

```
Int[((c_.) + (d_.)*(x_.))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_.)], x_Symbol
] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]
```

Rule 2180

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_.)))/Sqrt[(c_.) + (d_.)*(x_.)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !$UseGamma == True
```

Rule 2204

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rule 2205

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_.))^2), x_Symbol] := Simp[(F^a*Sqr
t[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rule 5676

```
Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sq
rt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] := Simp[(a + b*ArcCosh[c*x])^(n + 1)/(b
*c*Sqrt[-(d1*d2)]*(n + 1)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] &&
EqQ[e1, c*d1] && EqQ[e2, -(c*d2)] && GtQ[d1, 0] && LtQ[d2, 0] && NeQ[n, -1
]
```

Rubi steps

$$\begin{aligned}
\int \frac{x}{(a + b \cosh^{-1}(cx))^{7/2}} dx &= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} - \frac{2\int \frac{1}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{5/2}} dx}{5bc} + \frac{(4c)\int \frac{x^2}{\sqrt{-1+cx}\sqrt{1+cx}(a+b\cosh^{-1}(cx))^{5/2}} dx}{5b} \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{4}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b\cosh^{-1}(cx))^{3/2}} + \dots \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{4}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b\cosh^{-1}(cx))^{3/2}} - \dots \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{4}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b\cosh^{-1}(cx))^{3/2}} - \dots \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{4}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b\cosh^{-1}(cx))^{3/2}} - \dots \\
&= -\frac{2x\sqrt{-1+cx}\sqrt{1+cx}}{5bc(a+b\cosh^{-1}(cx))^{5/2}} + \frac{4}{15b^2c^2(a+b\cosh^{-1}(cx))^{3/2}} - \frac{8x^2}{15b^2(a+b\cosh^{-1}(cx))^{3/2}} - \dots
\end{aligned}$$

Mathematica [A] time = 1.60954, size = 175, normalized size = 0.76

$$\frac{\sqrt{b}\left(-\sinh(2\cosh^{-1}(cx))\left(16(a+b\cosh^{-1}(cx))^2+3b^2\right)-4b\cosh(2\cosh^{-1}(cx))(a+b\cosh^{-1}(cx))\right)}{(a+b\cosh^{-1}(cx))^{5/2}} + 8\sqrt{2\pi}\left(\sinh\left(\frac{2a}{b}\right)+\cosh\left(\frac{2a}{b}\right)\right)\operatorname{Erf}\left(\frac{\sqrt{2}\sqrt{a+b\cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c^2}$$

Warning: Unable to verify antiderivative.

[In] Integrate[x/(a + b*ArcCosh[c*x])^(7/2), x]

[Out] (8*Sqrt[2*Pi]*Erfi[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] - Sinh[(2*a)/b]) + 8*Sqrt[2*Pi]*Erf[(Sqrt[2]*Sqrt[a + b*ArcCosh[c*x]])/Sqrt[b]]*(Cosh[(2*a)/b] + Sinh[(2*a)/b]) + (Sqrt[b]*(-4*b*(a + b*ArcCosh[c*x]))*Cosh[2*ArcCosh[c*x]] - (3*b^2 + 16*(a + b*ArcCosh[c*x])^2)*Sinh[2*ArcCosh[c*x]])/(a + b*ArcCosh[c*x])^(5/2))/(15*b^(7/2)*c^2)

Maple [F] time = 0.111, size = 0, normalized size = 0.

$$\int x(a + b\operatorname{arccosh}(cx))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x/(a+b*arccosh(c*x))^(7/2), x)

[Out] int(x/(a+b*arccosh(c*x))^(7/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{x}{(b \operatorname{arcosh}(cx) + a)^{\frac{7}{2}}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(7/2),x, algorithm="maxima")

[Out] integrate(x/(b*arccosh(c*x) + a)^(7/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(7/2),x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*acosh(c*x))**(7/2),x)

[Out] Timed out

Giac [F] time = 0., size = 0, normalized size = 0.

sage₀x

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x/(a+b*arccosh(c*x))^(7/2),x, algorithm="giac")

[Out] sage0*x

$$3.162 \quad \int \frac{1}{(a+b \cosh^{-1}(cx))^{7/2}} dx$$

Optimal. Leaf size=188

$$\frac{4\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c} + \frac{4\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c} - \frac{4x}{15b^2(a+b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{cx-1}\sqrt{cx+1}}{15b^3c\sqrt{a+b \cosh^{-1}(cx)}} - \frac{5}{5}$$

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(5b^2c(a+b\operatorname{ArcCosh}[cx])^{5/2}) - (4x)/(15b^2(a+b\operatorname{ArcCosh}[cx])^{3/2}) - (8\sqrt{-1+cx}\sqrt{1+cx})/(15b^3c\sqrt{a+b\operatorname{ArcCosh}[cx]}) + (4E^{a/b}\sqrt{\pi}\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(15b^{7/2}c) + (4\sqrt{\pi}\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(15b^{7/2}cE^{a/b})$

Rubi [A] time = 0.771664, antiderivative size = 188, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 7, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.583$, Rules used = {5656, 5775, 5781, 3307, 2180, 2204, 2205}

$$\frac{4\sqrt{\pi}e^{a/b}\operatorname{Erf}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c} + \frac{4\sqrt{\pi}e^{-\frac{a}{b}}\operatorname{Erfi}\left(\frac{\sqrt{a+b \cosh^{-1}(cx)}}{\sqrt{b}}\right)}{15b^{7/2}c} - \frac{4x}{15b^2(a+b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{cx-1}\sqrt{cx+1}}{15b^3c\sqrt{a+b \cosh^{-1}(cx)}} - \frac{5}{5}$$

Antiderivative was successfully verified.

[In] $\operatorname{Int}[(a+b\operatorname{ArcCosh}[cx])^{-7/2}, x]$

[Out] $(-2\sqrt{-1+cx}\sqrt{1+cx})/(5b^2c(a+b\operatorname{ArcCosh}[cx])^{5/2}) - (4x)/(15b^2(a+b\operatorname{ArcCosh}[cx])^{3/2}) - (8\sqrt{-1+cx}\sqrt{1+cx})/(15b^3c\sqrt{a+b\operatorname{ArcCosh}[cx]}) + (4E^{a/b}\sqrt{\pi}\operatorname{Erf}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(15b^{7/2}c) + (4\sqrt{\pi}\operatorname{Erfi}[\sqrt{a+b\operatorname{ArcCosh}[cx]}/\sqrt{b}])/(15b^{7/2}cE^{a/b})$

Rule 5656

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}, x_Symbol] \rightarrow \operatorname{Simp}[(\sqrt{-1+cx}\sqrt{1+cx}(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(b^2c(n+1)), x] - \operatorname{Dist}[c/(b^2c(n+1)), \operatorname{Int}[(x(a+b\operatorname{ArcCosh}[cx])^{(n+1)})/(\sqrt{-1+cx}\sqrt{1+cx})], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{LtQ}[n, -1]$

Rule 5775

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(f(x))^{(m)} / (\sqrt{(d_1 + (e_1(x))\sqrt{d_2 + (e_2(x))})}), x_Symbol] \rightarrow \operatorname{Simp}[(f(x))^{(m)}(a + b\operatorname{ArcCosh}[cx])^{(n+1)}) / (b^2c\sqrt{-(d_1d_2)}(n+1)), x] - \operatorname{Dist}[(f(x))^{(m)} / (b^2c\sqrt{-(d_1d_2)}(n+1)), \operatorname{Int}[(f(x))^{(m-1)}(a + b\operatorname{ArcCosh}[cx])^{(n+1)}], x] /;$ $\operatorname{FreeQ}\{a, b, c, d_1, e_1, d_2, e_2, f, m, x\} \ \&\& \ \operatorname{EqQ}[e_1 - cd_1, 0] \ \&\& \ \operatorname{EqQ}[e_2 + cd_2, 0] \ \&\& \ \operatorname{LtQ}[n, -1] \ \&\& \ \operatorname{GtQ}[d_1, 0] \ \&\& \ \operatorname{LtQ}[d_2, 0]$

Rule 5781

$\operatorname{Int}[(a + \operatorname{ArcCosh}[c(x)](b))^{(n)}(x)^{(m)}((d_1 + (e_1(x))\sqrt{d_2 + (e_2(x))})^{(p)}), x_Symbol] \rightarrow \operatorname{Dist}[(d_1d_2)^{p/c}(m+1), \operatorname{Subst}[\operatorname{Int}[(a + b^2x)^n \operatorname{Cosh}[x]^m \operatorname{Sinh}[x]^{(2p+1)}], x], x, \operatorname{ArcCosh}[cx]$

]], x] /; FreeQ[{a, b, c, d1, e1, d2, e2, n}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && IntegerQ[p + 1/2] && GtQ[p, -1] && IGtQ[m, 0] && (GtQ[d1, 0] && LtQ[d2, 0])

Rule 3307

Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x] && IntegerQ[2*k]

Rule 2180

Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] := Dist[2/d, Subst[Int[F^(g*(e - (c*f)/d) + (f*g*x^2)/d), x], x, Sqrt[c + d*x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !\$UseGamma == True

Rule 2204

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erfi[(c + d*x)*Rt[b*Log[F], 2]])/(2*d*Rt[b*Log[F], 2]), x] /; FreeQ[{F, a, b, c, d}, x] && PosQ[b]

Rule 2205

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)^2), x_Symbol] := Simp[(F^a*Sqrt[Pi]*Erf[(c + d*x)*Rt[-(b*Log[F]), 2]])/(2*d*Rt[-(b*Log[F]), 2]), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rubi steps

$$\begin{aligned}
 \int \frac{1}{(a + b \cosh^{-1}(cx))^{7/2}} dx &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} + \frac{(2c) \int \frac{x}{\sqrt{-1 + cx}\sqrt{1 + cx}(a + b \cosh^{-1}(cx))^{5/2}} dx}{5b} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} + \frac{4 \int \frac{1}{(a + b \cosh^{-1}(cx))^{3/2}} dx}{15b^2} \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{-1 + cx}\sqrt{1 + cx}}{15b^3c\sqrt{a + b \cosh^{-1}(cx)}} + \dots \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{-1 + cx}\sqrt{1 + cx}}{15b^3c\sqrt{a + b \cosh^{-1}(cx)}} + \dots \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{-1 + cx}\sqrt{1 + cx}}{15b^3c\sqrt{a + b \cosh^{-1}(cx)}} + \dots \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{-1 + cx}\sqrt{1 + cx}}{15b^3c\sqrt{a + b \cosh^{-1}(cx)}} + \dots \\
 &= -\frac{2\sqrt{-1 + cx}\sqrt{1 + cx}}{5bc(a + b \cosh^{-1}(cx))^{5/2}} - \frac{4x}{15b^2(a + b \cosh^{-1}(cx))^{3/2}} - \frac{8\sqrt{-1 + cx}\sqrt{1 + cx}}{15b^3c\sqrt{a + b \cosh^{-1}(cx)}} + \dots
 \end{aligned}$$

Mathematica [A] time = 0.698332, size = 214, normalized size = 1.14

$$\frac{2e^{-\cosh^{-1}(cx)}(a+b\cosh^{-1}(cx))\left(2e^{\frac{a}{b}+\cosh^{-1}(cx)}\sqrt{\frac{a}{b}+\cosh^{-1}(cx)}(a+b\cosh^{-1}(cx))\Gamma\left(\frac{1}{2},\frac{a}{b}+\cosh^{-1}(cx)\right)-2a-2b\cosh^{-1}(cx)+b\right)}{b^2} - \frac{2e^{-\frac{a}{b}}(a+b\cosh^{-1}(cx))}{15bc(a+b\cosh^{-1}(cx))^{5/2}}$$

Warning: Unable [A] to verify antiderivative.

[In] Integrate[(a + b*ArcCosh[c*x])^(-7/2), x]

[Out] (-6*Sqrt[(-1 + c*x)/(1 + c*x)]*(1 + c*x) - (2*(a + b*ArcCosh[c*x])*(-2*a + b - 2*b*ArcCosh[c*x] + 2*E^(a/b + ArcCosh[c*x])*Sqrt[a/b + ArcCosh[c*x]]*(a + b*ArcCosh[c*x])*Gamma[1/2, a/b + ArcCosh[c*x]])))/(b^2*E^ArcCosh[c*x]) - (2*(a + b*ArcCosh[c*x])*(E^(a/b + ArcCosh[c*x])*(2*a + b + 2*b*ArcCosh[c*x]) + 2*b*(-((a + b*ArcCosh[c*x])/b))^(3/2)*Gamma[1/2, -((a + b*ArcCosh[c*x])/b)])))/(b^2*E^(a/b)))/(15*b*c*(a + b*ArcCosh[c*x])^(5/2))

Maple [F] time = 0.109, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^{-7/2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(1/(a+b*arccosh(c*x))^(7/2), x)

[Out] int(1/(a+b*arccosh(c*x))^(7/2), x)

Maxima [F] time = 0., size = 0, normalized size = 0.

$$\int \frac{1}{(b \operatorname{arcosh}(cx) + a)^{7/2}} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(7/2), x, algorithm="maxima")

[Out] integrate((b*arccosh(c*x) + a)^(-7/2), x)

Fricas [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: UnboundLocalError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(1/(a+b*arccosh(c*x))^(7/2), x, algorithm="fricas")

[Out] Exception raised: UnboundLocalError

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/(a+b*acosh(c*x))**(7/2),x)
```

```
[Out] Timed out
```

Giac [F] time = 0., size = 0, normalized size = 0.

$\text{sage}_0 x$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(1/(a+b*arccosh(c*x))^(7/2),x, algorithm="giac")
```

```
[Out] sage0*x
```

3.163 $\int \sqrt{fx} (a + b \cosh^{-1}(cx))^2 dx$

Optimal. Leaf size=128

$$\frac{16b^2c^2(fx)^{7/2}\text{HypergeometricPFQ}\left(\left\{1, \frac{7}{4}, \frac{7}{4}\right\}, \left\{\frac{9}{4}, \frac{11}{4}\right\}, c^2x^2\right)}{105f^3} - \frac{8bc\sqrt{1-cx}(fx)^{5/2}\text{Hypergeometric2F1}\left(\frac{1}{2}, \frac{5}{4}, \frac{9}{4}, c^2x^2\right)}{15f^2\sqrt{cx-1}}$$

[Out] $(2*(f*x)^{(3/2)}*(a + b*\text{ArcCosh}[c*x])^2)/(3*f) - (8*b*c*(f*x)^{(5/2)}*\text{Sqrt}[1 - c*x]*(a + b*\text{ArcCosh}[c*x])*\text{Hypergeometric2F1}[1/2, 5/4, 9/4, c^2*x^2])/(15*f^2*\text{Sqrt}[-1 + c*x]) - (16*b^2*c^2*(f*x)^{(7/2)}*\text{HypergeometricPFQ}[\{1, 7/4, 7/4\}, \{9/4, 11/4\}, c^2*x^2])/(105*f^3)$

Rubi [A] time = 0.285291, antiderivative size = 141, normalized size of antiderivative = 1.1, number of steps used = 2, number of rules used = 2, integrand size = 18, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {5662, 5763}

$$\frac{16b^2c^2(fx)^{7/2} {}_3F_2\left(1, \frac{7}{4}, \frac{7}{4}; \frac{9}{4}, \frac{11}{4}; c^2x^2\right)}{105f^3} - \frac{8bc\sqrt{1-c^2x^2}(fx)^{5/2} {}_2F_1\left(\frac{1}{2}, \frac{5}{4}; \frac{9}{4}; c^2x^2\right)(a + b \cosh^{-1}(cx))}{15f^2\sqrt{cx-1}\sqrt{cx+1}} + \frac{2(fx)^{3/2}(a + b \cosh^{-1}(cx))}{3f}$$

Antiderivative was successfully verified.

[In] Int[Sqrt[f*x]*(a + b*ArcCosh[c*x])^2,x]

[Out] $(2*(f*x)^{(3/2)}*(a + b*\text{ArcCosh}[c*x])^2)/(3*f) - (8*b*c*(f*x)^{(5/2)}*\text{Sqrt}[1 - c^2*x^2]*(a + b*\text{ArcCosh}[c*x])*\text{Hypergeometric2F1}[1/2, 5/4, 9/4, c^2*x^2])/(15*f^2*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]) - (16*b^2*c^2*(f*x)^{(7/2)}*\text{HypergeometricPFQ}[\{1, 7/4, 7/4\}, \{9/4, 11/4\}, c^2*x^2])/(105*f^3)$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol] :> Simp[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^n)/(d*(m + 1)), x] - Dist[(b*c*n)/(d*(m + 1)), Int[((d*x)^(m + 1)*(a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 5763

Int[(((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))*((f_.)*(x_.))^(m_.))/(Sqrt[(d1_.) + (e1_.)*(x_.)]*Sqrt[(d2_.) + (e2_.)*(x_.)]), x_Symbol] :> Simp[((f*x)^(m + 1)*Sqrt[1 - c^2*x^2]*(a + b*ArcCosh[c*x])*Hypergeometric2F1[1/2, (1 + m)/2, (3 + m)/2, c^2*x^2])/(f*(m + 1)*Sqrt[d1 + e1*x]*Sqrt[d2 + e2*x]), x] + Simp[(b*c*(f*x)^(m + 2)*HypergeometricPFQ[{1, 1 + m/2, 1 + m/2}, {3/2 + m/2, 2 + m/2}, c^2*x^2])/(Sqrt[-(d1*d2)]*f^2*(m + 1)*(m + 2)), x] /; FreeQ[{a, b, c, d1, e1, d2, e2, f, m}, x] && EqQ[e1 - c*d1, 0] && EqQ[e2 + c*d2, 0] && GtQ[d1, 0] && LtQ[d2, 0] && !IntegerQ[m]

Rubi steps

$$\int \sqrt{fx} (a + b \cosh^{-1}(cx))^2 dx = \frac{2(fx)^{3/2} (a + b \cosh^{-1}(cx))^2}{3f} - \frac{(4bc) \int \frac{(fx)^{3/2} (a + b \cosh^{-1}(cx))}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{3f}$$

$$= \frac{2(fx)^{3/2} (a + b \cosh^{-1}(cx))^2}{3f} - \frac{8bc(fx)^{5/2} \sqrt{1 - c^2 x^2} (a + b \cosh^{-1}(cx)) {}_2F_1\left(\frac{1}{2}, \frac{5}{4}; \frac{9}{4}; \frac{c^2 x^2}{1 - c^2 x^2}\right)}{15f^2 \sqrt{-1 + cx} \sqrt{1 + cx}}$$

Mathematica [A] time = 0.397293, size = 118, normalized size = 0.92

$$\frac{2}{105} x \sqrt{fx} \left(35 (a + b \cosh^{-1}(cx))^2 - 4bcx \left(2bcx \operatorname{HypergeometricPFQ}\left(\left\{1, \frac{7}{4}, \frac{7}{4}\right\}, \left\{\frac{9}{4}, \frac{11}{4}\right\}, c^2 x^2\right) + \frac{7\sqrt{1 - c^2 x^2} \operatorname{Hypergeometric2F1}\left[\frac{1}{2}, \frac{5}{4}, \frac{9}{4}, c^2 x^2\right]}{\sqrt{-1 + cx} \sqrt{1 + cx}} \right) \right)$$

Antiderivative was successfully verified.

[In] Integrate[Sqrt[f*x]*(a + b*ArcCosh[c*x])^2,x]

[Out] (2*x*Sqrt[f*x]*(35*(a + b*ArcCosh[c*x])^2 - 4*b*c*x*((7*Sqrt[1 - c^2*x^2]*(a + b*ArcCosh[c*x])*Hypergeometric2F1[1/2, 5/4, 9/4, c^2*x^2])/(Sqrt[-1 + c*x]*Sqrt[1 + c*x]) + 2*b*c*x*HypergeometricPFQ[{1, 7/4, 7/4}, {9/4, 11/4}, c^2*x^2]))) / 105

Maple [F] time = 0.29, size = 0, normalized size = 0.

$$\int (a + b \operatorname{arccosh}(cx))^2 \sqrt{fx} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((a+b*arccosh(c*x))^2*(f*x)^(1/2),x)

[Out] int((a+b*arccosh(c*x))^2*(f*x)^(1/2),x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^2*(f*x)^(1/2),x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\left(b^2 \operatorname{arcosh}(cx)^2 + 2ab \operatorname{arcosh}(cx) + a^2\right) \sqrt{fx}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^2*(f*x)^(1/2),x, algorithm="fricas")

[Out] integral((b^2*arccosh(c*x)^2 + 2*a*b*arccosh(c*x) + a^2)*sqrt(f*x), x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int \sqrt{fx} (a + b \operatorname{acosh}(cx))^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*acosh(c*x))**2*(f*x)**(1/2),x)

[Out] Integral(sqrt(f*x)*(a + b*acosh(c*x))**2, x)

Giac [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((a+b*arccosh(c*x))^2*(f*x)^(1/2),x, algorithm="giac")

[Out] Timed out

3.164 $\int (dx)^m \left(a + b \cosh^{-1}(cx) \right)^2 dx$

Optimal. Leaf size=181

$$\frac{2b^2c^2(dx)^{m+3}\text{HypergeometricPFQ}\left(\left\{1, \frac{m}{2} + \frac{3}{2}, \frac{m}{2} + \frac{3}{2}\right\}, \left\{\frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}\right\}, c^2x^2\right)}{d^3(m+1)(m+2)(m+3)} - \frac{2bc\sqrt{1-cx}(dx)^{m+2}\text{HypergeometricPFQ}\left(\left\{1, \frac{m}{2} + \frac{3}{2}\right\}, \left\{\frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}\right\}, c^2x^2\right)}{d^2(m+1)(m+2)\sqrt{cx-1}\sqrt{cx+1}}$$

[Out] $((d*x)^{(1+m)}*(a + b*\text{ArcCosh}[c*x])^2)/(d*(1+m)) - (2*b*c*(d*x)^{(2+m)}*\text{Sqrt}[1 - c*x]*(a + b*\text{ArcCosh}[c*x])*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, c^2*x^2])/(d^2*(1+m)*(2+m)*\text{Sqrt}[-1 + c*x]) - (2*b^2*c^2*(d*x)^{(3+m)}*\text{HypergeometricPFQ}[\{1, 3/2 + m/2, 3/2 + m/2\}, \{2 + m/2, 5/2 + m/2\}, c^2*x^2])/(d^3*(1+m)*(2+m)*(3+m))$

Rubi [A] time = 0.309833, antiderivative size = 194, normalized size of antiderivative = 1.07, number of steps used = 2, number of rules used = 2, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {5662, 5763}

$$\frac{2b^2c^2(dx)^{m+3} {}_3F_2\left(1, \frac{m}{2} + \frac{3}{2}, \frac{m}{2} + \frac{3}{2}; \frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}; c^2x^2\right)}{d^3(m+1)(m+2)(m+3)} - \frac{2bc\sqrt{1-c^2x^2}(dx)^{m+2} {}_2F_1\left(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; c^2x^2\right)(a + b \cosh^{-1}(cx))^2}{d^2(m+1)(m+2)\sqrt{cx-1}\sqrt{cx+1}}$$

Antiderivative was successfully verified.

[In] $\text{Int}[(d*x)^m*(a + b*\text{ArcCosh}[c*x])^2, x]$

[Out] $((d*x)^{(1+m)}*(a + b*\text{ArcCosh}[c*x])^2)/(d*(1+m)) - (2*b*c*(d*x)^{(2+m)}*\text{Sqrt}[1 - c^2*x^2]*(a + b*\text{ArcCosh}[c*x])*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, c^2*x^2])/(d^2*(1+m)*(2+m)*\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]) - (2*b^2*c^2*(d*x)^{(3+m)}*\text{HypergeometricPFQ}[\{1, 3/2 + m/2, 3/2 + m/2\}, \{2 + m/2, 5/2 + m/2\}, c^2*x^2])/(d^3*(1+m)*(2+m)*(3+m))$

Rule 5662

$\text{Int}[(a + \text{ArcCosh}[c*x])*(b*x)^n*(d*x)^m, x_Symbol] \rightarrow \text{Simp}[(d*x)^{(m+1)}*(a + b*\text{ArcCosh}[c*x])^n/(d*(m+1)), x] - \text{Dist}[(b*c^n)/(d*(m+1)), \text{Int}[(d*x)^{(m+1)}*(a + b*\text{ArcCosh}[c*x])^{(n-1)}]/(\text{Sqrt}[-1 + c*x]*\text{Sqrt}[1 + c*x]), x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x \&\& \text{IGtQ}[n, 0] \&\& \text{NeQ}[m, -1]$

Rule 5763

$\text{Int}[(a + \text{ArcCosh}[c*x])*(b*x)^m*(f*x)^n/(\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x]), x_Symbol] \rightarrow \text{Simp}[(f*x)^{(m+1)}*\text{Sqrt}[1 - c^2*x^2]*(a + b*\text{ArcCosh}[c*x])*\text{Hypergeometric2F1}[1/2, (1+m)/2, (3+m)/2, c^2*x^2])/(f*(m+1)*\text{Sqrt}[d1 + e1*x]*\text{Sqrt}[d2 + e2*x]), x] + \text{Simp}[(b*c*(f*x)^{(m+2)}*\text{HypergeometricPFQ}[\{1, 1 + m/2, 1 + m/2\}, \{3/2 + m/2, 2 + m/2\}, c^2*x^2])/(f*(m+1)*\text{Sqrt}[-(d1*d2)]*f^2*(m+1)*(m+2)), x] /; \text{FreeQ}\{a, b, c, d1, e1, d2, e2, f, m\}, x \&\& \text{EqQ}[e1 - c*d1, 0] \&\& \text{EqQ}[e2 + c*d2, 0] \&\& \text{GtQ}[d1, 0] \&\& \text{LtQ}[d2, 0] \&\& \text{IntegerQ}[m]$

Rubi steps

$$\int (dx)^m (a + b \cosh^{-1}(cx))^2 dx = \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))^2}{d(1+m)} - \frac{(2bc) \int \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{d(1+m)}$$

$$= \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))^2}{d(1+m)} - \frac{2bc(dx)^{2+m} \sqrt{1-c^2x^2} (a + b \cosh^{-1}(cx)) {}_2F_1\left(\frac{1}{2}, \frac{2+m}{2}; \frac{4+m}{2}; -c^2x^2\right)}{d^2(1+m)(2+m)\sqrt{-1+cx}\sqrt{1+cx}}$$

Mathematica [A] time = 0.246303, size = 164, normalized size = 0.91

$$x(dx)^m \left(-\frac{2b^2c^2x^2 \text{HypergeometricPFQ}\left(\left\{1, \frac{m}{2} + \frac{3}{2}, \frac{m}{2} + \frac{3}{2}\right\}, \left\{\frac{m}{2} + 2, \frac{m}{2} + \frac{5}{2}\right\}, c^2x^2\right)}{m^2 + 5m + 6} - \frac{2bcx\sqrt{1-c^2x^2} \text{Hypergeometric2F1}\left(\frac{1}{2}, \frac{m+2}{2}, \frac{m+4}{2}, c^2x^2\right)(a+b \cosh^{-1}(cx))}{(m+2)\sqrt{cx-1}\sqrt{cx+1}} \right) + \frac{\quad}{m+1}$$

Antiderivative was successfully verified.

[In] Integrate[(d*x)^m*(a + b*ArcCosh[c*x])^2,x]

[Out] (x*(d*x)^m*((a + b*ArcCosh[c*x])^2 - (2*b*c*x*Sqrt[1 - c^2*x^2]*(a + b*ArcCosh[c*x])*Hypergeometric2F1[1/2, (2 + m)/2, (4 + m)/2, c^2*x^2])/((2 + m)*Sqrt[-1 + c*x]*Sqrt[1 + c*x]) - (2*b^2*c^2*x^2*HypergeometricPFQ[{1, 3/2 + m/2, 3/2 + m/2}, {2 + m/2, 5/2 + m/2}, c^2*x^2])/(6 + 5*m + m^2)))/(1 + m)

Maple [F] time = 2.246, size = 0, normalized size = 0.

$$\int (dx)^m (a + b \operatorname{arccosh}(cx))^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((d*x)^m*(a+b*arccosh(c*x))^2,x)

[Out] int((d*x)^m*(a+b*arccosh(c*x))^2,x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*(a+b*arccosh(c*x))^2,x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}\left(\left(b^2 \operatorname{arccosh}(cx)^2 + 2ab \operatorname{arccosh}(cx) + a^2\right)(dx)^m, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((d*x)^m*(a+b*arccosh(c*x))^2,x, algorithm="fricas")
```

```
[Out] integral((b^2*arccosh(c*x)^2 + 2*a*b*arccosh(c*x) + a^2)*(d*x)^m, x)
```

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int (dx)^m (a + b \operatorname{acosh}(cx))^2 dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((d*x)**m*(a+b*acosh(c*x))**2,x)
```

```
[Out] Integral((d*x)**m*(a + b*acosh(c*x))**2, x)
```

Giac [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((d*x)^m*(a+b*arccosh(c*x))^2,x, algorithm="giac")
```

```
[Out] Timed out
```

3.165 $\int (dx)^m (a + b \cosh^{-1}(cx)) dx$

Optimal. Leaf size=106

$$\frac{(dx)^{m+1} (a + b \cosh^{-1}(cx))}{d(m+1)} - \frac{bc\sqrt{1-c^2x^2}(dx)^{m+2} \text{Hypergeometric2F1}\left(\frac{1}{2}, \frac{m+2}{2}, \frac{m+4}{2}, c^2x^2\right)}{d^2(m+1)(m+2)\sqrt{cx-1}\sqrt{cx+1}}$$

[Out] $((d*x)^{(1+m)*(a+b*\text{ArcCosh}[c*x])})/(d*(1+m)) - (b*c*(d*x)^{(2+m)*\text{Sqrt}[1-c^2*x^2]}*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, c^2*x^2])/(d^2*(1+m)*(2+m)*\text{Sqrt}[-1+c*x]*\text{Sqrt}[1+c*x])$

Rubi [A] time = 0.053476, antiderivative size = 106, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 4, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.286$, Rules used = {5662, 126, 365, 364}

$$\frac{(dx)^{m+1} (a + b \cosh^{-1}(cx))}{d(m+1)} - \frac{bc\sqrt{1-c^2x^2}(dx)^{m+2} {}_2F_1\left(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; c^2x^2\right)}{d^2(m+1)(m+2)\sqrt{cx-1}\sqrt{cx+1}}$$

Antiderivative was successfully verified.

[In] Int[(d*x)^m*(a + b*ArcCosh[c*x]), x]

[Out] $((d*x)^{(1+m)*(a+b*\text{ArcCosh}[c*x])})/(d*(1+m)) - (b*c*(d*x)^{(2+m)*\text{Sqrt}[1-c^2*x^2]}*\text{Hypergeometric2F1}[1/2, (2+m)/2, (4+m)/2, c^2*x^2])/(d^2*(1+m)*(2+m)*\text{Sqrt}[-1+c*x]*\text{Sqrt}[1+c*x])$

Rule 5662

Int[((a_.) + ArcCosh[(c_.)*(x_.)]*(b_.))^(n_.)*((d_.)*(x_.))^(m_.), x_Symbol] :> Simp[((d*x)^(m+1)*(a + b*ArcCosh[c*x])^n)/(d*(m+1)), x] - Dist[(b*c*n)/(d*(m+1)), Int[((d*x)^(m+1)*(a + b*ArcCosh[c*x])^(n-1))/(Sqrt[-1+c*x]*Sqrt[1+c*x]), x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && NeQ[m, -1]

Rule 126

Int[((f_.)*(x_.))^(p_.)*((a_.) + (b_.)*(x_.))^(m_.)*((c_.) + (d_.)*(x_.))^(n_.), x_Symbol] :> Dist[(a + b*x)^FracPart[m]*(c + d*x)^FracPart[m]]/(a*c + b*d*x^2)^FracPart[m], Int[(a*c + b*d*x^2)^m*(f*x)^p, x], x] /; FreeQ[{a, b, c, d, f, m, n, p}, x] && EqQ[b*c + a*d, 0] && EqQ[m - n, 0]

Rule 365

Int[((c_.)*(x_.))^(m_.)*((a_.) + (b_.)*(x_.))^(n_.)^(p_.), x_Symbol] :> Dist[(a^IntPart[p]*(a + b*x^n)^FracPart[p]]/(1 + (b*x^n)/a)^FracPart[p], Int[(c*x)^m*(1 + (b*x^n)/a)^p, x], x] /; FreeQ[{a, b, c, m, n, p}, x] && !IGtQ[p, 0] && !(ILtQ[p, 0] || GtQ[a, 0])

Rule 364

Int[((c_.)*(x_.))^(m_.)*((a_.) + (b_.)*(x_.))^(n_.)^(p_.), x_Symbol] :> Simp[(a^p*(c*x)^(m+1)*Hypergeometric2F1[-p, (m+1)/n, (m+1)/n+1, -(b*x^n)/a])]/(c*(m+1)), x] /; FreeQ[{a, b, c, m, n, p}, x] && !IGtQ[p, 0] && (ILtQ[p, 0] || GtQ[a, 0])

Rubi steps

$$\begin{aligned}
\int (dx)^m (a + b \cosh^{-1}(cx)) dx &= \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))}{d(1+m)} - \frac{(bc) \int \frac{(dx)^{1+m}}{\sqrt{-1+cx}\sqrt{1+cx}} dx}{d(1+m)} \\
&= \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))}{d(1+m)} - \frac{(bc\sqrt{-1+c^2x^2}) \int \frac{(dx)^{1+m}}{\sqrt{-1+c^2x^2}} dx}{d(1+m)\sqrt{-1+cx}\sqrt{1+cx}} \\
&= \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))}{d(1+m)} - \frac{(bc\sqrt{1-c^2x^2}) \int \frac{(dx)^{1+m}}{\sqrt{1-c^2x^2}} dx}{d(1+m)\sqrt{-1+cx}\sqrt{1+cx}} \\
&= \frac{(dx)^{1+m} (a + b \cosh^{-1}(cx))}{d(1+m)} - \frac{bc(dx)^{2+m}\sqrt{1-c^2x^2} {}_2F_1\left(\frac{1}{2}, \frac{2+m}{2}; \frac{4+m}{2}; c^2x^2\right)}{d^2(1+m)(2+m)\sqrt{-1+cx}\sqrt{1+cx}}
\end{aligned}$$

Mathematica [A] time = 0.13697, size = 87, normalized size = 0.82

$$\frac{x(dx)^m \left(-\frac{bcx\sqrt{1-c^2x^2} \operatorname{Hypergeometric2F1}\left(\frac{1}{2}, \frac{m+2}{2}, \frac{m+4}{2}, c^2x^2\right)}{(m+2)\sqrt{cx-1}\sqrt{cx+1}} + a + b \cosh^{-1}(cx) \right)}{m+1}$$

Antiderivative was successfully verified.

[In] Integrate[(d*x)^m*(a + b*ArcCosh[c*x]), x]

[Out] (x*(d*x)^m*(a + b*ArcCosh[c*x] - (b*c*x*Sqrt[1 - c^2*x^2]*Hypergeometric2F1[1/2, (2 + m)/2, (4 + m)/2, c^2*x^2])/((2 + m)*Sqrt[-1 + c*x]*Sqrt[1 + c*x]))/(1 + m)

Maple [F] time = 2.023, size = 0, normalized size = 0.

$$\int (dx)^m (a + \operatorname{arccosh}(cx)) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((d*x)^m*(a+b*arccosh(c*x)), x)

[Out] int((d*x)^m*(a+b*arccosh(c*x)), x)

Maxima [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: ValueError

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*(a+b*arccosh(c*x)), x, algorithm="maxima")

[Out] Exception raised: ValueError

Fricas [F] time = 0., size = 0, normalized size = 0.

$$\text{integral}((b \operatorname{arcosh}(cx) + a)(dx)^m, x)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*(a+b*arccosh(c*x)),x, algorithm="fricas")

[Out] integral((b*arccosh(c*x) + a)*(d*x)^m, x)

Sympy [F] time = 0., size = 0, normalized size = 0.

$$\int (dx)^m (a + b \operatorname{acosh}(cx)) dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)**m*(a+b*acosh(c*x)),x)

[Out] Integral((d*x)**m*(a + b*acosh(c*x)), x)

Giac [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m*(a+b*arccosh(c*x)),x, algorithm="giac")

[Out] Timed out

$$3.166 \quad \int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx$$

Optimal. Leaf size=18

$$\text{Unintegrable}\left(\frac{(dx)^m}{a+b \cosh^{-1}(cx)}, x\right)$$

[Out] Unintegrable[(d*x)^m/(a + b*ArcCosh[c*x]), x]

Rubi [A] time = 0.0281057, antiderivative size = 0, normalized size of antiderivative = 0., number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.$, Rules used = {}

$$\int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx$$

Verification is Not applicable to the result.

[In] Int[(d*x)^m/(a + b*ArcCosh[c*x]), x]

[Out] Defer[Int] [(d*x)^m/(a + b*ArcCosh[c*x]), x]

Rubi steps

$$\int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx = \int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx$$

Mathematica [A] time = 0.457408, size = 0, normalized size = 0.

$$\int \frac{(dx)^m}{a+b \cosh^{-1}(cx)} dx$$

Verification is Not applicable to the result.

[In] Integrate[(d*x)^m/(a + b*ArcCosh[c*x]), x]

[Out] Integrate[(d*x)^m/(a + b*ArcCosh[c*x]), x]

Maple [A] time = 0.811, size = 0, normalized size = 0.

$$\int \frac{(dx)^m}{a + \text{barccosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int((d*x)^m/(a+b*arccosh(c*x)), x)

[Out] int((d*x)^m/(a+b*arccosh(c*x)), x)

Maxima [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{(dx)^m}{b \operatorname{arcosh}(cx) + a} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m/(a+b*arccosh(c*x)),x, algorithm="maxima")

[Out] integrate((d*x)^m/(b*arccosh(c*x) + a), x)

Fricas [A] time = 0., size = 0, normalized size = 0.

$$\operatorname{integral}\left(\frac{(dx)^m}{b \operatorname{arcosh}(cx) + a}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m/(a+b*arccosh(c*x)),x, algorithm="fricas")

[Out] integral((d*x)^m/(b*arccosh(c*x) + a), x)

Sympy [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{(dx)^m}{a + b \operatorname{acosh}(cx)} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)**m/(a+b*acosh(c*x)),x)

[Out] Integral((d*x)**m/(a + b*acosh(c*x)), x)

Giac [A] time = 0., size = 0, normalized size = 0.

$$\int \frac{(dx)^m}{b \operatorname{arcosh}(cx) + a} dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate((d*x)^m/(a+b*arccosh(c*x)),x, algorithm="giac")

[Out] integrate((d*x)^m/(b*arccosh(c*x) + a), x)

Chapter 4

Listing of Grading functions

The following are the current version of the grading functions used for grading the quality of the antiderivative with reference to the optimal antiderivative included in the test suite.

There is a version for Maple and for Mathematica/Rubi. There is a version for grading Sympy and version for use with Sagemath.

The following are links to the current source code.

The following are the listings of source code of the grading functions.

4.0.1 Mathematica and Rubi grading function

```
1 (* Original version thanks to Albert Rich emailed on 03/21/2017 *)
2 (* ::Package:: *)
3
4 (* ::Subsection:: *)
5 (*GradeAntiderivative[result,optimal]*)
6
7
8 (* ::Text:: *)
9 (*If result and optimal are mathematical expressions, *)
10 (*      GradeAntiderivative[result,optimal] returns*)
11 (* "F" if the result fails to integrate an expression that*)
12 (*   is integrable*)
13 (* "C" if result involves higher level functions than necessary*)
14 (* "B" if result is more than twice the size of the optimal*)
15 (*   antiderivative*)
16 (* "A" if result can be considered optimal*)
17
18
19 GradeAntiderivative[result_,optimal_] :=
20   If[ExpnType[result]<=ExpnType[optimal],
21     If[FreeQ[result,Complex] || Not[FreeQ[optimal,Complex]],
22       If[LeafCount[result]<=2*LeafCount[optimal],
23         "A",
24         "B"],
25       "C"],
26     If[FreeQ[result,Integrate] && FreeQ[result,Int],
27       "C",
28       "F"]]
29
30
31 (* ::Text:: *)
32 (*The following summarizes the type number assigned an *)
33 (*expression based on the functions it involves*)
34 (*1 = rational function*)
35 (*2 = algebraic function*)
36 (*3 = elementary function*)
37 (*4 = special function*)
```

```

38 (*5 = hyperpergeometric function*)
39 (*6 = appell function*)
40 (*7 = rootsum function*)
41 (*8 = integrate function*)
42 (*9 = unknown function*)
43
44
45 ExpnType[expn_] :=
46   If[AtomQ[expn],
47     1,
48     If[ListQ[expn],
49       Max[Map[ExpnType,expn]],
50       If[Head[expn]===Power,
51         If[IntegerQ[expn[[2]]],
52           ExpnType[expn[[1]]],
53           If[Head[expn[[2]]]===Rational,
54             If[IntegerQ[expn[[1]]] || Head[expn[[1]]]===Rational,
55               1,
56               Max[ExpnType[expn[[1]],2]],
57             Max[ExpnType[expn[[1]],ExpnType[expn[[2]],3]],
58             If[Head[expn]===Plus || Head[expn]===Times,
59               Max[ExpnType[First[expn]],ExpnType[Rest[expn]]],
60             If[ElementaryFunctionQ[Head[expn]],
61               Max[3,ExpnType[expn[[1]]],
62             If[SpecialFunctionQ[Head[expn]],
63               Apply[Max,Append[Map[ExpnType,Apply[List,expn]],4]],
64             If[HypergeometricFunctionQ[Head[expn]],
65               Apply[Max,Append[Map[ExpnType,Apply[List,expn]],5]],
66             If[AppellFunctionQ[Head[expn]],
67               Apply[Max,Append[Map[ExpnType,Apply[List,expn]],6]],
68             If[Head[expn]===RootSum,
69               Apply[Max,Append[Map[ExpnType,Apply[List,expn]],7]],
70             If[Head[expn]===Integrate || Head[expn]===Int,
71               Apply[Max,Append[Map[ExpnType,Apply[List,expn]],8]],
72             9]]]]]]]]]]
73
74
75 ElementaryFunctionQ[func_] :=
76   MemberQ[{
77     Exp,Log,
78     Sin,Cos,Tan,Cot,Sec,Csc,
79     ArcSin,ArcCos,ArcTan,ArcCot,ArcSec,ArcCsc,
80     Sinh,Cosh,Tanh,Coth,Sech,Csch,
81     ArcSinh,ArcCosh,ArcTanh,ArcCoth,ArcSech,ArcCsch
82   },func]
83
84
85 SpecialFunctionQ[func_] :=
86   MemberQ[{
87     Erf, Erfc, Erfi,
88     FresnelS, FresnelC,
89     ExpIntegralE, ExpIntegralEi, LogIntegral,
90     SinIntegral, CosIntegral, SinhIntegral, CoshIntegral,
91     Gamma, LogGamma, PolyGamma,
92     Zeta, PolyLog, ProductLog,
93     EllipticF, EllipticE, EllipticPi
94   },func]
95
96
97 HypergeometricFunctionQ[func_] :=
98   MemberQ[{Hypergeometric1F1,Hypergeometric2F1,HypergeometricPFQ},func]
99
100

```

```

101 AppellFunctionQ[func_] :=
102   MemberQ[{AppellF1},func]

```

4.0.2 Maple grading function

```

1 # File: GradeAntiderivative.mpl
2 # Original version thanks to Albert Rich emailed on 03/21/2017
3
4 #Nasser 03/22/2017 Use Maple leaf count instead since buildin
5 #Nasser 03/23/2017 missing 'ln' for ElementaryFunctionQ added
6 #Nasser 03/24/2017 corrected the check for complex result
7 #Nasser 10/27/2017 check for leafsize and do not call ExpnType()
8 # if leaf size is "too large". Set at 500,000
9 #Nasser 12/22/2019 Added debug flag, added 'dilog' to special functions
10 # see problem 156, file Apostol_Problems
11
12 GradeAntiderivative := proc(result,optimal)
13 local leaf_count_result, leaf_count_optimal,ExpnType_result,ExpnType_optimal,
14     debug:=false;
15
16     leaf_count_result:=leafcount(result);
17     #do NOT call ExpnType() if leaf size is too large. Recursion problem
18     if leaf_count_result > 500000 then
19         return "B";
20     fi;
21
22     leaf_count_optimal:=leafcount(optimal);
23
24     ExpnType_result:=ExpnType(result);
25     ExpnType_optimal:=ExpnType(optimal);
26
27     if debug then
28         print("ExpnType_result",ExpnType_result," ExpnType_optimal=",
29             ExpnType_optimal);
30     fi;
31
32 # If result and optimal are mathematical expressions,
33 # GradeAntiderivative[result,optimal] returns
34 # "F" if the result fails to integrate an expression that
35 # is integrable
36 # "C" if result involves higher level functions than necessary
37 # "B" if result is more than twice the size of the optimal
38 # antiderivative
39 # "A" if result can be considered optimal
40
41 #This check below actually is not needed, since I only
42 #call this grading only for passed integrals. i.e. I check
43 #for "F" before calling this. But no harm of keeping it here.
44 #just in case.
45
46 if not type(result,freeof('int')) then
47     return "F";
48 end if;
49
50 if ExpnType_result<=ExpnType_optimal then
51     if debug then
52         print("ExpnType_result<=ExpnType_optimal");
53     fi;
54     if is_contains_complex(result) then
55         if is_contains_complex(optimal) then
56             if debug then

```

```

57         print("both result and optimal complex");
58         fi;
59         #both result and optimal complex
60         if leaf_count_result<=2*leaf_count_optimal then
61             return "A";
62         else
63             return "B";
64         end if
65     else #result contains complex but optimal is not
66         if debug then
67             print("result contains complex but optimal is not");
68         fi;
69         return "C";
70     end if
71 else # result do not contain complex
72     # this assumes optimal do not as well
73     if debug then
74         print("result do not contain complex, this assumes optimal do
not as well");
75     fi;
76     if leaf_count_result<=2*leaf_count_optimal then
77         if debug then
78             print("leaf_count_result<=2*leaf_count_optimal");
79         fi;
80         return "A";
81     else
82         if debug then
83             print("leaf_count_result>2*leaf_count_optimal");
84         fi;
85         return "B";
86     end if
87 end if
88 else #ExpnType(result) > ExpnType(optimal)
89     if debug then
90         print("ExpnType(result) > ExpnType(optimal)");
91     fi;
92     return "C";
93 end if
94
95 end proc:
96
97 #
98 # is_contains_complex(result)
99 # takes expressions and returns true if it contains "I" else false
100 #
101 #Nasser 032417
102 is_contains_complex:= proc(expression)
103     return (has(expression,I));
104 end proc:
105
106 # The following summarizes the type number assigned an expression
107 # based on the functions it involves
108 # 1 = rational function
109 # 2 = algebraic function
110 # 3 = elementary function
111 # 4 = special function
112 # 5 = hyperpergeometric function
113 # 6 = appell function
114 # 7 = rootsum function
115 # 8 = integrate function
116 # 9 = unknown function
117
118 ExpnType := proc(expn)

```



```

119   if type(expn,'atomic') then
120     1
121   elif type(expn,'list') then
122     apply(max,map(ExpnType,expn))
123   elif type(expn,'sqrt') then
124     if type(op(1,expn),'rational') then
125       1
126     else
127       max(2,ExpnType(op(1,expn)))
128     end if
129   elif type(expn,'`^`') then
130     if type(op(2,expn),'integer') then
131       ExpnType(op(1,expn))
132     elif type(op(2,expn),'rational') then
133       if type(op(1,expn),'rational') then
134         1
135       else
136         max(2,ExpnType(op(1,expn)))
137       end if
138     else
139       max(3,ExpnType(op(1,expn)),ExpnType(op(2,expn)))
140     end if
141   elif type(expn,'`+`') or type(expn,'`*`') then
142     max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
143   elif ElementaryFunctionQ(op(0,expn)) then
144     max(3,ExpnType(op(1,expn)))
145   elif SpecialFunctionQ(op(0,expn)) then
146     max(4,apply(max,map(ExpnType,[op(expn)])))
147   elif HypergeometricFunctionQ(op(0,expn)) then
148     max(5,apply(max,map(ExpnType,[op(expn)])))
149   elif AppellFunctionQ(op(0,expn)) then
150     max(6,apply(max,map(ExpnType,[op(expn)])))
151   elif op(0,expn)='int' then
152     max(8,apply(max,map(ExpnType,[op(expn)]))) else
153     9
154   end if
155 end proc:
156
157
158 ElementaryFunctionQ := proc(func)
159   member(func,[
160     exp,log,ln,
161     sin,cos,tan,cot,sec,csc,
162     arcsin,arccos,arctan,arccot,arcsec,arccsc,
163     sinh,cosh,tanh,coth,sech,csch,
164     arcsinh,arccosh,arctanh,arccoth,arcsech,arccsch])
165 end proc:
166
167 SpecialFunctionQ := proc(func)
168   member(func,[
169     erf,erfc,erfi,
170     FresnelS,FresnelC,
171     Ei,Ei,Li,Si,Ci,Shi,Chi,
172     GAMMA,lnGAMMA,Psi,Zeta,polylog,dilog,LambertW,
173     EllipticF,EllipticE,EllipticPi])
174 end proc:
175
176 HypergeometricFunctionQ := proc(func)
177   member(func,[Hypergeometric1F1,hypergeom,HypergeometricPFQ])
178 end proc:
179
180 AppellFunctionQ := proc(func)
181   member(func,[AppellF1])

```

```

182 end proc:
183
184 # u is a sum or product.  rest(u) returns all but the
185 # first term or factor of u.
186 rest := proc(u) local v;
187     if nops(u)=2 then
188         op(2,u)
189     else
190         apply(op(0,u),op(2..nops(u),u))
191     end if
192 end proc:
193
194 #leafcount(u) returns the number of nodes in u.
195 #Nasser 3/23/17 Replaced by build-in leafCount from package in Maple
196 leafcount := proc(u)
197     MmaTranslator[Mma][LeafCount](u);
198 end proc:

```

4.0.3 Sympy grading function

```

1 #Dec 24, 2019. Nasser M. Abbasi:
2 #           Port of original Maple grading function by
3 #           Albert Rich to use with Sympy/Python
4 #Dec 27, 2019 Nasser. Added `RootSum`. See problem 177, Timofeev file
5 #           added 'exp_polar'
6 from sympy import *
7
8 def leaf_count(expr):
9     #sympy do not have leaf count function. This is approximation
10    return round(1.7*count_ops(expr))
11
12 def is_sqrt(expr):
13     if isinstance(expr,Pow):
14         if expr.args[1] == Rational(1,2):
15             return True
16         else:
17             return False
18     else:
19         return False
20
21 def is_elementary_function(func):
22     return func in [exp,log,ln,sin,cos,tan,cot,sec,csc,
23                    asin,acos,atan,acot,asec,acsc,sinh,cosh,tanh,coth,sech,csch,
24                    asinh,acosh,atanh,acoth,asech,acsch
25                    ]
26
27 def is_special_function(func):
28     return func in [ erf,erfc,erfi,
29                    fresnels,fresnelc,Ei,Ei,Li,Si,Ci,Shi,Chi,
30                    gamma,loggamma,digamma,zeta,polylog,LambertW,
31                    elliptic_f,elliptic_e,elliptic_pi,exp_polar
32                    ]
33
34 def is_hypergeometric_function(func):
35     return func in [hyper]
36
37 def is_appell_function(func):
38     return func in [appellf1]
39
40 def is_atom(expn):
41     try:
42         if expn.isAtom or isinstance(expn,int) or isinstance(expn,float):
43             return True

```

```

44     else:
45         return False
46
47     except AttributeError as error:
48         return False
49
50 def expnType(expn):
51     debug=False
52     if debug:
53         print("expn=",expn,"type(expn)=",type(expn))
54
55     if is_atom(expn):
56         return 1
57     elif isinstance(expn,list):
58         return max(map(expnType, expn)) #apply(max,map(ExpnType,expn))
59     elif is_sqrt(expn):
60         if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
61             return 1
62         else:
63             return max(2,expnType(expn.args[0])) #max(2,ExpnType(op(1,expn)))
64     elif isinstance(expn,Pow): #type(expn,``^`)
65         if isinstance(expn.args[1],Integer): #type(op(2,expn),'integer')
66             return expnType(expn.args[0]) #ExpnType(op(1,expn))
67         elif isinstance(expn.args[1],Rational): #type(op(2,expn),'rational')
68             if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
69                 return 1
70             else:
71                 return max(2,expnType(expn.args[0])) #max(2,ExpnType(op(1,expn
72 )))
73     else:
74         return max(3,expnType(expn.args[0]),expnType(expn.args[1])) #max(3,
75 ExpnType(op(1,expn)),ExpnType(op(2,expn)))
76     elif isinstance(expn,Add) or isinstance(expn,Mul): #type(expn,``+`) or
77 type(expn,``*`)
78     m1 = expnType(expn.args[0])
79     m2 = expnType(list(expn.args[1:]))
80     return max(m1,m2) #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
81     elif is_elementary_function(expn.func): #ElementaryFunctionQ(op(0,expn))
82     return max(3,expnType(expn.args[0])) #max(3,ExpnType(op(1,expn)))
83     elif is_special_function(expn.func): #SpecialFunctionQ(op(0,expn))
84     m1 = max(map(expnType, list(expn.args)))
85     return max(4,m1) #max(4,apply(max,map(ExpnType,[op(expn)])))
86     elif is_hypergeometric_function(expn.func): #HypergeometricFunctionQ(op(0,
87 expn))
88     m1 = max(map(expnType, list(expn.args)))
89     return max(5,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
90     elif is_appell_function(expn.func):
91     m1 = max(map(expnType, list(expn.args)))
92     return max(6,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
93     elif isinstance(expn,RootSum):
94     m1 = max(map(expnType, list(expn.args))) #Apply[Max,Append[Map[ExpnType
95 ,Apply[List,expn]],7]],
96     return max(7,m1)
97     elif str(expn).find("Integral") != -1:
98     m1 = max(map(expnType, list(expn.args)))
99     return max(8,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
100     else:
101     return 9
102
103 #main function
104 def grade_antiderivative(result,optimal):
105
106     leaf_count_result = leaf_count(result)

```

```

102 leaf_count_optimal = leaf_count(optimal)
103
104 expnType_result = expnType(result)
105 expnType_optimal = expnType(optimal)
106
107 if str(result).find("Integral") != -1:
108     return "F"
109
110 if expnType_result <= expnType_optimal:
111     if result.has(I):
112         if optimal.has(I): #both result and optimal complex
113             if leaf_count_result <= 2*leaf_count_optimal:
114                 return "A"
115             else:
116                 return "B"
117         else: #result contains complex but optimal is not
118             return "C"
119     else: # result do not contain complex, this assumes optimal do not as
well
120         if leaf_count_result <= 2*leaf_count_optimal:
121             return "A"
122         else:
123             return "B"
124 else:
125     return "C"

```

4.0.4 SageMath grading function

```

1 #Dec 24, 2019. Nasser: Ported original Maple grading function by
2 #     Albert Rich to use with Sagemath. This is used to
3 #     grade Fracas, Giac and Maxima results.
4 #Dec 24, 2019. Nasser: Added 'exp_integral_e' and 'sng', 'sin_integral'
5 #     'arctan2','floor','abs','log_integral'
6
7 from sage.all import *
8 from sage.symbolic.operators import add_vararg, mul_vararg
9
10 def tree(expr):
11     debug=False;
12     if debug:
13         print ("Enter tree(expr), expr=",expr)
14         print ("expr.operator()=",expr.operator())
15         print ("expr.operands()=",expr.operands())
16         print ("map(tree, expr.operands()=",map(tree, expr.operands()))
17
18     if expr.operator() is None:
19         return expr
20     else:
21         return [expr.operator()+list(map(tree, expr.operands()))
22
23 def leaf_count(anti):
24     debug=False;
25
26     if debug: print ("Enter leaf_count, anti=", anti, " len(anti)=", len(anti))
27
28     if len(anti) == 0: #special check for optimal being 0 for some test cases.
29         if debug: print ("len(anti) == 0")
30         return 1
31     else:
32         if debug: print ("round(1.35*len(flatten(tree(anti))))=",round(1.35*len
(flatten(tree(anti))))
33         return round(1.35*len(flatten(tree(anti)))) #fudge factor
34             #since this estimate of leaf count is bit lower than

```

```

35         #what it should be compared to Mathematica's
36
37 def is_sqrt(expr):
38     debug=False;
39     if expr.operator() == operator.pow: #isinstance(expr,Pow):
40         if expr.operands()[1]==1/2: #expr.args[1] == Rational(1,2):
41             if debug: print ("expr is sqrt")
42             return True
43         else:
44             return False
45     else:
46         return False
47
48 def is_elementary_function(func):
49     debug = False
50
51     m = func.name() in ['exp','log','ln',
52         'sin','cos','tan','cot','sec','csc',
53         'arcsin','arccos','arctan','arccot','arcsec','arccsc',
54         'sinh','cosh','tanh','coth','sech','csch',
55         'arcsinh','arccosh','arctanh','arccoth','arcsech','arccsch','sgn',
56         'arctan2','floor','abs'
57     ]
58     if debug:
59         if m:
60             print ("func ", func , " is elementary_function")
61         else:
62             print ("func ", func , " is NOT elementary_function")
63
64
65     return m
66
67 def is_special_function(func):
68     debug = False
69
70     if debug: print ("type(func)=", type(func))
71
72     m= func.name() in ['erf','erfc','erfi','fresnel_sin','fresnel_cos','Ei',
73         'Ei','Li','Si','sin_integral','Ci','cos_integral','Shi','
74     sinh_integral'
75         'Chi','cosh_integral','gamma','log_gamma','psi,zeta',
76         'polylog','lambert_w','elliptic_f','elliptic_e',
77         'elliptic_pi','exp_integral_e','log_integral']
78
79     if debug:
80         print ("m=",m)
81         if m:
82             print ("func ", func , " is special_function")
83         else:
84             print ("func ", func , " is NOT special_function")
85
86     return m
87
88
89 def is_hypergeometric_function(func):
90     return func.name() in ['hypergeometric','hypergeometric_M','
91     hypergeometric_U']
92
93 def is_appell_function(func):
94     return func.name() in ['hypergeometric'] #[appellf1] can't find this in
95     sagemath

```

```

95 def is_atom(expn):
96
97     #thanks to answer at https://ask.sagemath.org/question/49179/what-is-
sagemath-equivalent-to-atomic-type-in-maple/
98     try:
99         if expn.parent() is SR:
100             return expn.operator() is None
101         if expn.parent() in (ZZ, QQ, AA, QQbar):
102             return expn in expn.parent() # Should always return True
103         if hasattr(expn.parent(),"base_ring") and hasattr(expn.parent(),"gens")
:
104             return expn in expn.parent().base_ring() or expn in expn.parent().
gens()
105         return False
106
107     except AttributeError as error:
108         return False
109
110
111 def expnType(expn):
112     debug=False
113
114     if debug:
115         print(">>>>Enter expnType, expn=", expn)
116         print(">>>>is_atom(expn)=", is_atom(expn))
117
118     if is_atom(expn):
119         return 1
120     elif type(expn)==list: #instance(expn,list):
121         return max(map(expnType, expn)) #apply(max,map(ExpnType,expn))
122     elif is_sqrt(expn):
123         if type(expn.operands()[0])==Rational: #type(instance(expn.args[0],
Rational):
124             return 1
125         else:
126             return max(2,expnType(expn.operands()[0])) #max(2,expnType(expn.
args[0]))
127     elif expn.operator() == operator.pow: #instance(expn,Pow)
128         if type(expn.operands()[1])==Integer: #instance(expn.args[1],Integer
)
129             return expnType(expn.operands()[0]) #expnType(expn.args[0])
130         elif type(expn.operands()[1])==Rational: #instance(expn.args[1],
Rational)
131             if type(expn.operands()[0])==Rational: #instance(expn.args[0],
Rational)
132                 return 1
133             else:
134                 return max(2,expnType(expn.operands()[0])) #max(2,expnType(
expn.args[0]))
135         else:
136             return max(3,expnType(expn.operands()[0]),expnType(expn.operands()
[1])) #max(3,expnType(expn.operands()[0]),expnType(expn.operands()[1]))
137     elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #
instance(expn,Add) or instance(expn,Mul)
138         m1 = expnType(expn.operands()[0]) #expnType(expn.args[0])
139         m2 = expnType(expn.operands()[1:]) #expnType(list(expn.args[1:]))
140         return max(m1,m2) #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn)))
141     elif is_elementary_function(expn.operator()): #is_elementary_function(expn
.func)
142         return max(3,expnType(expn.operands()[0]))
143     elif is_special_function(expn.operator()): #is_special_function(expn.func)
144         m1 = max(map(expnType, expn.operands())) #max(map(expnType, list(
expn.args)))

```

```

145     return max(4,m1)    #max(4,m1)
146     elif is_hypergeometric_function(expn.operator()): #
is_hypergeometric_function(expn.func)
147         m1 = max(map(expnType, expn.operands()))    #max(map(expnType, list(
expn.args)))
148         return max(5,m1)    #max(5,m1)
149     elif is_appell_function(expn.operator()):
150         m1 = max(map(expnType, expn.operands()))    #max(map(expnType, list(
expn.args)))
151         return max(6,m1)    #max(6,m1)
152     elif str(expn).find("Integral") != -1: #this will never happen, since it
153         #is checked before calling the grading function that is passed.
154         #but kept it here.
155         m1 = max(map(expnType, expn.operands()))    #max(map(expnType, list(
expn.args)))
156         return max(8,m1)    #max(5,apply(max,map(ExpnType,[op(expn)])))
157     else:
158         return 9
159
160 #main function
161 def grade_antiderivative(result,optimal):
162     debug = False;
163
164     if debug: print ("Enter grade_antiderivative for sagemath")
165
166     leaf_count_result = leaf_count(result)
167     leaf_count_optimal = leaf_count(optimal)
168
169     if debug: print ("leaf_count_result=", leaf_count_result, "
leaf_count_optimal=",leaf_count_optimal)
170
171
172     expnType_result = expnType(result)
173     expnType_optimal = expnType(optimal)
174
175     if debug: print ("expnType_result=", expnType_result, "expnType_optimal=",
expnType_optimal)
176
177     if expnType_result <= expnType_optimal:
178         if result.has(I):
179             if optimal.has(I): #both result and optimal complex
180                 if leaf_count_result <= 2*leaf_count_optimal:
181                     return "A"
182                 else:
183                     return "B"
184             else: #result contains complex but optimal is not
185                 return "C"
186         else: # result do not contain complex, this assumes optimal do not as
well
187             if leaf_count_result <= 2*leaf_count_optimal:
188                 return "A"
189             else:
190                 return "B"
191     else:
192         return "C"

```