Computer algebra independent integration tests

2-Exponentials/2.1-u-F^-c-a+b-x-^n

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Contents

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 [98]. This is test number [53].

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. (98)	% 0. (0)
Mathematica	% 100. (98)	% 0. (0)
Maple	% 79.59 (78)	% 20.41 (20)
Maxima	% 65.31 (64)	% 34.69 (34)
Fricas	% 88.78 (87)	% 11.22 (11)
Sympy	% 38.78 (38)	% 61.22 (60)
Giac	% 57.14 (56)	% 42.86 (42)

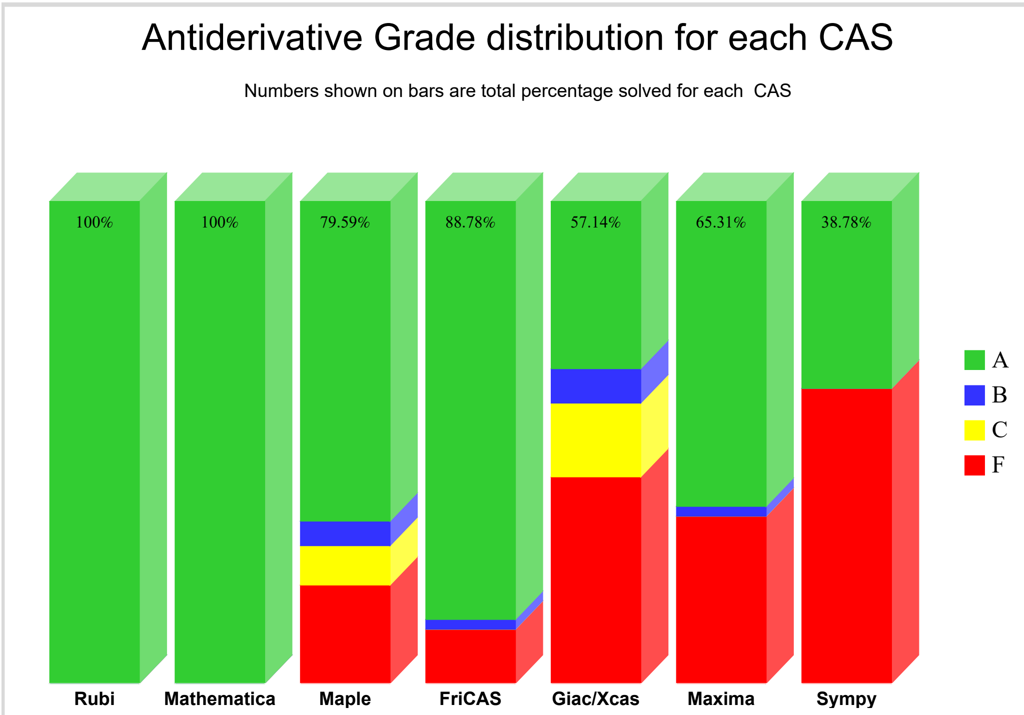
The table below gives additional break down of the grading of quality of the antiderivatives generated by each CAS. The grading is given using the letters A,B,C and F with A being the best quality. The grading is accomplished by comparing the antiderivative generated with the optimal antiderivatives 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 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.

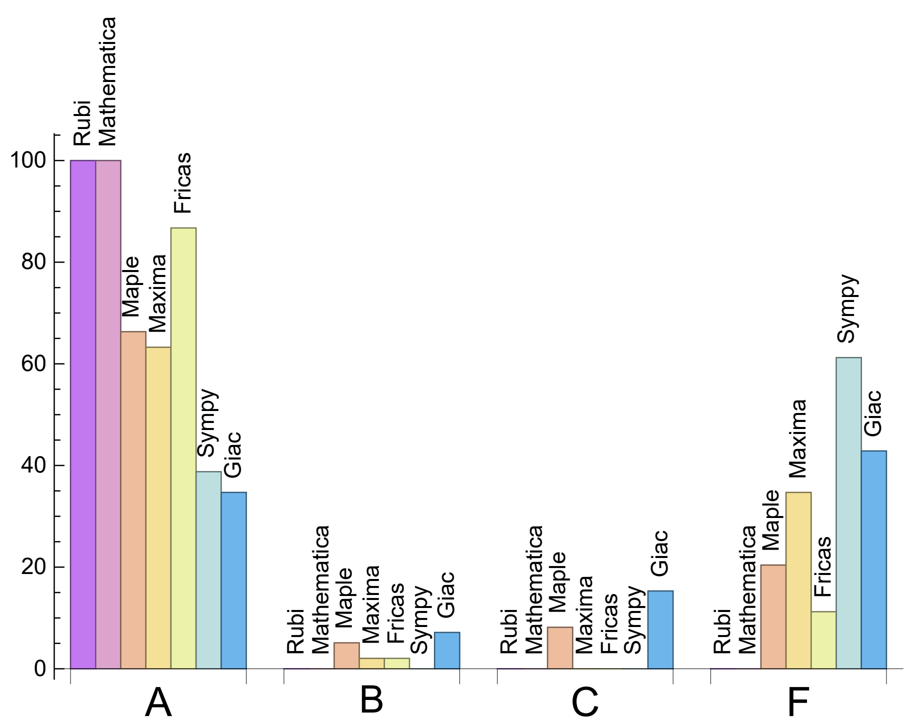
Grading is implemented for all CAS systems. Based on the above, the following table summarizes the grading for this test suite.

System	% A grade	% B grade	% C grade	% F grade
Rubi	100.	0.	0.	0.
Mathematica	100.	0.	0.	0.
Maple	66.33	5.1	8.16	20.41
Maxima	63.27	2.04	0.	34.69
Fricas	86.73	2.04	0.	11.22
Sympy	38.78	0.	0.	61.22
Giac	34.69	7.14	15.31	42.86

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	0.17	134.81	1.	95.5	1.
Mathematica	0.12	86.01	0.72	65.5	0.71
Maple	0.03	177.45	1.83	137.	1.15
Maxima	1.17	153.62	1.27	83.5	1.09
Fricas	1.54	314.39	2.17	205.	2.11
Sympy	5.88	191.18	1.11	124.5	0.87
Giac	1.6	2106.7	12.63	230.	1.41

1.4 list of integrals that has no closed form antiderivative

{}

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 {}

Mathematica {}

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 pecrentage 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/XCAS 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 buildin system function `LeafSize` is used to find the leaf size of each antiderivative.

The other CAS systems (SageMath and Sympy) do not have special buildin 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

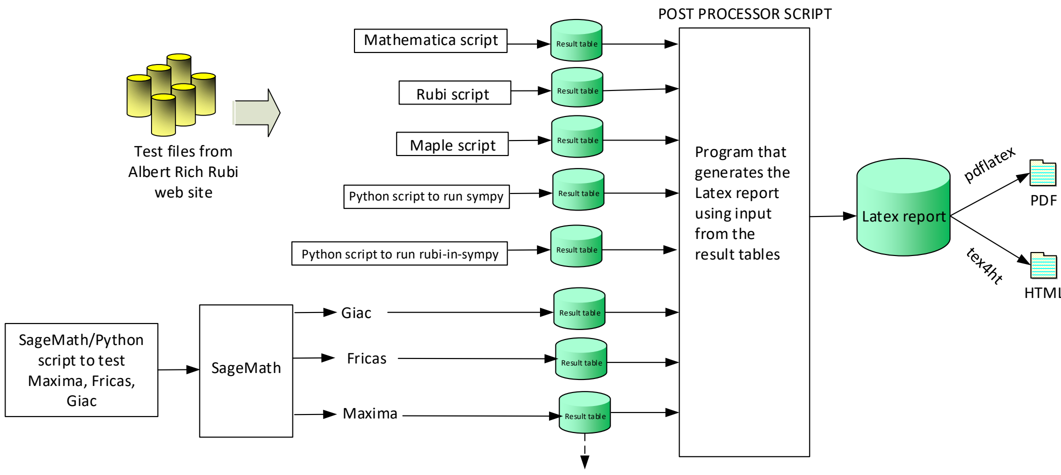
```
try:
  # 1.7 is a fudge factor since it is low side from actual leaf count
  leafCount = round(1.7*count_ops(anti))

  except Exception as ee:
         leafCount =1
```

When these cas systems have a buildin 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 syntx.
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

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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 }

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, 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 }

B grade: { }

C grade: { }

F grade: { }

2.1.3 Maple

A grade: { 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 48, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 90, 91, 92, 93, 94 }

B grade: { 64, 95, 96, 97, 98 }

C grade: { 55, 83, 84, 85, 86, 87, 88, 89 }

F grade: { 1, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50 }

2.1.4 Maxima

A grade: { 3, 4, 5, 6, 13, 14, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 48, 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, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98

B grade: { 2, 12 }

C grade: { }

F grade: { 1, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 78, 79, 80, 81, 82 }

2.1.5 FriCAS

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 23, 24, 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, 83, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade: { 81, 82 }

C grade: { }

F grade: { 20, 21, 22, 25, 26, 84, 85, 86, 87, 88, 89 }

2.1.6 Sympy

A grade: { 2, 3, 4, 5, 6, 12, 13, 14, 27, 28, 29, 35, 36, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 74, 75, 76, 77, 90, 91, 92, 93, 94 }

B grade: { }

C grade: { }

F grade: { 1, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 30, 31, 32, 33, 34, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 55, 64, 69, 70, 71, 72, 73, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 95, 96, 97, 98 }

2.1.7 Giac

A grade: { 6, 27, 28, 29, 30, 31, 32, 33, 34, 42, 43, 48, 56, 57, 58, 59, 60, 61, 62, 63, 74, 75, 76, 77, 78, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade: { 39, 40, 41, 79, 80, 81, 82 }

C grade: { 2, 3, 4, 5, 12, 13, 14, 51, 52, 53, 54, 65, 66, 67, 68 }

F grade: { 1, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 35, 36, 37, 38, 44, 45, 46, 47, 49, 50, 55, 64, 69, 70, 71, 72, 73, 83, 84, 85, 86, 87, 88, 89 }

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	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	67	67	67	0	0	153	0	0
normalized size	1	1.	1.	0.	0.	2.28	0.	0.
time (sec)	N/A	0.04	0.038	0.047	0.	1.525	0.	0.

Problem 2	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	B	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	141	141	100	260	417	474	350	10620
normalized size	1	1.	0.71	1.84	2.96	3.36	2.48	75.32
time (sec)	N/A	0.108	0.12	0.009	1.588	1.522	0.537	2.585

Problem 3	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	110	110	78	165	278	312	231	6336
normalized size	1	1.	0.71	1.5	2.53	2.84	2.1	57.6
time (sec)	N/A	0.073	0.083	0.007	1.02	1.525	0.299	6.128

Problem 4	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	79	79	56	91	166	186	133	3367
normalized size	1	1.	0.71	1.15	2.1	2.35	1.68	42.62
time (sec)	N/A	0.043	0.066	0.007	1.008	1.546	0.236	1.83

Problem 5	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	34	38	81	90	60	1462
normalized size	1	1.	0.71	0.79	1.69	1.88	1.25	30.46
time (sec)	N/A	0.017	0.037	0.003	0.976	1.5	0.234	7.068

Problem 6	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	20	20	21	21	27	41	20	27
normalized size	1	1.	1.05	1.05	1.35	2.05	1.	1.35
time (sec)	N/A	0.004	0.005	0.001	0.945	1.511	0.108	3.585

Problem 7	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	31	31	31	56	0	78	0	0
normalized size	1	1.	1.	1.81	0.	2.52	0.	0.
time (sec)	N/A	0.024	0.041	0.033	0.	1.546	0.	0.

Problem 8	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	57	57	55	99	0	159	0	0
normalized size	1	1.	0.96	1.74	0.	2.79	0.	0.
time (sec)	N/A	0.043	0.119	0.038	0.	1.539	0.	0.

Problem 9	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	95	95	88	155	0	278	0	0
normalized size	1	1.	0.93	1.63	0.	2.93	0.	0.
time (sec)	N/A	0.071	0.157	0.04	0.	1.503	0.	0.

Problem 10	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	128	128	99	199	0	425	0	0
normalized size	1	1.	0.77	1.55	0.	3.32	0.	0.
time (sec)	N/A	0.1	0.201	0.049	0.	1.521	0.	0.

Problem 11	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	161	161	121	243	0	606	0	0
normalized size	1	1.	0.75	1.51	0.	3.76	0.	0.
time (sec)	N/A	0.134	0.172	0.056	0.	1.567	0.	0.

Problem 12	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	B	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	141	141	100	260	417	474	350	10620
normalized size	1	1.	0.71	1.84	2.96	3.36	2.48	75.32
time (sec)	N/A	0.122	0.065	0.007	1.058	1.51	0.235	1.493

Problem 13	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	110	110	78	165	278	312	231	6336
normalized size	1	1.	0.71	1.5	2.53	2.84	2.1	57.6
time (sec)	N/A	0.086	0.075	0.006	1.127	1.533	0.319	1.407

Problem 14	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	79	79	56	91	166	186	133	3367
normalized size	1	1.	0.71	1.15	2.1	2.35	1.68	42.62
time (sec)	N/A	0.045	0.039	0.004	1.15	1.529	0.274	1.284

Problem 15	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	57	57	55	99	0	159	0	0
normalized size	1	1.	0.96	1.74	0.	2.79	0.	0.
time (sec)	N/A	0.043	0.06	0.043	0.	1.536	0.	0.

Problem 16	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	95	95	88	155	0	278	0	0
normalized size	1	1.	0.93	1.63	0.	2.93	0.	0.
time (sec)	N/A	0.098	0.051	0.059	0.	1.499	0.	0.

Problem 17	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	128	128	99	199	0	425	0	0
normalized size	1	1.	0.77	1.55	0.	3.32	0.	0.
time (sec)	N/A	0.134	0.08	0.076	0.	1.575	0.	0.

Problem 18	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	161	161	121	243	0	606	0	0
normalized size	1	1.	0.75	1.51	0.	3.76	0.	0.
time (sec)	N/A	0.18	0.034	0.096	0.	1.594	0.	0.

Problem 19	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	72	72	72	0	0	158	0	0
normalized size	1	1.	1.	0.	0.	2.19	0.	0.
time (sec)	N/A	0.054	0.013	0.043	0.	1.777	0.	0.

Problem 20	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.07	0.015	0.158	0.	0.	0.	0.

Problem 21	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.06	0.014	0.077	0.	0.	0.	0.

Problem 22	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.057	0.014	0.103	0.	0.	0.	0.

Problem 23	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	67	67	67	0	0	153	0	0
normalized size	1	1.	1.	0.	0.	2.28	0.	0.
time (sec)	N/A	0.022	0.012	0.	0.	1.54	0.	0.

Problem 24	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	69	69	69	0	0	153	0	0
normalized size	1	1.	1.	0.	0.	2.22	0.	0.
time (sec)	N/A	0.024	0.015	0.045	0.	1.566	0.	0.

Problem 25	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	73	73	73	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.057	0.011	0.099	0.	0.	0.	0.

Problem 26	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	73	73	73	0	0	0	0	0
normalized size	1	1.	1.	0.	0.	0.	0.	0.
time (sec)	N/A	0.06	0.011	0.075	0.	0.	0.	0.

Problem 27	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	15	15	15	14	18	32	15	18
normalized size	1	1.	1.	0.93	1.2	2.13	1.	1.2
time (sec)	N/A	0.003	0.004	0.004	1.122	1.5	0.095	1.211

Problem 28	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	15	15	15	16	20	32	15	20
normalized size	1	1.	1.	1.07	1.33	2.13	1.	1.33
time (sec)	N/A	0.003	0.004	0.006	1.051	1.51	0.093	1.191

Problem 29	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	19	19	19	14	18	35	10	18
normalized size	1	1.	1.	0.74	0.95	1.84	0.53	0.95
time (sec)	N/A	0.005	0.005	0.013	1.139	1.492	0.09	1.239

Problem 30	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	131	131	36	99	32	254	0	127
normalized size	1	1.	0.27	0.76	0.24	1.94	0.	0.97
time (sec)	N/A	0.147	0.006	0.022	1.229	1.533	0.	1.22

Problem 31	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	108	108	36	87	32	219	0	111
normalized size	1	1.	0.33	0.81	0.3	2.03	0.	1.03
time (sec)	N/A	0.094	0.006	0.01	1.224	1.518	0.	1.257

Problem 32	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	36	75	32	188	0	95
normalized size	1	1.	0.42	0.88	0.38	2.21	0.	1.12
time (sec)	N/A	0.066	0.006	0.012	1.217	1.499	0.	1.242

Problem 33	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	62	62	30	66	32	153	0	78
normalized size	1	1.	0.48	1.06	0.52	2.47	0.	1.26
time (sec)	N/A	0.044	0.008	0.008	1.25	1.519	0.	1.226

Problem 34	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	30	27	39	96	0	38
normalized size	1	1.	0.79	0.71	1.03	2.53	0.	1.
time (sec)	N/A	0.025	0.006	0.008	1.153	1.529	0.	1.346

Problem 35	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	54	54	38	64	32	122	34	0
normalized size	1	1.	0.7	1.19	0.59	2.26	0.63	0.
time (sec)	N/A	0.045	0.015	0.01	1.214	1.549	6.776	0.

Problem 36	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	77	77	49	72	32	170	39	0
normalized size	1	1.	0.64	0.94	0.42	2.21	0.51	0.
time (sec)	N/A	0.065	0.037	0.011	1.252	1.54	175.103	0.

Problem 37	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	100	100	61	84	32	205	0	0
normalized size	1	1.	0.61	0.84	0.32	2.05	0.	0.
time (sec)	N/A	0.089	0.05	0.012	1.255	1.524	0.	0.

Problem 38	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	123	123	73	96	32	236	0	0
normalized size	1	1.	0.59	0.78	0.26	1.92	0.	0.
time (sec)	N/A	0.108	0.062	0.013	1.297	1.48	0.	0.

Problem 39	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	208	208	72	0	0	516	0	1301
normalized size	1	1.	0.35	0.	0.	2.48	0.	6.25
time (sec)	N/A	0.266	0.03	0.02	0.	1.556	0.	1.378

Problem 40	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	173	173	72	0	0	383	0	779
normalized size	1	1.	0.42	0.	0.	2.21	0.	4.5
time (sec)	N/A	0.166	0.027	0.019	0.	1.542	0.	1.334

Problem 41	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	138	138	63	0	0	288	0	408
normalized size	1	1.	0.46	0.	0.	2.09	0.	2.96
time (sec)	N/A	0.119	0.07	0.02	0.	1.916	0.	1.191

Problem 42	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	105	105	63	0	0	220	0	170
normalized size	1	1.	0.6	0.	0.	2.1	0.	1.62
time (sec)	N/A	0.077	0.038	0.019	0.	2.089	0.	1.302

Problem 43	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	72	72	63	0	0	142	0	78
normalized size	1	1.	0.88	0.	0.	1.97	0.	1.08
time (sec)	N/A	0.045	0.028	0.022	0.	2.046	0.	1.254

Problem 44	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	97	97	75	0	0	205	0	0
normalized size	1	1.	0.77	0.	0.	2.11	0.	0.
time (sec)	N/A	0.085	0.074	0.02	0.	1.836	0.	0.

Problem 45	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	130	130	92	0	0	327	0	0
normalized size	1	1.	0.71	0.	0.	2.52	0.	0.
time (sec)	N/A	0.119	0.234	0.018	0.	1.573	0.	0.

Problem 46	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	165	165	118	0	0	497	0	0
normalized size	1	1.	0.72	0.	0.	3.01	0.	0.
time (sec)	N/A	0.165	0.138	0.019	0.	1.569	0.	0.

Problem 47	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	200	200	144	0	0	679	0	0
normalized size	1	1.	0.72	0.	0.	3.4	0.	0.
time (sec)	N/A	0.203	0.165	0.019	0.	1.59	0.	0.

Problem 48	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	F(-1)	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	151	151	24	145	107	242	0	108
normalized size	1	1.	0.16	0.96	0.71	1.6	0.	0.72
time (sec)	N/A	0.155	0.004	0.135	1.073	1.519	0.	1.161

Problem 49	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	63	0	0	281	0	0
normalized size	1	1.	0.89	0.	0.	3.96	0.	0.
time (sec)	N/A	0.031	0.08	0.018	0.	1.571	0.	0.

Problem 50	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	F	F	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	98	98	78	0	0	316	0	0
normalized size	1	1.	0.8	0.	0.	3.22	0.	0.
time (sec)	N/A	0.104	0.134	0.044	0.	1.559	0.	0.

Problem 51	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	34	38	81	90	60	1462
normalized size	1	1.	0.71	0.79	1.69	1.88	1.25	30.46
time (sec)	N/A	0.017	0.023	0.	1.041	1.549	0.129	1.296

Problem 52	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	135	135	56	80	158	167	116	3362
normalized size	1	1.	0.41	0.59	1.17	1.24	0.86	24.9
time (sec)	N/A	0.103	0.075	0.003	1.188	1.513	0.156	1.384

Problem 53	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	229	229	84	138	262	269	190	5787
normalized size	1	1.	0.37	0.6	1.14	1.17	0.83	25.27
time (sec)	N/A	0.191	0.111	0.004	1.132	1.512	0.184	1.416

Problem 54	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	348	348	117	212	393	396	284	10024
normalized size	1	1.	0.34	0.61	1.13	1.14	0.82	28.8
time (sec)	N/A	0.312	0.162	0.005	1.065	1.565	0.217	1.512

Problem 55	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	116	116	61	334	166	297	0	0
normalized size	1	1.	0.53	2.88	1.43	2.56	0.	0.
time (sec)	N/A	0.175	0.057	0.08	1.236	1.562	0.	0.

Problem 56	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	397	397	121	182	265	301	236	273
normalized size	1	1.	0.3	0.46	0.67	0.76	0.59	0.69
time (sec)	N/A	0.516	0.323	0.004	1.063	1.472	0.192	1.251

Problem 57	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	318	318	130	143	221	242	196	220
normalized size	1	1.	0.41	0.45	0.69	0.76	0.62	0.69
time (sec)	N/A	0.412	0.198	0.005	1.056	1.521	0.176	1.361

Problem 58	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	184	184	96	102	178	182	148	166
normalized size	1	1.	0.52	0.55	0.97	0.99	0.8	0.9
time (sec)	N/A	0.242	0.122	0.004	1.092	1.502	0.163	1.353

Problem 59	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	80	80	41	68	139	128	104	117
normalized size	1	1.	0.51	0.85	1.74	1.6	1.3	1.46
time (sec)	N/A	0.068	0.047	0.003	1.062	1.472	0.146	1.315

Problem 60	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	102	102	52	113	93	108	70	128
normalized size	1	1.	0.51	1.11	0.91	1.06	0.69	1.25
time (sec)	N/A	0.156	0.05	0.008	1.152	1.465	15.072	1.32

Problem 61	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	94	94	54	92	82	117	99	124
normalized size	1	1.	0.57	0.98	0.87	1.24	1.05	1.32
time (sec)	N/A	0.161	0.065	0.008	1.162	1.468	6.476	1.383

Problem 62	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	130	130	68	112	86	146	56	169
normalized size	1	1.	0.52	0.86	0.66	1.12	0.43	1.3
time (sec)	N/A	0.213	0.072	0.009	1.272	1.48	6.583	1.334

Problem 63	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	198	198	81	167	85	182	53	247
normalized size	1	1.	0.41	0.84	0.43	0.92	0.27	1.25
time (sec)	N/A	0.29	0.106	0.008	1.233	1.441	6.899	1.367

Problem 64	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	B	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	139	139	86	433	166	386	0	0
normalized size	1	1.	0.62	3.12	1.19	2.78	0.	0.
time (sec)	N/A	0.309	0.124	0.097	1.274	1.609	0.	0.

Problem 65	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	414	414	159	250	443	493	323	13437
normalized size	1	1.	0.38	0.6	1.07	1.19	0.78	32.46
time (sec)	N/A	0.672	0.12	0.009	1.061	1.553	0.21	1.86

Problem 66	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	328	328	121	197	354	386	260	9532
normalized size	1	1.	0.37	0.6	1.08	1.18	0.79	29.06
time (sec)	N/A	0.532	0.238	0.007	1.044	1.482	0.194	2.007

Problem 67	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	242	242	91	144	265	288	199	6340
normalized size	1	1.	0.38	0.6	1.1	1.19	0.82	26.2
time (sec)	N/A	0.356	0.15	0.007	1.049	1.573	0.176	1.486

Problem 68	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	A	A	A	C
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	58	93	181	192	134	3708
normalized size	1	1.	0.68	1.09	2.13	2.26	1.58	43.62
time (sec)	N/A	0.12	0.069	0.007	1.022	1.487	0.155	1.38

Problem 69	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	96	96	54	126	117	180	0	0
normalized size	1	1.	0.56	1.31	1.22	1.88	0.	0.
time (sec)	N/A	0.258	0.126	0.045	1.157	1.528	0.	0.

Problem 70	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	85	85	58	135	92	189	0	0
normalized size	1	1.	0.68	1.59	1.08	2.22	0.	0.
time (sec)	N/A	0.277	0.149	0.053	1.193	1.492	0.	0.

Problem 71	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	136	136	76	204	100	215	0	0
normalized size	1	1.	0.56	1.5	0.74	1.58	0.	0.
time (sec)	N/A	0.363	0.148	0.059	1.324	1.505	0.	0.

Problem 72	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	217	217	116	290	115	317	0	0
normalized size	1	1.	0.53	1.34	0.53	1.46	0.	0.
time (sec)	N/A	0.459	0.224	0.065	1.21	1.53	0.	0.

Problem 73	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	321	321	156	382	126	421	0	0
normalized size	1	1.	0.49	1.19	0.39	1.31	0.	0.
time (sec)	N/A	0.578	0.297	0.066	1.243	1.501	0.	0.

Problem 74	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	754	754	458	1062	1207	1310	1445	1480
normalized size	1	1.	0.61	1.41	1.6	1.74	1.92	1.96
time (sec)	N/A	0.916	0.696	0.005	1.176	1.506	0.492	1.292

Problem 75	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	495	495	320	640	809	844	899	910
normalized size	1	1.	0.65	1.29	1.63	1.71	1.82	1.84
time (sec)	N/A	0.636	0.445	0.005	1.181	1.435	0.356	1.259

Problem 76	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	271	271	191	297	464	468	447	447
normalized size	1	1.	0.7	1.1	1.71	1.73	1.65	1.65
time (sec)	N/A	0.339	0.253	0.005	1.086	1.503	0.245	1.241

Problem 77	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	102	102	50	108	201	192	158	178
normalized size	1	1.	0.49	1.06	1.97	1.88	1.55	1.75
time (sec)	N/A	0.096	0.061	0.004	1.123	1.429	0.164	1.207

Problem 78	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	277	277	175	489	0	479	0	240
normalized size	1	1.	0.63	1.77	0.	1.73	0.	0.87
time (sec)	N/A	0.338	0.298	0.012	0.	1.521	0.	1.189

Problem 79	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	258	258	163	406	0	729	0	1037
normalized size	1	1.	0.63	1.57	0.	2.83	0.	4.02
time (sec)	N/A	0.379	0.437	0.015	0.	1.534	0.	1.742

Problem 80	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	A	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	294	294	267	418	0	1158	0	2419
normalized size	1	1.	0.91	1.42	0.	3.94	0.	8.23
time (sec)	N/A	0.408	0.652	0.015	0.	1.569	0.	1.312

Problem 81	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	B	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	396	396	389	511	0	1733	0	4180
normalized size	1	1.	0.98	1.29	0.	4.38	0.	10.56
time (sec)	N/A	0.521	0.807	0.013	0.	1.595	0.	1.294

Problem 82	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	A	F	B	F(-1)	B
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	557	557	669	596	0	2442	0	6118
normalized size	1	1.	1.2	1.07	0.	4.38	0.	10.98
time (sec)	N/A	0.684	0.726	0.013	0.	1.643	0.	1.516

Problem 83	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	A	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	24	24	24	192	57	90	0	0
normalized size	1	1.	1.	8.	2.38	3.75	0.	0.
time (sec)	N/A	0.146	0.366	0.2	1.443	1.558	0.	0.

Problem 84	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	198	57	0	0	0
normalized size	1	1.	1.05	9.	2.59	0.	0.	0.
time (sec)	N/A	0.131	0.299	0.098	1.374	0.	0.	0.

Problem 85	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	198	57	0	0	0
normalized size	1	1.	1.05	9.	2.59	0.	0.	0.
time (sec)	N/A	0.09	0.269	0.097	1.404	0.	0.	0.

Problem 86	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	20	20	21	186	51	0	0	0
normalized size	1	1.	1.05	9.3	2.55	0.	0.	0.
time (sec)	N/A	0.046	0.171	0.108	1.358	0.	0.	0.

Problem 87	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	19	19	19	180	49	0	0	0
normalized size	1	1.	1.	9.47	2.58	0.	0.	0.
time (sec)	N/A	0.129	0.032	0.088	1.386	0.	0.	0.

Problem 88	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F(-2)
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	136	53	0	0	0
normalized size	1	1.	1.05	6.18	2.41	0.	0.	0.
time (sec)	N/A	0.131	0.328	0.105	1.428	0.	0.	0.

Problem 89	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	C	A	F(-2)	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	136	53	0	0	0
normalized size	1	1.	1.05	6.18	2.41	0.	0.	0.
time (sec)	N/A	0.131	0.323	0.102	1.381	0.	0.	0.

Problem 90	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	91	91	45	43	81	105	51	58
normalized size	1	1.	0.49	0.47	0.89	1.15	0.56	0.64
time (sec)	N/A	0.143	0.021	0.003	1.027	1.442	0.114	1.315

Problem 91	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	72	72	37	35	65	85	42	47
normalized size	1	1.	0.51	0.49	0.9	1.18	0.58	0.65
time (sec)	N/A	0.101	0.013	0.003	1.093	1.459	0.108	1.254

Problem 92	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	53	53	29	27	49	66	34	36
normalized size	1	1.	0.55	0.51	0.92	1.25	0.64	0.68
time (sec)	N/A	0.064	0.013	0.001	1.023	1.476	0.104	1.226

Problem 93	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	34	34	21	19	32	50	26	26
normalized size	1	1.	0.62	0.56	0.94	1.47	0.76	0.76
time (sec)	N/A	0.029	0.01	0.001	1.045	1.501	0.094	1.243

Problem 94	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	16	16	16	14	19	34	14	19
normalized size	1	1.	1.	0.88	1.19	2.12	0.88	1.19
time (sec)	N/A	0.007	0.005	0.001	1.043	1.467	0.083	1.245

Problem 95	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	B	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	27	27	27	57	14	31	0	14
normalized size	1	1.	1.	2.11	0.52	1.15	0.	0.52
time (sec)	N/A	0.058	0.016	0.039	1.173	1.493	0.	1.365

Problem 96	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	B	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	47	116	18	80	0	39
normalized size	1	1.	0.98	2.42	0.38	1.67	0.	0.81
time (sec)	N/A	0.086	0.027	0.021	1.172	1.431	0.	1.256

Problem 97	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	B	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	56	155	20	101	0	62
normalized size	1	1.	0.79	2.18	0.28	1.42	0.	0.87
time (sec)	N/A	0.119	0.042	0.028	1.146	1.508	0.	1.286

Problem 98	Optimal	Rubi	Mathematica	Maple	Maxima	Fricas	Sympy	Giac
grade	A	A	A	B	A	A	F	A
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	92	92	64	189	20	119	0	85
normalized size	1	1.	0.7	2.05	0.22	1.29	0.	0.92
time (sec)	N/A	0.155	0.053	0.03	1.139	1.467	0.	1.309

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 [48] had the largest ratio of [0.25]

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	1	1	1.	17	0.059
2	A	5	2	1.	17	0.118
3	A	4	2	1.	17	0.118
4	A	3	2	1.	17	0.118
5	A	2	2	1.	15	0.133
6	A	1	1	1.	9	0.111
7	A	1	1	1.	17	0.059
8	A	2	2	1.	17	0.118
9	A	3	2	1.	17	0.118
10	A	4	2	1.	17	0.118
11	A	5	2	1.	17	0.118
12	A	6	3	1.	48	0.062
13	A	5	3	1.	37	0.081
14	A	4	3	1.	26	0.115
15	A	3	3	1.	28	0.107
16	A	4	3	1.	39	0.077
17	A	5	3	1.	50	0.06
18	A	6	3	1.	61	0.049
19	A	2	2	1.	19	0.105
20	A	2	2	1.	50	0.04
21	A	2	2	1.	39	0.051
22	A	2	2	1.	28	0.071
23	A	1	1	1.	17	0.059
24	A	1	1	1.	19	0.053
25	A	2	2	1.	30	0.067
26	A	2	2	1.	41	0.049
27	A	1	1	1.	7	0.143
28	A	1	1	1.	7	0.143
29	A	1	1	1.	7	0.143
30	A	6	3	1.	13	0.231
31	A	5	3	1.	13	0.231
32	A	4	3	1.	13	0.231
33	A	3	3	1.	13	0.231
34	A	2	2	1.	13	0.154
35	A	3	3	1.	13	0.231

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
36	A	4	3	1.	13	0.231
37	A	5	3	1.	13	0.231
38	A	6	3	1.	13	0.231
39	A	6	3	1.	19	0.158
40	A	5	3	1.	19	0.158
41	A	4	3	1.	19	0.158
42	A	3	3	1.	19	0.158
43	A	2	2	1.	19	0.105
44	A	3	3	1.	19	0.158
45	A	4	3	1.	19	0.158
46	A	5	3	1.	19	0.158
47	A	6	3	1.	19	0.158
48	A	9	3	1.	12	0.25
49	A	1	1	1.	19	0.053
50	A	2	2	1.	21	0.095
51	A	2	2	1.	15	0.133
52	A	8	3	1.	20	0.15
53	A	12	3	1.	25	0.12
54	A	17	3	1.	30	0.1
55	A	6	2	1.	21	0.095
56	A	24	3	1.	21	0.143
57	A	20	3	1.	21	0.143
58	A	11	3	1.	19	0.158
59	A	4	2	1.	18	0.111
60	A	9	4	1.	21	0.19
61	A	8	5	1.	21	0.238
62	A	9	4	1.	21	0.19
63	A	12	3	1.	21	0.143
64	A	5	2	1.	22	0.091
65	A	17	3	1.	22	0.136
66	A	14	3	1.	22	0.136
67	A	11	3	1.	20	0.15
68	A	4	3	1.	19	0.158
69	A	6	4	1.	22	0.182
70	A	6	4	1.	22	0.182
71	A	8	3	1.	22	0.136
72	A	11	3	1.	22	0.136
73	A	14	3	1.	22	0.136
74	A	28	3	1.	25	0.12
75	A	20	3	1.	25	0.12
76	A	13	3	1.	23	0.13
77	A	5	2	1.	18	0.111
78	A	13	4	1.	25	0.16
79	A	11	5	1.	25	0.2

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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	11	5	1.	25	0.2
81	A	13	4	1.	25	0.16
82	A	17	3	1.	25	0.12
83	A	1	1	1.	39	0.026
84	A	1	1	1.	38	0.026
85	A	1	1	1.	36	0.028
86	A	1	1	1.	35	0.029
87	A	1	1	1.	35	0.029
88	A	1	1	1.	38	0.026
89	A	1	1	1.	38	0.026
90	A	5	2	1.	15	0.133
91	A	4	2	1.	15	0.133
92	A	3	2	1.	15	0.133
93	A	2	2	1.	13	0.154
94	A	1	1	1.	11	0.091
95	A	2	2	1.	15	0.133
96	A	3	3	1.	15	0.2
97	A	4	3	1.	15	0.2
98	A	5	3	1.	15	0.2

Chapter 3

Listing of integrals

3.1 $\int F^{c(a+bx)}(d+ex)^m\,dx$

Optimal. Leaf size=67

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m}\text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

Rubi [A] time = 0.0399163, antiderivative size = 67, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2181}

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m}\text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^m\,dx=\frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^m\Gamma\left(1+m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-m}}{bc\log(F)}$$

Mathematica [A] time = 0.0382056, size = 67, normalized size = 1.

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m} \text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

Maple [F] time = 0.047, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} (ex+d)^m \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^m,x)
```

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

$$\int (ex+d)^m F^{(bx+a)c} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^m*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.52543, size = 153, normalized size = 2.28

$$\frac{e^{\left(-\frac{em\log\left(-\frac{bc\log(F)}{e}\right)+(bcd-ace)\log(F)}{e}\right)}\Gamma\left(m+1,-\frac{(bcex+bcd)\log(F)}{e}\right)}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="fricas")
```

```
[Out] e^(-(e*m*log(-b*c*log(F)/e) + (b*c*d - a*c*e)*log(F))/e)*gamma(m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**m,x)
```

```
[Out] Timed out
```

<u>Giac</u> [F] time = 0., size = 0, normalized size = 0.

$$\int (ex+d)^m F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="giac")
```

```
[Out] integrate((e*x + d)^m*F^((b*x + a)*c), x)
```

3.2 $\int F^{c(a+bx)}(d+ex)^4\,dx$

Optimal. Leaf size=141

$$\frac{12e^2(d+ex)^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{24e^3(d+ex)F^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4e(d+ex)^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}+\frac{(d+ex)^4F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (24*e^4*F^(c*(a + b*x)))/(b^5*c^5*Log[F]^5) - (24*e^3*F^(c*(a + b*x))*(d +
e*x))/(b^4*c^4*Log[F]^4) + (12*e^2*F^(c*(a + b*x))*(d + e*x)^2)/(b^3*c^3*Lo
g[F]^3) - (4*e*F^(c*(a + b*x))*(d + e*x)^3)/(b^2*c^2*Log[F]^2) + (F^(c*(a +
 b*x))*(d + e*x)^4)/(b*c*Log[F])
```

Rubi [A] time = 0.108315, antiderivative size = 141, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2176, 2194}

$$\frac{12e^2(d+ex)^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{24e^3(d+ex)F^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4e(d+ex)^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}+\frac{(d+ex)^4F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^4,x]
```

```
[Out] (24*e^4*F^(c*(a + b*x)))/(b^5*c^5*Log[F]^5) - (24*e^3*F^(c*(a + b*x))*(d +
e*x))/(b^4*c^4*Log[F]^4) + (12*e^2*F^(c*(a + b*x))*(d + e*x)^2)/(b^3*c^3*Lo
g[F]^3) - (4*e*F^(c*(a + b*x))*(d + e*x)^3)/(b^2*c^2*Log[F]^2) + (F^(c*(a +
 b*x))*(d + e*x)^4)/(b*c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}(d+ex)^4\,dx &= \frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}-\frac{(4e)\int F^{c(a+bx)}(d+ex)^3\,dx}{bc\log(F)}\\
&= -\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}+\frac{\left(12e^2\right)\int F^{c(a+bx)}(d+ex)^2\,dx}{b^2c^2\log^2(F)}\\
&= \frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}-\frac{\left(24e^3\right)\int F^{c(a+bx)}(d+ex)\,dx}{b^3c^3\log^3(F)}\\
&= -\frac{24e^3F^{c(a+bx)}(d+ex)}{b^4c^4\log^4(F)}+\frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}+\frac{\left(24e^4\right)}{b^4}\\
&= \frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}-\frac{24e^3F^{c(a+bx)}(d+ex)}{b^4c^4\log^4(F)}+\frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+}{bc\log(F}\end{aligned}$$

Mathematica [A] time = 0.12032, size = 100, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(12b^2c^2e^2\log^2(F)(d+ex)^2-4b^3c^3e\log^3(F)(d+ex)^3+b^4c^4\log^4(F)(d+ex)^4-24bce^3\log(F)(d+ex)+24e^4\right)}{b^5c^5\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^4,x]
```

```
[Out] (F^(c*(a + b*x))*(24*e^4 - 24*b*c*e^3*(d + e*x)*Log[F] + 12*b^2*c^2*e^2*(d
+ e*x)^2*Log[F]^2 - 4*b^3*c^3*e*(d + e*x)^3*Log[F]^3 + b^4*c^4*(d + e*x)^4*
Log[F]^4))/(b^5*c^5*Log[F]^5)
```

Maple [A] time = 0.009, size = 260, normalized size = 1.8

$$\frac{\left(e^4x^4b^4c^4(\ln(F))^4+4(\ln(F))^4b^4c^4de^3x^3+6(\ln(F))^4b^4c^4d^2e^2x^2+4(\ln(F))^4b^4c^4d^3ex+(\ln(F))^4b^4c^4d^4-4(\ln(F)\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^4,x)
```

```
[Out] (e^4*x^4*b^4*c^4*ln(F)^4+4*ln(F)^4*b^4*c^4*d*e^3*x^3+6*ln(F)^4*b^4*c^4*d^2*
e^2*x^2+4*ln(F)^4*b^4*c^4*d^3*e*x+ln(F)^4*b^4*c^4*d^4-4*ln(F)^3*b^3*c^3*e^4
*x^3-12*ln(F)^3*b^3*c^3*d*e^3*x^2-12*ln(F)^3*b^3*c^3*d^2*e^2*x-4*ln(F)^3*b^
3*c^3*d^3*e+12*ln(F)^2*b^2*c^2*e^4*x^2+24*ln(F)^2*b^2*c^2*d*e^3*x+12*b^2*c^
2*ln(F)^2*e^2*d^2-24*ln(F)*b*c*e^4*x-24*d*e^3*b*c*ln(F)+24*e^4)*F^(c*(b*x+a
))/b^5/c^5/ln(F)^5
```

Maxima [B] time = 1.5879, size = 417, normalized size = 2.96

$$\frac{F^{bcx+ac}d^4}{bc\log(F)}+\frac{4\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}d^3e}{b^2c^2\log(F)^2}+\frac{6\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}d^2e^2}{b^3c^3\log(F)^3}+\frac{4\left(F^{ac}b^3c^3x^3\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^4,x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d^4/(b*c*log(F)) + 4*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d^3*e/(b^2*c^2*log(F)^2) + 6*(F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)
*b*c*x*log(F) + 2*F^(a*c))*F^(b*c*x)*d^2*e^2/(b^3*c^3*log(F)^3) + 4*(F^(a*c
)*b^3*c^3*x^3*log(F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*l
og(F) - 6*F^(a*c))*F^(b*c*x)*d*e^3/(b^4*c^4*log(F)^4) + (F^(a*c)*b^4*c^4*x^
4*log(F)^4 - 4*F^(a*c)*b^3*c^3*x^3*log(F)^3 + 12*F^(a*c)*b^2*c^2*x^2*log(F)
^2 - 24*F^(a*c)*b*c*x*log(F) + 24*F^(a*c))*F^(b*c*x)*e^4/(b^5*c^5*log(F)^5)
```

Fricas [A] time = 1.5216, size = 474, normalized size = 3.36

$$\frac{\left(\left(b^4c^4e^4x^4+4b^4c^4de^3x^3+6b^4c^4d^2e^2x^2+4b^4c^4d^3ex+b^4c^4d^4\right)\log(F)^4+24e^4-4\left(b^3c^3e^4x^3+3b^3c^3de^3x^2+3b^3c^3d^2\right.\right.}{b^5c^5\log(F}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^4,x, algorithm="fricas")
```

```
[Out] ((b^4*c^4*e^4*x^4 + 4*b^4*c^4*d*e^3*x^3 + 6*b^4*c^4*d^2*e^2*x^2 + 4*b^4*c^4
*d^3*e*x + b^4*c^4*d^4)*log(F)^4 + 24*e^4 - 4*(b^3*c^3*e^4*x^3 + 3*b^3*c^3*
d*e^3*x^2 + 3*b^3*c^3*d^2*e^2*x + b^3*c^3*d^3*e)*log(F)^3 + 12*(b^2*c^2*e^4
*x^2 + 2*b^2*c^2*d*e^3*x + b^2*c^2*d^2*e^2)*log(F)^2 - 24*(b*c*e^4*x + b*c*
d*e^3)*log(F))*F^(b*c*x + a*c)/(b^5*c^5*log(F)^5)
```

Sympy [A] time = 0.537105, size = 350, normalized size = 2.48

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^4c^4d^4\log(F)^4+4b^4c^4d^3ex\log(F)^4+6b^4c^4d^2e^2x^2\log(F)^4+4b^4c^4de^3x^3\log(F)^4+b^4c^4e^4x^4\log(F)^4-4b^3c^3d^3e\log(F)^3-12b^3c^3d^2e^2x\log(F)^3-12b^3c^3de^3x\right.}{b^5c^5\log(F)^5} \\ d^4x+2d^3ex^2+2d^2e^2x^3+de^3x^4+\frac{e^4x^5}{5} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**4,x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**4*c**4*d**4*log(F)**4 + 4*b**4*c**4*d**3*e*
x*log(F)**4 + 6*b**4*c**4*d**2*e**2*x**2*log(F)**4 + 4*b**4*c**4*d*e**3*x**
3*log(F)**4 + b**4*c**4*e**4*x**4*log(F)**4 - 4*b**3*c**3*d**3*e*log(F)**3
- 12*b**3*c**3*d**2*e**2*x*log(F)**3 - 12*b**3*c**3*d*e**3*x**2*log(F)**3 -
 4*b**3*c**3*e**4*x**3*log(F)**3 + 12*b**2*c**2*d**2*e**2*log(F)**2 + 24*b*
*2*c**2*d*e**3*x*log(F)**2 + 12*b**2*c**2*e**4*x**2*log(F)**2 - 24*b*c*d*e*
*3*log(F) - 24*b*c*e**4*x*log(F) + 24*e**4)/(b**5*c**5*log(F)**5), Ne(b**5*
c**5*log(F)**5, 0)), (d**4*x + 2*d**3*e*x**2 + 2*d**2*e**2*x**3 + d*e**3*x*
*4 + e**4*x**5/5, True))
```

Giac [C] time = 2.58487, size = 10620, normalized size = 75.32

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^4,x, algorithm="giac")
```

```
[Out] -((4*(pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F) - pi*b^4*c^4*x^4*log(abs(F))^3*sg
n(F) - pi^3*b^4*c^4*x^4*log(abs(F)) + pi*b^4*c^4*x^4*log(abs(F))^3 - pi^3*b
^3*c^3*x^3*sgn(F) + 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) + pi^3*b^3*c^3*x^
3 - 3*pi*b^3*c^3*x^3*log(abs(F))^2 - 6*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) +
6*pi*b^2*c^2*x^2*log(abs(F)) + 6*pi*b*c*x*sgn(F) - 6*pi*b*c*x)*(pi^5*b^5*c^
5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^
4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(
abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5
*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F
))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) -
 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^
2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2) - (pi^4*b^4*c^4*x^4*s
gn(F) - 6*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*x^4 + 6*pi^2
*b^4*c^4*x^4*log(abs(F))^2 - 2*b^4*c^4*x^4*log(abs(F))^4 + 12*pi^2*b^3*c^3*
x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*c^3*x^3*log(abs(F)) + 8*b^3*c^3*x^3*lo
g(abs(F))^3 - 12*pi^2*b^2*c^2*x^2*sgn(F) + 12*pi^2*b^2*c^2*x^2 - 24*b^2*c^2
```

```
*x^2*log(abs(F))^2 + 48*b*c*x*log(abs(F)) - 48)*(5*pi^4*b^5*c^5*log(abs(F))
*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F))
 + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)/((pi^5*b^5*c^5*
sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*
sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(ab
s(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F
))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 -
2*b^5*c^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*
pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^4*b^4*c^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*x^
4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*x^4 + 6*pi^2*b^4*c^4*x^4*log(abs(F))^
2 - 2*b^4*c^4*x^4*log(abs(F))^4 + 12*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) -
12*pi^2*b^3*c^3*x^3*log(abs(F)) + 8*b^3*c^3*x^3*log(abs(F))^3 - 12*pi^2*b^2
*c^2*x^2*sgn(F) + 12*pi^2*b^2*c^2*x^2 - 24*b^2*c^2*x^2*log(abs(F))^2 + 48*b
*c*x*log(abs(F)) - 48)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2
*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^
5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi
^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*
b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (
5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) -
5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(
abs(F))^5)^2) + 4*(pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F) - pi*b^4*c^4*x^4*log
(abs(F))^3*sgn(F) - pi^3*b^4*c^4*x^4*log(abs(F)) + pi*b^4*c^4*x^4*log(abs(F
))^3 - pi^3*b^3*c^3*x^3*sgn(F) + 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) + pi
^3*b^3*c^3*x^3 - 3*pi*b^3*c^3*x^3*log(abs(F))^2 - 6*pi*b^2*c^2*x^2*log(abs(
F))*sgn(F) + 6*pi*b^2*c^2*x^2*log(abs(F)) + 6*pi*b*c*x*sgn(F) - 6*pi*b*c*x)
*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F)
- 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*lo
g(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) +
 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs
(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F)
 - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*p
i^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*pi*b*c*x*
sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F
)) + a*c*log(abs(F)) + 4) + 1/2*I*((-16*I*pi^4*b^4*c^4*x^4*sgn(F) + 64*pi^3
*b^4*c^4*x^4*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F
) - 64*pi*b^4*c^4*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*x^4 - 64*pi^
3*b^4*c^4*x^4*log(abs(F)) - 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2 + 64*pi*b^4
*c^4*x^4*log(abs(F))^3 + 32*I*b^4*c^4*x^4*log(abs(F))^4 - 64*pi^3*b^3*c^3*x
^3*sgn(F) - 192*I*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) + 192*pi*b^3*c^3*x^3*
log(abs(F))^2*sgn(F) + 64*pi^3*b^3*c^3*x^3 + 192*I*pi^2*b^3*c^3*x^3*log(abs
(F)) - 192*pi*b^3*c^3*x^3*log(abs(F))^2 - 128*I*b^3*c^3*x^3*log(abs(F))^3 +
 192*I*pi^2*b^2*c^2*x^2*sgn(F) - 384*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 19
2*I*pi^2*b^2*c^2*x^2 + 384*pi*b^2*c^2*x^2*log(abs(F)) + 384*I*b^2*c^2*x^2*l
og(abs(F))^2 + 384*pi*b*c*x*sgn(F) - 384*pi*b*c*x - 768*I*b*c*x*log(abs(F))
 + 768*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) -
 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(
F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))
^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*c^5 + 80*p
i^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c
^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5
) - (-16*I*pi^4*b^4*c^4*x^4*sgn(F) - 64*pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F)
 + 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F) + 64*pi*b^4*c^4*x^4*log(abs(F
))^3*sgn(F) + 16*I*pi^4*b^4*c^4*x^4 + 64*pi^3*b^4*c^4*x^4*log(abs(F)) - 96*
I*pi^2*b^4*c^4*x^4*log(abs(F))^2 - 64*pi*b^4*c^4*x^4*log(abs(F))^3 + 32*I*b
^4*c^4*x^4*log(abs(F))^4 + 64*pi^3*b^3*c^3*x^3*sgn(F) - 192*I*pi^2*b^3*c^3*
x^3*log(abs(F))*sgn(F) - 192*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 64*pi^3*
b^3*c^3*x^3 + 192*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 192*pi*b^3*c^3*x^3*log(a
bs(F))^2 - 128*I*b^3*c^3*x^3*log(abs(F))^3 + 192*I*pi^2*b^2*c^2*x^2*sgn(F)
+ 384*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 192*I*pi^2*b^2*c^2*x^2 - 384*pi*b
```

```
^2*c^2*x^2*log(abs(F)) + 384*I*b^2*c^2*x^2*log(abs(F))^2 - 384*pi*b*c*x*sgn
(F) + 384*pi*b*c*x - 768*I*b*c*x*log(abs(F)) + 768*I)*e^(-1/2*I*pi*b*c*x*sg
n(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5
*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(a
bs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*l
og(abs(F))^4*sgn(F) + 16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160
*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^
5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c
*log(abs(F)) + 4) - 4*(((3*pi^2*b^3*c^3*d*x^3*log(abs(F))*sgn(F) - 3*pi^2*b
^3*c^3*d*x^3*log(abs(F)) + 2*b^3*c^3*d*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*d
*x^2*sgn(F) + 3*pi^2*b^2*c^2*d*x^2 - 6*b^2*c^2*d*x^2*log(abs(F))^2 + 12*b*c
*d*x*log(abs(F)) - 12*d)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^
2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(
F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b
^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi
^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*
c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*c^3*d*x^3*sgn(
F) - 3*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d*x^3 + 3*pi*b^
3*c^3*d*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*d*x^2*log(abs(F))*sgn(F) - 6*pi*b^
2*c^2*d*x^2*log(abs(F)) - 6*pi*b*c*d*x*sgn(F) + 6*pi*b*c*d*x)*(pi^3*b^4*c^4
*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(ab
s(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*lo
g(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^
4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(a
bs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*
cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) -
 ((pi^3*b^3*c^3*d*x^3*sgn(F) - 3*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - pi
^3*b^3*c^3*d*x^3 + 3*pi*b^3*c^3*d*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*d*x^2*lo
g(abs(F))*sgn(F) - 6*pi*b^2*c^2*d*x^2*log(abs(F)) - 6*pi*b*c*d*x*sgn(F) + 6
*pi*b*c*d*x)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)/((pi^
4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*p
i^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*l
og(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(
F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(3*pi^2*b^3*c^3*d*x^3*log(abs(F))*sg
n(F) - 3*pi^2*b^3*c^3*d*x^3*log(abs(F)) + 2*b^3*c^3*d*x^3*log(abs(F))^3 - 3
*pi^2*b^2*c^2*d*x^2*sgn(F) + 3*pi^2*b^2*c^2*d*x^2 - 6*b^2*c^2*d*x^2*log(abs
(F))^2 + 12*b*c*d*x*log(abs(F)) - 12*d)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) -
pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log
(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 1
6*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3
*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(
F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) +
 a*c*log(abs(F)) + 3) - 1/2*I*((32*pi^3*b^3*c^3*d*x^3*sgn(F) + 96*I*pi^2*b^
3*c^3*d*x^3*log(abs(F))*sgn(F) - 96*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) -
 32*pi^3*b^3*c^3*d*x^3 - 96*I*pi^2*b^3*c^3*d*x^3*log(abs(F)) + 96*pi*b^3*c^
3*d*x^3*log(abs(F))^2 + 64*I*b^3*c^3*d*x^3*log(abs(F))^3 - 96*I*pi^2*b^2*c^
2*d*x^2*sgn(F) + 192*pi*b^2*c^2*d*x^2*log(abs(F))*sgn(F) + 96*I*pi^2*b^2*c^
2*d*x^2 - 192*pi*b^2*c^2*d*x^2*log(abs(F)) - 192*I*b^2*c^2*d*x^2*log(abs(F)
)^2 - 192*pi*b*c*d*x*sgn(F) + 192*pi*b*c*d*x + 384*I*b*c*d*x*log(abs(F)) -
384*I*d)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) -
1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) + 32*I*pi^3*b^4*c^4*log(abs(F))*sgn(F)
 - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - 32*I*pi*b^4*c^4*log(abs(F))^3*sgn
(F) - 8*pi^4*b^4*c^4 - 32*I*pi^3*b^4*c^4*log(abs(F)) + 48*pi^2*b^4*c^4*log(
abs(F))^2 + 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*c^4*log(abs(F))^4) + (32
*pi^3*b^3*c^3*d*x^3*sgn(F) - 96*I*pi^2*b^3*c^3*d*x^3*log(abs(F))*sgn(F) - 9
6*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - 32*pi^3*b^3*c^3*d*x^3 + 96*I*pi^2
*b^3*c^3*d*x^3*log(abs(F)) + 96*pi*b^3*c^3*d*x^3*log(abs(F))^2 - 64*I*b^3*c
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^3*d*x^3*log(abs(F))^3 + 96*I*pi^2*b^2*c^2*d*x^2*sgn(F) + 192*pi*b^2*c^2*d*
x^2*log(abs(F))*sgn(F) - 96*I*pi^2*b^2*c^2*d*x^2 - 192*pi*b^2*c^2*d*x^2*log
(abs(F)) + 192*I*b^2*c^2*d*x^2*log(abs(F))^2 - 192*pi*b*c*d*x*sgn(F) + 192*
pi*b*c*d*x - 384*I*b*c*d*x*log(abs(F)) + 384*I*d)*e^(-1/2*I*pi*b*c*x*sgn(F)
 + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn
(F) - 32*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*
sgn(F) + 32*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 + 32*I*pi^3*
b^4*c^4*log(abs(F)) + 48*pi^2*b^4*c^4*log(abs(F))^2 - 32*I*pi*b^4*c^4*log(a
bs(F))^3 - 16*b^4*c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)
) + 3) - 6*((2*(pi*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*d^2*x^2*
log(abs(F)) - pi*b*c*d^2*x*sgn(F) + pi*b*c*d^2*x)*(pi^3*b^3*c^3*sgn(F) - 3*
pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2
)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3
+ 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi
^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) - (pi^2*b^2*c^2*d^2*x^
2*sgn(F) - pi^2*b^2*c^2*d^2*x^2 + 2*b^2*c^2*d^2*x^2*log(abs(F))^2 - 4*b*c*d
^2*x*log(abs(F)) + 4*d^2)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c
^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*
c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (
3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*
log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn
(F) + 1/2*pi*a*c) - ((pi^2*b^2*c^2*d^2*x^2*sgn(F) - pi^2*b^2*c^2*d^2*x^2 +
2*b^2*c^2*d^2*x^2*log(abs(F))^2 - 4*b*c*d^2*x*log(abs(F)) + 4*d^2)*(pi^3*b^
3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*
c^3*log(abs(F))^2)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F
) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(
F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) + 2*(
pi*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*d^2*x^2*log(abs(F)) - pi
*b*c*d^2*x*sgn(F) + pi*b*c*d^2*x)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi
^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3
*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^
2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*
b^3*c^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi
*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 2) + 1/
2*I*((24*I*pi^2*b^2*c^2*d^2*x^2*sgn(F) - 48*pi*b^2*c^2*d^2*x^2*log(abs(F))*
sgn(F) - 24*I*pi^2*b^2*c^2*d^2*x^2 + 48*pi*b^2*c^2*d^2*x^2*log(abs(F)) + 48
*I*b^2*c^2*d^2*x^2*log(abs(F))^2 + 48*pi*b*c*d^2*x*sgn(F) - 48*pi*b*c*d^2*x
 - 96*I*b*c*d^2*x*log(abs(F)) + 96*I*d^2)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*
pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*I*pi^3*b^3*c^3*sgn(F) +
12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F) +
 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*log(abs(F
))^2 + 8*b^3*c^3*log(abs(F))^3) - (24*I*pi^2*b^2*c^2*d^2*x^2*sgn(F) + 48*pi
*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*c^2*d^2*x^2 - 48*pi*b^2
*c^2*d^2*x^2*log(abs(F)) + 48*I*b^2*c^2*d^2*x^2*log(abs(F))^2 - 48*pi*b*c*d
^2*x*sgn(F) + 48*pi*b*c*d^2*x - 96*I*b*c*d^2*x*log(abs(F)) + 96*I*d^2)*e^(-
1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c
)/(4*I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b
^3*c^3*log(abs(F))^2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)
) + 12*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 2) + 4*(2*((b*c*d^3*x*log(abs(F)) - d^3)*(pi^2*
b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)/((pi^2*b^2*c^2*sgn
(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))
*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi*b*c*d^3*x*sgn(F) - pi*b*c*d^3*x)
*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^2*sg
n(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F)
)*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*
c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi*b*c*d^3*x*sgn(F) - pi*b*c*d^3*
x)*(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)/((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*lo
```

```
g(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(b*c*d^3*x*log(abs(F)) -
d^3)*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^
2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(ab
s(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*p
i*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(a
bs(F)) + 1) - 1/2*I*((8*pi*b*c*d^3*x*sgn(F) - 8*pi*b*c*d^3*x - 16*I*b*c*d^3
*x*log(abs(F)) + 16*I*d^3)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*
I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log
(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*l
og(abs(F))^2) + (8*pi*b*c*d^3*x*sgn(F) - 8*pi*b*c*d^3*x + 16*I*b*c*d^3*x*lo
g(abs(F)) - 16*I*d^3)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi
*a*c*sgn(F) + 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs
(F))*sgn(F) - 2*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(a
bs(F))^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d^4*cos(-
1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(ab
s(F))/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(
F) - pi*b*c)*d^4*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F
) + 1/2*pi*a*c)/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(
b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^4*e^(1/2*I*pi*b*c*x*sg
n(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F
) - I*pi*b*c + 2*b*c*log(abs(F))) + 2*I*d^4*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2
*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*
b*c + 2*b*c*log(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.3 $\int F^{c(a+bx)}(d+ex)^3\,dx$

Optimal. Leaf size=110

$$\frac{6e^2(d+ex)F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3e(d+ex)^2F^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{(d+ex)^3F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (-6*e^3*F^(c*(a + b*x)))/(b^4*c^4*Log[F]^4) + (6*e^2*F^(c*(a + b*x))*(d + e
*x))/(b^3*c^3*Log[F]^3) - (3*e*F^(c*(a + b*x))*(d + e*x)^2)/(b^2*c^2*Log[F]
^2) + (F^(c*(a + b*x))*(d + e*x)^3)/(b*c*Log[F])
```

Rubi [A] time = 0.0729904, antiderivative size = 110, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2176, 2194}

$$\frac{6e^2(d+ex)F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3e(d+ex)^2F^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{(d+ex)^3F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^3,x]
```


```
[Out] (-6*e^3*F^(c*(a + b*x)))/(b^4*c^4*Log[F]^4) + (6*e^2*F^(c*(a + b*x))*(d + e
*x))/(b^3*c^3*Log[F]^3) - (3*e*F^(c*(a + b*x))*(d + e*x)^2)/(b^2*c^2*Log[F]
^2) + (F^(c*(a + b*x))*(d + e*x)^3)/(b*c*Log[F])
```


Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}(d+ex)^3\,dx&=\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}-\frac{(3e)\int F^{c(a+bx)}(d+ex)^2\,dx}{bc\log(F)}\\&=-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}+\frac{\left(6e^2\right)\int F^{c(a+bx)}(d+ex)\,dx}{b^2c^2\log^2(F)}\\&=\frac{6e^2F^{c(a+bx)}(d+ex)}{b^3c^3\log^3(F)}-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}-\frac{\left(6e^3\right)\int F^{c(a+bx)}\,dx}{b^3c^3\log^3(F)}\\&=-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{6e^2F^{c(a+bx)}(d+ex)}{b^3c^3\log^3(F)}-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0834539, size = 78, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(-3b^2c^2e\log^2(F)(d+ex)^2+b^3c^3\log^3(F)(d+ex)^3+6bce^2\log(F)(d+ex)-6e^3\right)}{b^4c^4\log^4(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^3,x]
```

```
[Out] (F^(c*(a + b*x))*(-6*e^3 + 6*b*c*e^2*(d + e*x)*Log[F] - 3*b^2*c^2*e*(d + e*
x)^2*Log[F]^2 + b^3*c^3*(d + e*x)^3*Log[F]^3))/(b^4*c^4*Log[F]^4)
```

Maple [A] time = 0.007, size = 165, normalized size = 1.5

$$\frac{\left(e^3x^3b^3c^3 (\ln (F))^3 + 3 (\ln (F))^3 b^3c^3de^2x^2 + 3 (\ln (F))^3 b^3c^3d^2ex + b^3c^3 (\ln (F))^3 d^3 - 3 (\ln (F))^2 b^2c^2e^3x^2 - 6 (\ln (F))^2 b^2c$$
$$b^4c^4 (\ln (F))^4$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^3,x)
```

```
[Out] (e^3*x^3*b^3*c^3*ln(F)^3+3*ln(F)^3*b^3*c^3*d*e^2*x^2+3*ln(F)^3*b^3*c^3*d^2*
e*x+b^3*c^3*ln(F)^3*d^3-3*ln(F)^2*b^2*c^2*e^3*x^2-6*ln(F)^2*b^2*c^2*d*e^2*x
-3*b^2*c^2*ln(F)^2*e*d^2+6*ln(F)*b*c*e^3*x+6*d*e^2*b*c*ln(F)-6*e^3)*F^(c*(b
*x+a))/b^4/c^4/ln(F)^4
```

Maxima [A] time = 1.01955, size = 278, normalized size = 2.53

$$\frac{F^{bcx+ac}d^3}{bc\log(F)} + \frac{3\,(F^{ac}bcx\log(F) - F^{ac})F^{bcx}d^2e}{b^2c^2\log(F)^2} + \frac{3\left(F^{ac}b^2c^2x^2\log(F)^2 - 2\,F^{ac}bcx\log(F) + 2\,F^{ac}\right)F^{bcx}de^2}{b^3c^3\log(F)^3} + \frac{\left(F^{ac}b^3c^3x^3\log(F$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^3,x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d^3/(b*c*log(F)) + 3*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d^2*e/(b^2*c^2*log(F)^2) + 3*(F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)
*b*c*x*log(F) + 2*F^(a*c))*F^(b*c*x)*d*e^2/(b^3*c^3*log(F)^3) + (F^(a*c)*b^
3*c^3*x^3*log(F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*log(F
) - 6*F^(a*c))*F^(b*c*x)*e^3/(b^4*c^4*log(F)^4)
```

Fricas [A] time = 1.5247, size = 312, normalized size = 2.84

$$\frac{\left(\left(b^3c^3e^3x^3 + 3\,b^3c^3de^2x^2 + 3\,b^3c^3d^2ex + b^3c^3d^3\right)\log(F)^3 - 6\,e^3 - 3\left(b^2c^2e^3x^2 + 2\,b^2c^2de^2x + b^2c^2d^2e\right)\log(F)^2 + 6\left(bce^3x\right.$$
$$b^4c^4\log(F)^4$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^3,x, algorithm="fricas")
```

```
[Out] ((b^3*c^3*e^3*x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d^3)*
log(F)^3 - 6*e^3 - 3*(b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*
log(F)^2 + 6*(b*c*e^3*x + b*c*d*e^2)*log(F))*F^(b*c*x + a*c)/(b^4*c^4*log(F
)^4)
```

Sympy [A] time = 0.298741, size = 231, normalized size = 2.1

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^3c^3d^3\log(F)^3+3b^3c^3d^2ex\log(F)^3+3b^3c^3de^2x^2\log(F)^3+b^3c^3e^3x^3\log(F)^3-3b^2c^2d^2e\log(F)^2-6b^2c^2de^2x\log(F)^2-3b^2c^2e^3x^2\log(F)^2+6bcde^2\log(\right.}{b^4c^4\log(F)^4} \\ d^3x+\frac{3d^2ex^2}{2}+de^2x^3+\frac{e^3x^4}{4} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**3,x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**3*c**3*d**3*log(F)**3 + 3*b**3*c**3*d**2*e*
x*log(F)**3 + 3*b**3*c**3*d*e**2*x**2*log(F)**3 + b**3*c**3*e**3*x**3*log(F
)**3 - 3*b**2*c**2*d**2*e*log(F)**2 - 6*b**2*c**2*d*e**2*x*log(F)**2 - 3*b*
*2*c**2*e**3*x**2*log(F)**2 + 6*b*c*d*e**2*log(F) + 6*b*c*e**3*x*log(F) - 6
*e**3)/(b**4*c**4*log(F)**4), Ne(b**4*c**4*log(F)**4, 0)), (d**3*x + 3*d**2
*e*x**2/2 + d*e**2*x**3 + e**3*x**4/4, True))
```

Giac [C] time = 6.12779, size = 6336, normalized size = 57.6

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^3,x, algorithm="giac")
```

```
[Out] ((4*(pi^3*b^3*c^3*x^3*sgn(F) - 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - pi^3
*b^3*c^3*x^3 + 3*pi*b^3*c^3*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*x^2*log(abs(F)
)*sgn(F) - 6*pi*b^2*c^2*x^2*log(abs(F)) - 6*pi*b*c*x*sgn(F) + 6*pi*b*c*x)*(
pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^
4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^
2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^
2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b
^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs
(F))^3)^2) - (pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)*(3*pi
^2*b^3*c^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*x^3*log(abs(F)) + 2*b^3*
c^3*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*x^2*sgn(F) + 3*pi^2*b^2*c^2*x^2 - 6*
b^2*c^2*x^2*log(abs(F))^2 + 12*b*c*x*log(abs(F)) - 12)/((pi^4*b^4*c^4*sgn(F
) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log
(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(
F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^
4*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*s
gn(F) + 1/2*pi*a*c) + ((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*
sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F)
)^4)*(pi^3*b^3*c^3*x^3*sgn(F) - 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - pi^
3*b^3*c^3*x^3 + 3*pi*b^3*c^3*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*x^2*log(abs(F
))*sgn(F) - 6*pi*b^2*c^2*x^2*log(abs(F)) - 6*pi*b*c*x*sgn(F) + 6*pi*b*c*x)/
((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4
+ 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*
c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log
(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(pi^3*b^4*c^4*log(abs(F))*sgn(F
) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4
*log(abs(F))^3)*(3*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*x^3
*log(abs(F)) + 2*b^3*c^3*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*x^2*sgn(F) + 3*
pi^2*b^2*c^2*x^2 - 6*b^2*c^2*x^2*log(abs(F))^2 + 12*b*c*x*log(abs(F)) - 12)
```

```
/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4
 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4
*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*lo
g(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi
*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(ab
s(F)) + 3) - 1/2*I*((8*pi^3*b^3*c^3*x^3*sgn(F) + 24*I*pi^2*b^3*c^3*x^3*log(
abs(F))*sgn(F) - 24*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*x^
3 - 24*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 24*pi*b^3*c^3*x^3*log(abs(F))^2 + 1
6*I*b^3*c^3*x^3*log(abs(F))^3 - 24*I*pi^2*b^2*c^2*x^2*sgn(F) + 48*pi*b^2*c^
2*x^2*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*x^2 - 48*pi*b^2*c^2*x^2*log(ab
s(F)) - 48*I*b^2*c^2*x^2*log(abs(F))^2 - 48*pi*b*c*x*sgn(F) + 48*pi*b*c*x +
 96*I*b*c*x*log(abs(F)) - 96*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x +
 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) + 32*I*pi^3*b^4
*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - 32*I*pi*b^
4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 - 32*I*pi^3*b^4*c^4*log(abs(F))
 + 48*pi^2*b^4*c^4*log(abs(F))^2 + 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*c
^4*log(abs(F))^4) + (8*pi^3*b^3*c^3*x^3*sgn(F) - 24*I*pi^2*b^3*c^3*x^3*log(
abs(F))*sgn(F) - 24*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*x^
3 + 24*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 24*pi*b^3*c^3*x^3*log(abs(F))^2 - 1
6*I*b^3*c^3*x^3*log(abs(F))^3 + 24*I*pi^2*b^2*c^2*x^2*sgn(F) + 48*pi*b^2*c^
2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*c^2*x^2 - 48*pi*b^2*c^2*x^2*log(ab
s(F)) + 48*I*b^2*c^2*x^2*log(abs(F))^2 - 48*pi*b*c*x*sgn(F) + 48*pi*b*c*x -
 96*I*b*c*x*log(abs(F)) + 96*I)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x
- 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) - 32*I*pi^3*b^
4*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) + 32*I*pi*b
^4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 + 32*I*pi^3*b^4*c^4*log(abs(F)
) + 48*pi^2*b^4*c^4*log(abs(F))^2 - 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*
c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 3) + 3*(((pi^2
*b^2*c^2*d*x^2*sgn(F) - pi^2*b^2*c^2*d*x^2 + 2*b^2*c^2*d*x^2*log(abs(F))^2
- 4*b*c*d*x*log(abs(F)) + 4*d)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*
b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi
*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^
2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3
*c^3*log(abs(F))^3)^2) - 2*(pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^
2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)*(pi*b^2*c^2*d*x^2*log
(abs(F))*sgn(F) - pi*b^2*c^2*d*x^2*log(abs(F)) - pi*b*c*d*x*sgn(F) + pi*b*c
*d*x)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*
c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) -
3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x
*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^3*b^3*c^3*s
gn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log
(abs(F))^2)*(pi^2*b^2*c^2*d*x^2*sgn(F) - pi^2*b^2*c^2*d*x^2 + 2*b^2*c^2*d*x
^2*log(abs(F))^2 - 4*b*c*d*x*log(abs(F)) + 4*d)/((pi^3*b^3*c^3*sgn(F) - 3*p
i*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)
^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^
3*c^3*log(abs(F))^3)^2) + 2*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)*(pi*b^2*c^2*d*x^2*log(abs(F))*s
gn(F) - pi*b^2*c^2*d*x^2*log(abs(F)) - pi*b*c*d*x*sgn(F) + pi*b*c*d*x)/((pi
^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi
*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) +
1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*
log(abs(F)) + 2) + 1/2*I*((12*I*pi^2*b^2*c^2*d*x^2*sgn(F) - 24*pi*b^2*c^2*d
*x^2*log(abs(F))*sgn(F) - 12*I*pi^2*b^2*c^2*d*x^2 + 24*pi*b^2*c^2*d*x^2*log
(abs(F)) + 24*I*b^2*c^2*d*x^2*log(abs(F))^2 + 24*pi*b*c*d*x*sgn(F) - 24*pi*
b*c*d*x - 48*I*b*c*d*x*log(abs(F)) + 48*I*d)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2
*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*I*pi^3*b^3*c^3*sgn(F)
 + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F
) + 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*log(ab
```

```
s(F))^2 + 8*b^3*c^3*log(abs(F))^3) - (12*I*pi^2*b^2*c^2*d*x^2*sgn(F) + 24*p
i*b^2*c^2*d*x^2*log(abs(F))*sgn(F) - 12*I*pi^2*b^2*c^2*d*x^2 - 24*pi*b^2*c^
2*d*x^2*log(abs(F)) + 24*I*b^2*c^2*d*x^2*log(abs(F))^2 - 24*pi*b*c*d*x*sgn(
F) + 24*pi*b*c*d*x - 48*I*b*c*d*x*log(abs(F)) + 48*I*d)*e^(-1/2*I*pi*b*c*x*
sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3
*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(
F))^2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3
*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*l
og(abs(F)) + 2) + 3*(2*((pi*b*c*d^2*x*sgn(F) - pi*b*c*d^2*x)*(pi*b^2*c^2*lo
g(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2
*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b
^2*c^2*log(abs(F)))^2) + (pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*lo
g(abs(F))^2)*(b*c*d^2*x*log(abs(F)) - d^2)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2
*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b
^2*c^2*log(abs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*
c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*l
og(abs(F))^2)*(pi*b*c*d^2*x*sgn(F) - pi*b*c*d^2*x)/((pi^2*b^2*c^2*sgn(F) -
pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F
) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*
c^2*log(abs(F)))*(b*c*d^2*x*log(abs(F)) - d^2)/((pi^2*b^2*c^2*sgn(F) - pi^2
*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) -
pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*p
i*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) - 1
/2*I*((6*pi*b*c*d^2*x*sgn(F) - 6*pi*b*c*d^2*x - 12*I*b*c*d^2*x*log(abs(F))
+ 12*I*d^2)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F)
 - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F))*sgn(F)
 - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2) +
 (6*pi*b*c*d^2*x*sgn(F) - 6*pi*b*c*d^2*x + 12*I*b*c*d^2*x*log(abs(F)) - 12*
I*d^2)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1
/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2
*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b
*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d^3*cos(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^
2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d^
3*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)
/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(b*c*x*log(abs(F
)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^3*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi
*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c +
2*b*c*log(abs(F))) + 2*I*d^3*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1
/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*b*c + 2*b*c*log
(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.4 $\int F^{c(a+bx)}(d+ex)^2\,dx$

Optimal. Leaf size=79

$$-\frac{2e(d+ex)F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{(d+ex)^2F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (2*e^2*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (2*e*F^(c*(a + b*x))*(d + e*x)
)/(b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^2)/(b*c*Log[F])
```

Rubi [A] time = 0.042787, antiderivative size = 79, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2176, 2194}

$$-\frac{2e(d+ex)F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{(d+ex)^2F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^2,x]
```

```
[Out] (2*e^2*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (2*e*F^(c*(a + b*x))*(d + e*x)
)/(b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^2)/(b*c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}(d+ex)^2\,dx &= \frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}-\frac{(2e)\int F^{c(a+bx)}(d+ex)\,dx}{bc\log(F)}\\ &= -\frac{2eF^{c(a+bx)}(d+ex)}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}+\frac{\left(2e^2\right)\int F^{c(a+bx)}\,dx}{b^2c^2\log^2(F)}\\ &= \frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{2eF^{c(a+bx)}(d+ex)}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0660184, size = 56, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(b^2c^2\log^2(F)(d+ex)^2-2bce\log(F)(d+ex)+2e^2\right)}{b^3c^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^2,x]
```

```
[Out] (F^(c*(a + b*x))*(2*e^2 - 2*b*c*e*(d + e*x)*Log[F] + b^2*c^2*(d + e*x)^2*Lo
g[F]^2))/(b^3*c^3*Log[F]^3)
```

Maple [A] time = 0.007, size = 91, normalized size = 1.2

$$\frac{\left(e^2x^2b^2c^2\left(\ln\left(F\right)\right)^2+2\left(\ln\left(F\right)\right)^2b^2c^2dex+b^2c^2\left(\ln\left(F\right)\right)^2d^2-2\ln\left(F\right)bce^2x-2\ln\left(F\right)bced+2e^2\right)F^{c(bx+a)}}{b^3c^3\left(\ln\left(F\right)\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^2,x)
```

```
[Out] (e^2*x^2*b^2*c^2*ln(F)^2+2*ln(F)^2*b^2*c^2*d*e*x+b^2*c^2*ln(F)^2*d^2-2*ln(F
)*b*c*e^2*x-2*ln(F)*b*c*e*d+2*e^2)*F^(c*(b*x+a))/b^3/c^3/ln(F)^3
```

Maxima [A] time = 1.00751, size = 166, normalized size = 2.1

$$\frac{F^{bcx+ac}d^2}{bc\log\left(F\right)}+\frac{2\left(F^{ac}bcx\log\left(F\right)-F^{ac}\right)F^{bcx}de}{b^2c^2\log\left(F\right)^2}+\frac{\left(F^{ac}b^2c^2x^2\log\left(F\right)^2-2F^{ac}bcx\log\left(F\right)+2F^{ac}\right)F^{bcx}e^2}{b^3c^3\log\left(F\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^2,x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d^2/(b*c*log(F)) + 2*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d*e/(b^2*c^2*log(F)^2) + (F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)*b*c
*x*log(F) + 2*F^(a*c))*F^(b*c*x)*e^2/(b^3*c^3*log(F)^3)
```

Fricas [A] time = 1.54573, size = 186, normalized size = 2.35

$$\frac{\left(\left(b^2c^2e^2x^2+2b^2c^2dex+b^2c^2d^2\right)\log\left(F\right)^2+2e^2-2\left(bce^2x+bcde\right)\log\left(F\right)\right)F^{bcx+ac}}{b^3c^3\log\left(F\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^2,x, algorithm="fricas")
```

```
[Out] ((b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b^2*c^2*d^2)*log(F)^2 + 2*e^2 - 2*(b*
c*e^2*x + b*c*d*e)*log(F))*F^(b*c*x + a*c)/(b^3*c^3*log(F)^3)
```

Sympy [A] time = 0.235673, size = 133, normalized size = 1.68

$$\begin{cases}\frac{F^{c(a+bx)}\left(b^2c^2d^2\log\left(F\right)^2+2b^2c^2dex\log\left(F\right)^2+b^2c^2e^2x^2\log\left(F\right)^2-2bcde\log\left(F\right)-2bce^2x\log\left(F\right)+2e^2\right)}{b^3c^3\log\left(F\right)^3} & \text{for } b^3c^3\log\left(F\right)^3\neq 0\\ d^2x+dex^2+\frac{e^2x^3}{3} & \text{otherwise}\end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**2,x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**2*c**2*d**2*log(F)**2 + 2*b**2*c**2*d*e*x*l
og(F)**2 + b**2*c**2*e**2*x**2*log(F)**2 - 2*b*c*d*e*log(F) - 2*b*c*e**2*x*
log(F) + 2*e**2)/(b**3*c**3*log(F)**3), Ne(b**3*c**3*log(F)**3, 0)), (d**2*
x + d*e*x**2 + e**2*x**3/3, True))
```

Giac [C] time = 1.82994, size = 3367, normalized size = 42.62

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^2,x, algorithm="giac")
```

```
[Out] (((3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c
^3*log(abs(F))^3)*(pi^2*b^2*c^2*x^2*sgn(F) - pi^2*b^2*c^2*x^2 + 2*b^2*c^2*x
^2*log(abs(F))^2 - 4*b*c*x*log(abs(F)) + 4)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^
3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 +
 (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^
3*log(abs(F))^3)^2) - 2*(pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*s
gn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)*(pi*b^2*c^2*x^2*log(abs(
F))*sgn(F) - pi*b^2*c^2*x^2*log(abs(F)) - pi*b*c*x*sgn(F) + pi*b*c*x)/((pi^
3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*
b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*
c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1
/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^3*b^3*c^3*sgn(F) - 3*p
i*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)
*(pi^2*b^2*c^2*x^2*sgn(F) - pi^2*b^2*c^2*x^2 + 2*b^2*c^2*x^2*log(abs(F))^2
- 4*b*c*x*log(abs(F)) + 4)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))
^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*
log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^
2) + 2*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*
b^3*c^3*log(abs(F))^3)*(pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*x^2*
log(abs(F)) - pi*b*c*x*sgn(F) + pi*b*c*x)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*
c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (
3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*
log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn
(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 2) + 1/2*I*((4*
I*pi^2*b^2*c^2*x^2*sgn(F) - 8*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*
b^2*c^2*x^2 + 8*pi*b^2*c^2*x^2*log(abs(F)) + 8*I*b^2*c^2*x^2*log(abs(F))^2
+ 8*pi*b*c*x*sgn(F) - 8*pi*b*c*x - 16*I*b*c*x*log(abs(F)) + 16*I)*e^(1/2*I*
pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*
I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^
3*log(abs(F))^2*sgn(F) + 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 1
2*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3) - (4*I*pi^2*b^2*c^2
*x^2*sgn(F) + 8*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*x^2 -
8*pi*b^2*c^2*x^2*log(abs(F)) + 8*I*b^2*c^2*x^2*log(abs(F))^2 - 8*pi*b*c*x*s
gn(F) + 8*pi*b*c*x - 16*I*b*c*x*log(abs(F)) + 16*I)*e^(-1/2*I*pi*b*c*x*sgn(
F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3*c^3
*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(F))^
2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3*c^3
*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*log(a
bs(F)) + 2) + 2*(2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F))
)*(pi*b*c*d*x*sgn(F) - pi*b*c*d*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2
```

```
*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*l
og(abs(F)))^2) + (pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F)
)^2)*(b*c*d*x*log(abs(F)) - d)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2
*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(a
bs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1
/2*pi*a*c) + ((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2
)*(pi*b*c*d*x*sgn(F) - pi*b*c*d*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2
*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*l
og(abs(F)))^2) - 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))
*(b*c*d*x*log(abs(F)) - d)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2
*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F
)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*p
i*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) - 1/2*I*((4*pi*b*c*d*x*
sgn(F) - 4*pi*b*c*d*x - 8*I*b*c*d*x*log(abs(F)) + 8*I*d)*e^(1/2*I*pi*b*c*x*
sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c
^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2
*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2) + (4*pi*b*c*d*x*sgn(F) - 4*pi*b
*c*d*x + 8*I*b*c*d*x*log(abs(F)) - 8*I*d)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I
*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*
I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F
)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1)
+ 2*(2*b*c*d^2*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F)
+ 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*
c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d^2*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*
x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(
F) - pi*b*c)^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^2*
e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*
a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c + 2*b*c*log(abs(F))) + 2*I*d^2*e^(-1/2*I*p
i*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*p
i*b*c*sgn(F) + I*pi*b*c + 2*b*c*log(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*lo
g(abs(F)))
```

3.5 $\int F^{c(a+bx)}(d+ex)\,dx$

Optimal. Leaf size=48

$$\frac{(d+ex)F^{c(a+bx)}}{bc\log(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}$$

```
[Out] -((e*F^(c*(a + b*x)))/(b^2*c^2*Log[F]^2)) + (F^(c*(a + b*x))*(d + e*x))/(b*
c*Log[F])
```

Rubi [A] time = 0.0166666, antiderivative size = 48, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2176, 2194}

$$\frac{(d+ex)F^{c(a+bx)}}{bc\log(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x),x]
```

```
[Out] -((e*F^(c*(a + b*x)))/(b^2*c^2*Log[F]^2)) + (F^(c*(a + b*x))*(d + e*x))/(b*
c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}(d+ex)\,dx&=\frac{F^{c(a+bx)}(d+ex)}{bc\log(F)}-\frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)}\\&=-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0374469, size = 34, normalized size = 0.71

$$\frac{F^{c(a+bx)}(bc\log(F)(d+ex)-e)}{b^2c^2\log^2(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x),x]
```

```
[Out] (F^(c*(a + b*x))*(-e + b*c*(d + e*x)*Log[F]))/(b^2*c^2*Log[F]^2)
```

Maple [A] time = 0.003, size = 38, normalized size = 0.8

$$\frac{(\ln(F)\,bcex + \ln(F)\,bcd - e)\,F^{c(bx+a)}}{b^2c^2\,(\ln(F))^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d),x)
```

```
[Out] (ln(F)*b*c*e*x+ln(F)*b*c*d-e)*F^(c*(b*x+a))/b^2/c^2/ln(F)^2
```

Maxima [A] time = 0.975917, size = 81, normalized size = 1.69

$$\frac{F^{bcx+ac}d}{bc\log(F)} + \frac{(F^{ac}bcx\log(F) - F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d/(b*c*log(F)) + (F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*c*x)
*e/(b^2*c^2*log(F)^2)
```

Fricas [A] time = 1.49956, size = 90, normalized size = 1.88

$$\frac{((bcex + bcd)\log(F) - e)F^{bcx+ac}}{b^2c^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="fricas")
```

```
[Out] ((b*c*e*x + b*c*d)*log(F) - e)*F^(b*c*x + a*c)/(b^2*c^2*log(F)^2)
```

Sympy [A] time = 0.234251, size = 60, normalized size = 1.25

$$\begin{cases} \frac{F^{c(a+bx)}(bcd\log(F)+bcex\log(F)-e)}{b^2c^2\log(F)^2} & \text{for } b^2c^2\log(F)^2 \neq 0 \\ dx + \frac{ex^2}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d),x)
```

```
[Out] Piecewise(((F**(c*(a + b*x))*(b*c*d*log(F) + b*c*e*x*log(F) - e)/(b**2*c**2*
log(F)**2), Ne(b**2*c**2*log(F)**2, 0)), (d*x + e*x**2/2, True))
```

Giac [C] time = 7.06795, size = 1462, normalized size = 30.46

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(pi*b*c*x*sgn(
F) - pi*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))
^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi
^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(b*c*x*log(abs(
F)) - 1)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*p
i*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(pi*b*c*x*sgn(F) - p
i*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2
*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(b*c*x*log(abs(F)) - 1)/(
(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^
2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F))
 + a*c*log(abs(F)) + 1) - 1/2*I*((2*pi*b*c*x*sgn(F) - 2*pi*b*c*x - 4*I*b*c*
x*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a
*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F
))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs
(F))^2) + (2*pi*b*c*x*sgn(F) - 2*pi*b*c*x + 4*I*b*c*x*log(abs(F)) - 4*I)*e^
(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a
*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2
*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*
pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^2*log(abs(F
))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d*sin(-1/2*pi
*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)/(4*b^2*c^2*l
og(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(b*c*x*log(abs(F)) + a*c*log(
abs(F))) - 1/2*I*(-2*I*d*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*
pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c + 2*b*c*log(abs(F
))) + 2*I*d*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F
) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*b*c + 2*b*c*log(abs(F))))*e^(b*c
*x*log(abs(F)) + a*c*log(abs(F)))
```

3.6 $\int F^{c(a+bx)}\,dx$

Optimal. Leaf size=20

$$\frac{F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] F^(c*(a + b*x))/(b*c*Log[F])
```

Rubi [A] time = 0.0036889, antiderivative size = 20, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2194}

$$\frac{F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x)),x]
```

```
[Out] F^(c*(a + b*x))/(b*c*Log[F])
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{c(a+bx)}\,dx=\frac{F^{c(a+bx)}}{bc\log(F)}$$

Mathematica [A] time = 0.0048603, size = 21, normalized size = 1.05

$$\frac{F^{ac+bcx}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x)),x]
```

```
[Out] F^(a*c + b*c*x)/(b*c*Log[F])
```

Maple [A] time = 0.001, size = 21, normalized size = 1.1

$$\frac{F^{c(bx+a)}}{bc\ln(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a)),x)
```

```
[Out] F^(c*(b*x+a))/b/c/ln(F)
```

Maxima [A] time = 0.944983, size = 27, normalized size = 1.35

$$\frac{F^{(bx+a)c}}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a)),x, algorithm="maxima")
```

```
[Out] F^((b*x + a)*c)/(b*c*log(F))
```

Fricas [A] time = 1.51071, size = 41, normalized size = 2.05

$$\frac{F^{bcx+ac}}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a)),x, algorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)/(b*c*log(F))
```

Sympy [A] time = 0.108263, size = 20, normalized size = 1.

$$\begin{cases} \frac{F^{c(a+bx)}}{bc\log(F)} & \text{for}\ bc\log(F) \neq 0 \\ x & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a)),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))/(b*c*log(F)), Ne(b*c*log(F), 0)), (x, True))
```

Giac [A] time = 3.58521, size = 27, normalized size = 1.35

$$\frac{F^{(bx+a)c}}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a)),x, algorithm="giac")
```

```
[Out] F^((b*x + a)*c)/(b*c*log(F))
```

3.7 $\int \frac{F^{c(a+bx)}}{d+ex} dx$

Optimal. Leaf size=31

$$\frac{F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e}$$

```
[Out] (F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e])/e
```

Rubi [A] time = 0.0238996, antiderivative size = 31, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2178}

$$\frac{F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x),x]
```

```
[Out] (F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e])/e
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{d+ex}\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e}$$

Mathematica [A] time = 0.0407943, size = 31, normalized size = 1.

$$\frac{F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x),x]
```

```
[Out] (F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e])/e
```

Maple [A] time = 0.033, size = 56, normalized size = 1.8

$$-\frac{1}{e}F^{\frac{c(ae-bd)}{e}}\text{Ei}\left(1,-bcx\ln(F)-ac\ln(F)-\frac{-\ln(F)\,ace+\ln(F)\,bcd}{e}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d),x)
```

```
[Out] -1/e*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*a*c*e+ln(F)*b*c*
d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{ex+d}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d), x)
```

Fricas [A] time = 1.54641, size = 78, normalized size = 2.52

$$\frac{\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)}{F^{\frac{bcd-ace}{e}}e}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d),x, algorithm="fricas")
```

```
[Out] Ei((b*c*e*x + b*c*d)*log(F)/e)/(F^((b*c*d - a*c*e)/e)*e)
```

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

$$\int \frac{F^{c(a+bx)}}{d+ex}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d),x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x), x)
```

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

$$\int \frac{F^{(bx+a)c}}{ex+d}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d), x)
```

3.8 $\int \frac{F^{c(a+bx)}}{(d+ex)^2} dx$

Optimal. Leaf size=57

$$\frac{bc\log(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e^2}-\frac{F^{c(a+bx)}}{e(d+ex)}$$

```
[Out] -(F^(c*(a + b*x))/(e*(d + e*x))) + (b*c*F^(c*(a - (b*d)/e))*ExpIntegralEi[(
b*c*(d + e*x)*Log[F])/e]*Log[F])/e^2
```

Rubi [A] time = 0.043363, antiderivative size = 57, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2177, 2178}

$$\frac{bc\log(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e^2}-\frac{F^{c(a+bx)}}{e(d+ex)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^2,x]
```

```
[Out] -(F^(c*(a + b*x))/(e*(d + e*x))) + (b*c*F^(c*(a - (b*d)/e))*ExpIntegralEi[(
b*c*(d + e*x)*Log[F])/e]*Log[F])/e^2
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{F^{c(a+bx)}}{(d+ex)^2} dx &= -\frac{F^{c(a+bx)}}{e(d+ex)}+\frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{d+ex} dx}{e}\\ &= -\frac{F^{c(a+bx)}}{e(d+ex)}+\frac{bcF^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log(F)}{e^2}\end{aligned}$$

Mathematica [A] time = 0.118915, size = 55, normalized size = 0.96

$$\frac{F^{ac}\left(bc\log(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)-\frac{eF^{bcx}}{d+ex}\right)}{e^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^2,x]
```

```
[Out] (F^(a*c)*(-((e*F^(b*c*x))/(d + e*x)) + (b*c*ExpIntegralEi[(b*c*(d + e*x)*Lo
g[F])/e]*Log[F])/F^((b*c*d)/e)))/e^2
```

Maple [A] time = 0.038, size = 99, normalized size = 1.7

$$-\frac{bc\ln(F)F^{bcx}F^{ac}}{e^2}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-1}-\frac{bc\ln(F)}{e^2}F^{\frac{c(ae-bd)}{e}}\mathrm{Ei}\left(1,-bcx\ln(F)-ac\ln(F)-\frac{-\ln(F)ace+\ln(F)bcd}{e}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^2,x)
```

```
[Out] -b*c*ln(F)/e^2*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-b*c*ln(F)/e^
2*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*a*c*e+ln(F)*b*c*d)/
e)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^2,x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^2, x)
```

Fricas [A] time = 1.53936, size = 159, normalized size = 2.79

$$-\frac{F^{bcx+ac}e-\frac{(bcex+bcd)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}}{e^3x+de^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^2,x, algorithm="fricas")
```

```
[Out] -(F^(b*c*x + a*c)*e - (b*c*e*x + b*c*d)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(
F)/F^((b*c*d - a*c*e)/e))/(e^3*x + d*e^2)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**2,x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**2, x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^2,x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^2, x)
```

3.9 $\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx$

Optimal. Leaf size=95

$$\frac{b^2c^2\log^2(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{2e^3}-\frac{bc\log(F)F^{c(a+bx)}}{2e^2(d+ex)}-\frac{F^{c(a+bx)}}{2e(d+ex)^2}$$

```
[Out] -F^(c*(a + b*x))/(2*e*(d + e*x)^2) - (b*c*F^(c*(a + b*x))*Log[F])/(2*e^2*(d
 + e*x)) + (b^2*c^2*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F]
)/e]*Log[F]^2)/(2*e^3)
```

Rubi [A] time = 0.0707388, antiderivative size = 95, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2177, 2178}

$$\frac{b^2c^2\log^2(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{2e^3}-\frac{bc\log(F)F^{c(a+bx)}}{2e^2(d+ex)}-\frac{F^{c(a+bx)}}{2e(d+ex)^2}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^3,x]
```

```
[Out] -F^(c*(a + b*x))/(2*e*(d + e*x)^2) - (b*c*F^(c*(a + b*x))*Log[F])/(2*e^2*(d
 + e*x)) + (b^2*c^2*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F]
)/e]*Log[F]^2)/(2*e^3)
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx &= -\frac{F^{c(a+bx)}}{2e(d+ex)^2}+\frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx}{2e}\\ &= -\frac{F^{c(a+bx)}}{2e(d+ex)^2}-\frac{bcF^{c(a+bx)}\log(F)}{2e^2(d+ex)}+\frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{d+ex}\,dx}{2e^2}\\ &= -\frac{F^{c(a+bx)}}{2e(d+ex)^2}-\frac{bcF^{c(a+bx)}\log(F)}{2e^2(d+ex)}+\frac{b^2c^2F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^2(F)}{2e^3}\end{aligned}$$

Mathematica [A] time = 0.157105, size = 88, normalized size = 0.93

$$\frac{F^{c\left(a-\frac{bd}{e}\right)}\left(b^2c^2\log^2(F)(d+ex)^2\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)-eF^{\frac{bc(d+ex)}{e}}(bc\log(F)(d+ex)+e)\right)}{2e^3(d+ex)^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^3,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(b^2*c^2*(d + e*x)^2*ExpIntegralEi[(b*c*(d + e*x)*Log[
F])/e]*Log[F]^2 - e*F^((b*c*(d + e*x))/e)*(e + b*c*(d + e*x)*Log[F])))/(2*e
^3*(d + e*x)^2)
```

Maple [A] time = 0.04, size = 155, normalized size = 1.6

$$-\frac{b^2c^2(\ln(F))^2F^{bcx}F^{ac}}{2e^3}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-2}-\frac{b^2c^2(\ln(F))^2F^{bcx}F^{ac}}{2e^3}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-1}-\frac{b^2c^2(\ln(F))^2}{2e^3}F$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^3,x)
```

```
[Out] -1/2*b^2*c^2*ln(F)^2/e^3*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-
1/2*b^2*c^2*ln(F)^2/e^3*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/2
*b^2*c^2*ln(F)^2/e^3*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*
a*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^3,x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^3, x)
```

Fricas [A] time = 1.50316, size = 278, normalized size = 2.93

$$\frac{\frac{\left(b^2c^2e^2x^2+2\,b^2c^2dex+b^2c^2d^2\right)\text{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^2}{F^{\frac{bcd-ace}{e}}}-\left(e^2+\left(bce^2x+bcde\right)\log(F)\right)F^{bcx+ac}}{2\left(e^5x^2+2\,de^4x+d^2e^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^3,x, algorithm="fricas")
```

```
[Out] 1/2*((b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b^2*c^2*d^2)*Ei((b*c*e*x + b*c*d)
*log(F)/e)*log(F)^2/F^((b*c*d - a*c*e)/e) - (e^2 + (b*c*e^2*x + b*c*d*e)*lo
```

```
g(F))*F^(b*c*x + a*c))/(e^5*x^2 + 2*d*e^4*x + d^2*e^3)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**3,x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**3, x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^3,x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^3, x)
```

3.10 $\int \frac{F^{c(a+bx)}}{(d+ex)^4} dx$

Optimal. Leaf size=128

$$\frac{b^3c^3\log^3(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{6e^4}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{6e^3(d+ex)}-\frac{bc\log(F)F^{c(a+bx)}}{6e^2(d+ex)^2}-\frac{F^{c(a+bx)}}{3e(d+ex)^3}$$

```
[Out] -F^(c*(a + b*x))/(3*e*(d + e*x)^3) - (b*c*F^(c*(a + b*x))*Log[F])/(6*e^2*(d
 + e*x)^2) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(6*e^3*(d + e*x)) + (b^3*c^
3*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/(6*
e^4)
```

Rubi [A] time = 0.100237, antiderivative size = 128, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2177, 2178}

$$\frac{b^3c^3\log^3(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{6e^4}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{6e^3(d+ex)}-\frac{bc\log(F)F^{c(a+bx)}}{6e^2(d+ex)^2}-\frac{F^{c(a+bx)}}{3e(d+ex)^3}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^4,x]
```

```
[Out] -F^(c*(a + b*x))/(3*e*(d + e*x)^3) - (b*c*F^(c*(a + b*x))*Log[F])/(6*e^2*(d
 + e*x)^2) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(6*e^3*(d + e*x)) + (b^3*c^
3*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/(6*
e^4)
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^4}dx = -\frac{F^{c(a+bx)}}{3e(d+ex)^3} + \frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^3}dx}{3e}$$
$$= -\frac{F^{c(a+bx)}}{3e(d+ex)^3} - \frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2} + \frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^2}dx}{6e^2}$$
$$= -\frac{F^{c(a+bx)}}{3e(d+ex)^3} - \frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{6e^3(d+ex)} + \frac{\left(b^3c^3\log^3(F)\right)\int \frac{F^{c(a+bx)}}{d+ex}dx}{6e^3}$$
$$= -\frac{F^{c(a+bx)}}{3e(d+ex)^3} - \frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{6e^3(d+ex)} + \frac{b^3c^3F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^3(F)}{6e^4}$$

Mathematica [A] time = 0.201428, size = 99, normalized size = 0.77

$$\frac{F^{ac}\left(b^3c^3\log^3(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right) - \frac{eF^{bcx}\left(b^2c^2\log^2(F)(d+ex)^2+bce\log(F)(d+ex)+2e^2\right)}{(d+ex)^3}\right)}{6e^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^4,x]
```

```
[Out] (F^(a*c)*((b^3*c^3*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/F^((b*
c*d)/e) - (e*F^(b*c*x)*(2*e^2 + b*c*e*(d + e*x)*Log[F] + b^2*c^2*(d + e*x)^
2*Log[F]^2))/(d + e*x)^3))/(6*e^4)
```

Maple [A] time = 0.049, size = 199, normalized size = 1.6

$$-\frac{b^3c^3(\ln(F))^3F^{bcx}F^{ac}}{3e^4}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-3} - \frac{b^3c^3(\ln(F))^3F^{bcx}F^{ac}}{6e^4}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-2} - \frac{b^3c^3(\ln(F))^3F^{bcx}F}{6e^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^4,x)
```

```
[Out] -1/3*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^3-
1/6*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-1
/6*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/6*
b^3*c^3*ln(F)^3/e^4*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*a
*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^4}dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^4,x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^4, x)
```

Fricas [A] time = 1.52107, size = 425, normalized size = 3.32

$$\frac{\frac{\left(b^3c^3e^3x^3+3\,b^3c^3de^2x^2+3\,b^3c^3d^2ex+b^3c^3d^3\right){\rm Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^3}{F^{\frac{bcd-ace}{e}}} - \left(2\,e^3 + \left(b^2c^2e^3x^2 + 2\,b^2c^2de^2x + b^2c^2d^2e\right)\log\left(F\right)^2 + \left(bce^3x + \right.\right.}{6\left(e^7x^3 + 3\,de^6x^2 + 3\,d^2e^5x + d^3e^4\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^4,x, algorithm="fricas")
```

```
[Out] 1/6*((b^3*c^3*e^3*x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d
^3)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(F)^3/F^((b*c*d - a*c*e)/e) - (2*e^3
+ (b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*log(F)^2 + (b*c*e^3
*x + b*c*d*e^2)*log(F))*F^(b*c*x + a*c))/(e^7*x^3 + 3*d*e^6*x^2 + 3*d^2*e^5
*x + d^3*e^4)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^4}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**4,x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**4, x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^4}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^4,x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^4, x)
```

3.11 $\int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx$

Optimal. Leaf size=161

$$\frac{b^4c^4\log^4(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{24e^5}-\frac{b^3c^3\log^3(F)F^{c(a+bx)}}{24e^4(d+ex)}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{24e^3(d+ex)^2}-\frac{bc\log(F)F^{c(a+bx)}}{12e^2(d+ex)^3}-\frac{F^{c(a+bx)}}{4e(d+ex)^4}$$

```
[Out] -F^(c*(a + b*x))/(4*e*(d + e*x)^4) - (b*c*F^(c*(a + b*x))*Log[F])/(12*e^2*(
d + e*x)^3) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(24*e^3*(d + e*x)^2) - (b^
3*c^3*F^(c*(a + b*x))*Log[F]^3)/(24*e^4*(d + e*x)) + (b^4*c^4*F^(c*(a - (b*
d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/(24*e^5)
```

Rubi [A] time = 0.134198, antiderivative size = 161, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2177, 2178}

$$\frac{b^4c^4\log^4(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{24e^5}-\frac{b^3c^3\log^3(F)F^{c(a+bx)}}{24e^4(d+ex)}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{24e^3(d+ex)^2}-\frac{bc\log(F)F^{c(a+bx)}}{12e^2(d+ex)^3}-\frac{F^{c(a+bx)}}{4e(d+ex)^4}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^5,x]
```

```
[Out] -F^(c*(a + b*x))/(4*e*(d + e*x)^4) - (b*c*F^(c*(a + b*x))*Log[F])/(12*e^2*(
d + e*x)^3) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(24*e^3*(d + e*x)^2) - (b^
3*c^3*F^(c*(a + b*x))*Log[F]^3)/(24*e^4*(d + e*x)) + (b^4*c^4*F^(c*(a - (b*
d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/(24*e^5)
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx = -\frac{F^{c(a+bx)}}{4e(d+ex)^4} + \frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^4}\,dx}{4e}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} + \frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx}{12e^2}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} + \frac{\left(b^3c^3\log^3(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx}{24e^3}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} - \frac{b^3c^3F^{c(a+bx)}\log^3(F)}{24e^4(d+ex)} + \frac{\left(b^4c^4\log^4(F)\right)\int \frac{F^{c}}{d}}{24e^4}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} - \frac{b^3c^3F^{c(a+bx)}\log^3(F)}{24e^4(d+ex)} + \frac{b^4c^4F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(}{}\right.}{24}$$

Mathematica [A] time = 0.171768, size = 121, normalized size = 0.75

$$\frac{F^{ac}\left(b^4c^4\log^4(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right) - \frac{eF^{bcx}\left(b^2c^2e\log^2(F)(d+ex)^2+b^3c^3\log^3(F)(d+ex)^3+2bce^2\log(F)(d+ex)+6e^3\right)}{(d+ex)^4}\right)}{24e^5}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^5,x]
```

```
[Out] (F^(a*c)*((b^4*c^4*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/F^((b*
c*d)/e) - (e*F^(b*c*x)*(6*e^3 + 2*b*c*e^2*(d + e*x)*Log[F] + b^2*c^2*e*(d +
 e*x)^2*Log[F]^2 + b^3*c^3*(d + e*x)^3*Log[F]^3))/(d + e*x)^4))/(24*e^5)
```

Maple [A] time = 0.056, size = 243, normalized size = 1.5

$$-\frac{b^4c^4(\ln(F))^4F^{bcx}F^{ac}}{4e^5}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-4} - \frac{b^4c^4(\ln(F))^4F^{bcx}F^{ac}}{12e^5}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-3} - \frac{b^4c^4(\ln(F))^4F}{24e^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^5,x)
```

```
[Out] -1/4*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^4-
1/12*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^3-
1/24*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-
1/24*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/
24*b^4*c^4*ln(F)^4/e^5*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F
)*a*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^5,x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^5, x)
```

Fricas [A] time = 1.56745, size = 606, normalized size = 3.76

$$\frac{\frac{\left(b^4c^4e^4x^4+4\,b^4c^4de^3x^3+6\,b^4c^4d^2e^2x^2+4\,b^4c^4d^3ex+b^4c^4d^4\right)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^4}{F^{\frac{bcd-ace}{e}}} - \left(6\,e^4 + \left(b^3c^3e^4x^3 + 3\,b^3c^3de^3x^2 + 3\,b^3c^3d^2e^2x + b^3c^3d \right.\right.}{24\left(e^9x^4 + 4\,de^8x^3 + 6\,d^2e^7x^2 + 4\,d^3e^6 \right.}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^5,x, algorithm="fricas")
```

```
[Out] 1/24*((b^4*c^4*e^4*x^4 + 4*b^4*c^4*d*e^3*x^3 + 6*b^4*c^4*d^2*e^2*x^2 + 4*b^
4*c^4*d^3*e*x + b^4*c^4*d^4)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(F)^4/F^((b*
c*d - a*c*e)/e) - (6*e^4 + (b^3*c^3*e^4*x^3 + 3*b^3*c^3*d*e^3*x^2 + 3*b^3*c
^3*d^2*e^2*x + b^3*c^3*d^3*e)*log(F)^3 + (b^2*c^2*e^4*x^2 + 2*b^2*c^2*d*e^3
*x + b^2*c^2*d^2*e^2)*log(F)^2 + 2*(b*c*e^4*x + b*c*d*e^3)*log(F))*F^(b*c*x
 + a*c))/(e^9*x^4 + 4*d*e^8*x^3 + 6*d^2*e^7*x^2 + 4*d^3*e^6*x + d^4*e^5)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**5,x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^5,x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^5, x)
```

3.12 $\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)dx$

Optimal. Leaf size=141

$$\frac{12e^2(d+ex)^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{24e^3(d+ex)F^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4e(d+ex)^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}+\frac{(d+ex)^4F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (24*e^4*F^(c*(a + b*x)))/(b^5*c^5*Log[F]^5) - (24*e^3*F^(c*(a + b*x))*(d +
e*x))/(b^4*c^4*Log[F]^4) + (12*e^2*F^(c*(a + b*x))*(d + e*x)^2)/(b^3*c^3*Lo
g[F]^3) - (4*e*F^(c*(a + b*x))*(d + e*x)^3)/(b^2*c^2*Log[F]^2) + (F^(c*(a +
 b*x))*(d + e*x)^4)/(b*c*Log[F])
```

Rubi [A] time = 0.122031, antiderivative size = 141, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 48, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.062, Rules used = {2187, 2176, 2194}

$$\frac{12e^2(d+ex)^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{24e^3(d+ex)F^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4e(d+ex)^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}+\frac{(d+ex)^4F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 + e^4*x^
4),x]
```


```
[Out] (24*e^4*F^(c*(a + b*x)))/(b^5*c^5*Log[F]^5) - (24*e^3*F^(c*(a + b*x))*(d +
e*x))/(b^4*c^4*Log[F]^4) + (12*e^2*F^(c*(a + b*x))*(d + e*x)^2)/(b^3*c^3*Lo
g[F]^3) - (4*e*F^(c*(a + b*x))*(d + e*x)^3)/(b^2*c^2*Log[F]^2) + (F^(c*(a +
 b*x))*(d + e*x)^4)/(b*c*Log[F])
```


Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] &&  !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)dx=\int F^{c(a+bx)}(d+ex)^4\,dx$$
$$=\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}-\frac{(4e)\int F^{c(a+bx)}(d+ex)^3\,dx}{bc\log(F)}$$
$$=-\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}+\frac{\left(12e^2\right)\int F^{c(a+bx)}(d+}{b^2c^2\log^2(F)}$$
$$=\frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4eF^{c(a+bx)}(d+ex)^3}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^4}{bc\log(F)}-$$
$$=-\frac{24e^3F^{c(a+bx)}(d+ex)}{b^4c^4\log^4(F)}+\frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4eF^{c(a+bx)}(d+e}{b^2c^2\log^2(F)}$$
$$=\frac{24e^4F^{c(a+bx)}}{b^5c^5\log^5(F)}-\frac{24e^3F^{c(a+bx)}(d+ex)}{b^4c^4\log^4(F)}+\frac{12e^2F^{c(a+bx)}(d+ex)^2}{b^3c^3\log^3(F)}-\frac{4e}{}$$

Mathematica [A] time = 0.0651696, size = 100, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(12b^2c^2e^2\log^2(F)(d+ex)^2-4b^3c^3e\log^3(F)(d+ex)^3+b^4c^4\log^4(F)(d+ex)^4-24bce^3\log(F)(d+ex)+24e^4\right)}{b^5c^5\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 + 
e^4*x^4),x]
```

```
[Out] (F^(c*(a + b*x))*(24*e^4 - 24*b*c*e^3*(d + e*x)*Log[F] + 12*b^2*c^2*e^2*(d
+ e*x)^2*Log[F]^2 - 4*b^3*c^3*e*(d + e*x)^3*Log[F]^3 + b^4*c^4*(d + e*x)^4*
Log[F]^4))/(b^5*c^5*Log[F]^5)
```

Maple [A] time = 0.007, size = 260, normalized size = 1.8

$$\frac{\left(e^4x^4b^4c^4(\ln(F))^4+4(\ln(F))^4b^4c^4de^3x^3+6(\ln(F))^4b^4c^4d^2e^2x^2+4(\ln(F))^4b^4c^4d^3ex+(\ln(F))^4b^4c^4d^4-4(\ln(F))^3b\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x)
```

```
[Out] (e^4*x^4*b^4*c^4*ln(F)^4+4*ln(F)^4*b^4*c^4*d*e^3*x^3+6*ln(F)^4*b^4*c^4*d^2*
e^2*x^2+4*ln(F)^4*b^4*c^4*d^3*e*x+ln(F)^4*b^4*c^4*d^4-4*ln(F)^3*b^3*c^3*e^4
*x^3-12*ln(F)^3*b^3*c^3*d*e^3*x^2-12*ln(F)^3*b^3*c^3*d^2*e^2*x-4*ln(F)^3*b^
3*c^3*d^3*e+12*ln(F)^2*b^2*c^2*e^4*x^2+24*ln(F)^2*b^2*c^2*d*e^3*x+12*b^2*c^
2*ln(F)^2*e^2*d^2-24*ln(F)*b*c*e^4*x-24*d*e^3*b*c*ln(F)+24*e^4)*F^(c*(b*x+a
))/b^5/c^5/ln(F)^5
```

Maxima [B] time = 1.05755, size = 417, normalized size = 2.96

$$\frac{F^{bcx+ac}d^4}{bc\log(F)}+\frac{4\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}d^3e}{b^2c^2\log(F)^2}+\frac{6\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}d^2e^2}{b^3c^3\log(F)^3}+\frac{4\left(F^{ac}b^3c^3x^3\log\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d^4/(b*c*log(F)) + 4*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d^3*e/(b^2*c^2*log(F)^2) + 6*(F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)
*b*c*x*log(F) + 2*F^(a*c))*F^(b*c*x)*d^2*e^2/(b^3*c^3*log(F)^3) + 4*(F^(a*c
)*b^3*c^3*x^3*log(F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*l
og(F) - 6*F^(a*c))*F^(b*c*x)*d*e^3/(b^4*c^4*log(F)^4) + (F^(a*c)*b^4*c^4*x^
4*log(F)^4 - 4*F^(a*c)*b^3*c^3*x^3*log(F)^3 + 12*F^(a*c)*b^2*c^2*x^2*log(F)
^2 - 24*F^(a*c)*b*c*x*log(F) + 24*F^(a*c))*F^(b*c*x)*e^4/(b^5*c^5*log(F)^5)
```

Fricas [A] time = 1.51039, size = 474, normalized size = 3.36

$$\frac{\left(\left(b^4c^4e^4x^4 + 4\,b^4c^4de^3x^3 + 6\,b^4c^4d^2e^2x^2 + 4\,b^4c^4d^3ex + b^4c^4d^4\right)\log\left(F\right)^4 + 24\,e^4 - 4\left(b^3c^3e^4x^3 + 3\,b^3c^3de^3x^2 + 3\,b^3c^3d^2\right.}{b^5c^5\log\left(F\right.}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="fricas")
```

```
[Out] ((b^4*c^4*e^4*x^4 + 4*b^4*c^4*d*e^3*x^3 + 6*b^4*c^4*d^2*e^2*x^2 + 4*b^4*c^4
*d^3*e*x + b^4*c^4*d^4)*log(F)^4 + 24*e^4 - 4*(b^3*c^3*e^4*x^3 + 3*b^3*c^3*
d*e^3*x^2 + 3*b^3*c^3*d^2*e^2*x + b^3*c^3*d^3*e)*log(F)^3 + 12*(b^2*c^2*e^4
*x^2 + 2*b^2*c^2*d*e^3*x + b^2*c^2*d^2*e^2)*log(F)^2 - 24*(b*c*e^4*x + b*c*
d*e^3)*log(F))*F^(b*c*x + a*c)/(b^5*c^5*log(F)^5)
```

Sympy [A] time = 0.234603, size = 350, normalized size = 2.48

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^4c^4d^4\log\left(F\right)^4 + 4b^4c^4d^3ex\log\left(F\right)^4 + 6b^4c^4d^2e^2x^2\log\left(F\right)^4 + 4b^4c^4de^3x^3\log\left(F\right)^4 + b^4c^4e^4x^4\log\left(F\right)^4 - 4b^3c^3d^3e\log\left(F\right)^3 - 12b^3c^3d^2e^2x\log\left(F\right)^3 - 12b^3c^3\right.}{b^5c^5\log\left(F\right)^5} \\ d^4x + 2d^3ex^2 + 2d^2e^2x^3 + de^3x^4 + \frac{e^4x^5}{5} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**4*x**4+4*d*e**3*x**3+6*d**2*e**2*x**2+4*d**3*e
*x+d**4),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**4*c**4*d**4*log(F)**4 + 4*b**4*c**4*d**3*e*
x*log(F)**4 + 6*b**4*c**4*d**2*e**2*x**2*log(F)**4 + 4*b**4*c**4*d*e**3*x**
3*log(F)**4 + b**4*c**4*e**4*x**4*log(F)**4 - 4*b**3*c**3*d**3*e*log(F)**3
- 12*b**3*c**3*d**2*e**2*x*log(F)**3 - 12*b**3*c**3*d*e**3*x**2*log(F)**3 -
 4*b**3*c**3*e**4*x**3*log(F)**3 + 12*b**2*c**2*d**2*e**2*log(F)**2 + 24*b*
*2*c**2*d*e**3*x*log(F)**2 + 12*b**2*c**2*e**4*x**2*log(F)**2 - 24*b*c*d*e*
*3*log(F) - 24*b*c*e**4*x*log(F) + 24*e**4)/(b**5*c**5*log(F)**5), Ne(b**5*
c**5*log(F)**5, 0)), (d**4*x + 2*d**3*e*x**2 + 2*d**2*e**2*x**3 + d*e**3*x*
*4 + e**4*x**5/5, True))
```

Giac [C] time = 1.4932, size = 10620, normalized size = 75.32

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="giac")
```

```
[Out] -((4*(pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F) - pi*b^4*c^4*x^4*log(abs(F))^3*sg
n(F) - pi^3*b^4*c^4*x^4*log(abs(F)) + pi*b^4*c^4*x^4*log(abs(F))^3 - pi^3*b
^3*c^3*x^3*sgn(F) + 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) + pi^3*b^3*c^3*x^
3 - 3*pi*b^3*c^3*x^3*log(abs(F))^2 - 6*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) +
6*pi*b^2*c^2*x^2*log(abs(F)) + 6*pi*b*c*x*sgn(F) - 6*pi*b*c*x)*(pi^5*b^5*c^
5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^
4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(
abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5
*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F
))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) -
 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^
2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2) - (pi^4*b^4*c^4*x^4*s
gn(F) - 6*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*x^4 + 6*pi^2
*b^4*c^4*x^4*log(abs(F))^2 - 2*b^4*c^4*x^4*log(abs(F))^4 + 12*pi^2*b^3*c^3*
x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*c^3*x^3*log(abs(F)) + 8*b^3*c^3*x^3*lo
g(abs(F))^3 - 12*pi^2*b^2*c^2*x^2*sgn(F) + 12*pi^2*b^2*c^2*x^2 - 24*b^2*c^2
*x^2*log(abs(F))^2 + 48*b*c*x*log(abs(F)) - 48)*(5*pi^4*b^5*c^5*log(abs(F))
*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F))
 + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)/((pi^5*b^5*c^5*
sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*
sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(ab
s(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F
))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 -
2*b^5*c^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*
pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^4*b^4*c^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*x^
4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*x^4 + 6*pi^2*b^4*c^4*x^4*log(abs(F))^
2 - 2*b^4*c^4*x^4*log(abs(F))^4 + 12*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) -
12*pi^2*b^3*c^3*x^3*log(abs(F)) + 8*b^3*c^3*x^3*log(abs(F))^3 - 12*pi^2*b^2
*c^2*x^2*sgn(F) + 12*pi^2*b^2*c^2*x^2 - 24*b^2*c^2*x^2*log(abs(F))^2 + 48*b
*c*x*log(abs(F)) - 48)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2
*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^
5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi
^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*
b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (
5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) -
5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(
abs(F))^5)^2) + 4*(pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F) - pi*b^4*c^4*x^4*log
(abs(F))^3*sgn(F) - pi^3*b^4*c^4*x^4*log(abs(F)) + pi*b^4*c^4*x^4*log(abs(F
))^3 - pi^3*b^3*c^3*x^3*sgn(F) + 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) + pi
^3*b^3*c^3*x^3 - 3*pi*b^3*c^3*x^3*log(abs(F))^2 - 6*pi*b^2*c^2*x^2*log(abs(
F))*sgn(F) + 6*pi*b^2*c^2*x^2*log(abs(F)) + 6*pi*b*c*x*sgn(F) - 6*pi*b*c*x)
*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F)
- 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*lo
g(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) +
 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs
(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F)
 - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*p
i^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*pi*b*c*x*
sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F
)) + a*c*log(abs(F)) + 4) + 1/2*I*((-16*I*pi^4*b^4*c^4*x^4*sgn(F) + 64*pi^3
*b^4*c^4*x^4*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F
) - 64*pi*b^4*c^4*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*x^4 - 64*pi^
3*b^4*c^4*x^4*log(abs(F)) - 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2 + 64*pi*b^4
*c^4*x^4*log(abs(F))^3 + 32*I*b^4*c^4*x^4*log(abs(F))^4 - 64*pi^3*b^3*c^3*x
```

```
^3*sgn(F) - 192*I*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) + 192*pi*b^3*c^3*x^3*
log(abs(F))^2*sgn(F) + 64*pi^3*b^3*c^3*x^3 + 192*I*pi^2*b^3*c^3*x^3*log(abs
(F)) - 192*pi*b^3*c^3*x^3*log(abs(F))^2 - 128*I*b^3*c^3*x^3*log(abs(F))^3 +
 192*I*pi^2*b^2*c^2*x^2*sgn(F) - 384*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 19
2*I*pi^2*b^2*c^2*x^2 + 384*pi*b^2*c^2*x^2*log(abs(F)) + 384*I*b^2*c^2*x^2*l
og(abs(F))^2 + 384*pi*b*c*x*sgn(F) - 384*pi*b*c*x - 768*I*b*c*x*log(abs(F))
 + 768*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) -
 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(
F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))
^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*c^5 + 80*p
i^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c
^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5
) - (-16*I*pi^4*b^4*c^4*x^4*sgn(F) - 64*pi^3*b^4*c^4*x^4*log(abs(F))*sgn(F)
 + 96*I*pi^2*b^4*c^4*x^4*log(abs(F))^2*sgn(F) + 64*pi*b^4*c^4*x^4*log(abs(F
))^3*sgn(F) + 16*I*pi^4*b^4*c^4*x^4 + 64*pi^3*b^4*c^4*x^4*log(abs(F)) - 96*
I*pi^2*b^4*c^4*x^4*log(abs(F))^2 - 64*pi*b^4*c^4*x^4*log(abs(F))^3 + 32*I*b
^4*c^4*x^4*log(abs(F))^4 + 64*pi^3*b^3*c^3*x^3*sgn(F) - 192*I*pi^2*b^3*c^3*
x^3*log(abs(F))*sgn(F) - 192*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 64*pi^3*
b^3*c^3*x^3 + 192*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 192*pi*b^3*c^3*x^3*log(a
bs(F))^2 - 128*I*b^3*c^3*x^3*log(abs(F))^3 + 192*I*pi^2*b^2*c^2*x^2*sgn(F)
+ 384*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 192*I*pi^2*b^2*c^2*x^2 - 384*pi*b
^2*c^2*x^2*log(abs(F)) + 384*I*b^2*c^2*x^2*log(abs(F))^2 - 384*pi*b*c*x*sgn
(F) + 384*pi*b*c*x - 768*I*b*c*x*log(abs(F)) + 768*I)*e^(-1/2*I*pi*b*c*x*sg
n(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5
*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(a
bs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*l
og(abs(F))^4*sgn(F) + 16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160
*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^
5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c
*log(abs(F)) + 4) - 4*(((3*pi^2*b^3*c^3*d*x^3*log(abs(F))*sgn(F) - 3*pi^2*b
^3*c^3*d*x^3*log(abs(F)) + 2*b^3*c^3*d*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*d
*x^2*sgn(F) + 3*pi^2*b^2*c^2*d*x^2 - 6*b^2*c^2*d*x^2*log(abs(F))^2 + 12*b*c
*d*x*log(abs(F)) - 12*d)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^
2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(
F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b
^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi
^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*
c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*c^3*d*x^3*sgn(
F) - 3*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d*x^3 + 3*pi*b^
3*c^3*d*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*d*x^2*log(abs(F))*sgn(F) - 6*pi*b^
2*c^2*d*x^2*log(abs(F)) - 6*pi*b*c*d*x*sgn(F) + 6*pi*b*c*d*x)*(pi^3*b^4*c^4
*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(ab
s(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*lo
g(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^
4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(a
bs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*
cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) -
 ((pi^3*b^3*c^3*d*x^3*sgn(F) - 3*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - pi
^3*b^3*c^3*d*x^3 + 3*pi*b^3*c^3*d*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*d*x^2*lo
g(abs(F))*sgn(F) - 6*pi*b^2*c^2*d*x^2*log(abs(F)) - 6*pi*b*c*d*x*sgn(F) + 6
*pi*b*c*d*x)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)/((pi^
4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*p
i^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*l
og(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(
F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(3*pi^2*b^3*c^3*d*x^3*log(abs(F))*sg
n(F) - 3*pi^2*b^3*c^3*d*x^3*log(abs(F)) + 2*b^3*c^3*d*x^3*log(abs(F))^3 - 3
*pi^2*b^2*c^2*d*x^2*sgn(F) + 3*pi^2*b^2*c^2*d*x^2 - 6*b^2*c^2*d*x^2*log(abs
(F))^2 + 12*b*c*d*x*log(abs(F)) - 12*d)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) -
```

```
pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log
(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 1
6*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3
*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(
F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) +
 a*c*log(abs(F)) + 3) - 1/2*I*((32*pi^3*b^3*c^3*d*x^3*sgn(F) + 96*I*pi^2*b^
3*c^3*d*x^3*log(abs(F))*sgn(F) - 96*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) -
 32*pi^3*b^3*c^3*d*x^3 - 96*I*pi^2*b^3*c^3*d*x^3*log(abs(F)) + 96*pi*b^3*c^
3*d*x^3*log(abs(F))^2 + 64*I*b^3*c^3*d*x^3*log(abs(F))^3 - 96*I*pi^2*b^2*c^
2*d*x^2*sgn(F) + 192*pi*b^2*c^2*d*x^2*log(abs(F))*sgn(F) + 96*I*pi^2*b^2*c^
2*d*x^2 - 192*pi*b^2*c^2*d*x^2*log(abs(F)) - 192*I*b^2*c^2*d*x^2*log(abs(F)
)^2 - 192*pi*b*c*d*x*sgn(F) + 192*pi*b*c*d*x + 384*I*b*c*d*x*log(abs(F)) -
384*I*d)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) -
1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) + 32*I*pi^3*b^4*c^4*log(abs(F))*sgn(F)
 - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - 32*I*pi*b^4*c^4*log(abs(F))^3*sgn
(F) - 8*pi^4*b^4*c^4 - 32*I*pi^3*b^4*c^4*log(abs(F)) + 48*pi^2*b^4*c^4*log(
abs(F))^2 + 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*c^4*log(abs(F))^4) + (32
*pi^3*b^3*c^3*d*x^3*sgn(F) - 96*I*pi^2*b^3*c^3*d*x^3*log(abs(F))*sgn(F) - 9
6*pi*b^3*c^3*d*x^3*log(abs(F))^2*sgn(F) - 32*pi^3*b^3*c^3*d*x^3 + 96*I*pi^2
*b^3*c^3*d*x^3*log(abs(F)) + 96*pi*b^3*c^3*d*x^3*log(abs(F))^2 - 64*I*b^3*c
^3*d*x^3*log(abs(F))^3 + 96*I*pi^2*b^2*c^2*d*x^2*sgn(F) + 192*pi*b^2*c^2*d*
x^2*log(abs(F))*sgn(F) - 96*I*pi^2*b^2*c^2*d*x^2 - 192*pi*b^2*c^2*d*x^2*log
(abs(F)) + 192*I*b^2*c^2*d*x^2*log(abs(F))^2 - 192*pi*b*c*d*x*sgn(F) + 192*
pi*b*c*d*x - 384*I*b*c*d*x*log(abs(F)) + 384*I*d)*e^(-1/2*I*pi*b*c*x*sgn(F)
 + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn
(F) - 32*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*
sgn(F) + 32*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 + 32*I*pi^3*
b^4*c^4*log(abs(F)) + 48*pi^2*b^4*c^4*log(abs(F))^2 - 32*I*pi*b^4*c^4*log(a
bs(F))^3 - 16*b^4*c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)
) + 3) - 6*((2*(pi*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*d^2*x^2*
log(abs(F)) - pi*b*c*d^2*x*sgn(F) + pi*b*c*d^2*x)*(pi^3*b^3*c^3*sgn(F) - 3*
pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2
)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3
+ 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi
^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) - (pi^2*b^2*c^2*d^2*x^
2*sgn(F) - pi^2*b^2*c^2*d^2*x^2 + 2*b^2*c^2*d^2*x^2*log(abs(F))^2 - 4*b*c*d
^2*x*log(abs(F)) + 4*d^2)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c
^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*
c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (
3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*
log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn
(F) + 1/2*pi*a*c) - ((pi^2*b^2*c^2*d^2*x^2*sgn(F) - pi^2*b^2*c^2*d^2*x^2 +
2*b^2*c^2*d^2*x^2*log(abs(F))^2 - 4*b*c*d^2*x*log(abs(F)) + 4*d^2)*(pi^3*b^
3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*
c^3*log(abs(F))^2)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F
) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(
F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) + 2*(
pi*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*d^2*x^2*log(abs(F)) - pi
*b*c*d^2*x*sgn(F) + pi*b*c*d^2*x)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi
^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3
*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^
2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*
b^3*c^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi
*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 2) + 1/
2*I*((24*I*pi^2*b^2*c^2*d^2*x^2*sgn(F) - 48*pi*b^2*c^2*d^2*x^2*log(abs(F))*
sgn(F) - 24*I*pi^2*b^2*c^2*d^2*x^2 + 48*pi*b^2*c^2*d^2*x^2*log(abs(F)) + 48
*I*b^2*c^2*d^2*x^2*log(abs(F))^2 + 48*pi*b*c*d^2*x*sgn(F) - 48*pi*b*c*d^2*x
 - 96*I*b*c*d^2*x*log(abs(F)) + 96*I*d^2)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*
```

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pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*I*pi^3*b^3*c^3*sgn(F) +
12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F) +
 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*log(abs(F
))^2 + 8*b^3*c^3*log(abs(F))^3) - (24*I*pi^2*b^2*c^2*d^2*x^2*sgn(F) + 48*pi
*b^2*c^2*d^2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*c^2*d^2*x^2 - 48*pi*b^2
*c^2*d^2*x^2*log(abs(F)) + 48*I*b^2*c^2*d^2*x^2*log(abs(F))^2 - 48*pi*b*c*d
^2*x*sgn(F) + 48*pi*b*c*d^2*x - 96*I*b*c*d^2*x*log(abs(F)) + 96*I*d^2)*e^(-
1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c
)/(4*I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b
^3*c^3*log(abs(F))^2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)
) + 12*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 2) + 4*(2*((b*c*d^3*x*log(abs(F)) - d^3)*(pi^2*
b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)/((pi^2*b^2*c^2*sgn
(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))
*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi*b*c*d^3*x*sgn(F) - pi*b*c*d^3*x)
*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^2*sg
n(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F)
)*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*
c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi*b*c*d^3*x*sgn(F) - pi*b*c*d^3*
x)*(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)/((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*lo
g(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(b*c*d^3*x*log(abs(F)) -
d^3)*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^
2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(ab
s(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*p
i*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(a
bs(F)) + 1) - 1/2*I*((8*pi*b*c*d^3*x*sgn(F) - 8*pi*b*c*d^3*x - 16*I*b*c*d^3
*x*log(abs(F)) + 16*I*d^3)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*
I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log
(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*l
og(abs(F))^2) + (8*pi*b*c*d^3*x*sgn(F) - 8*pi*b*c*d^3*x + 16*I*b*c*d^3*x*lo
g(abs(F)) - 16*I*d^3)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi
*a*c*sgn(F) + 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs
(F))*sgn(F) - 2*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(a
bs(F))^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d^4*cos(-
1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(ab
s(F))/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(
F) - pi*b*c)*d^4*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F
) + 1/2*pi*a*c)/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(
b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^4*e^(1/2*I*pi*b*c*x*sg
n(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F
) - I*pi*b*c + 2*b*c*log(abs(F))) + 2*I*d^4*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2
*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*
b*c + 2*b*c*log(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.13 $\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)dx$

Optimal. Leaf size=110

$$\frac{6e^2(d+ex)F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3e(d+ex)^2F^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{(d+ex)^3F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (-6*e^3*F^(c*(a + b*x)))/(b^4*c^4*Log[F]^4) + (6*e^2*F^(c*(a + b*x))*(d + e
*x))/(b^3*c^3*Log[F]^3) - (3*e*F^(c*(a + b*x))*(d + e*x)^2)/(b^2*c^2*Log[F]
^2) + (F^(c*(a + b*x))*(d + e*x)^3)/(b*c*Log[F])
```

Rubi [A] time = 0.0857957, antiderivative size = 110, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 37, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.081, Rules used = {2187, 2176, 2194}

$$\frac{6e^2(d+ex)F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3e(d+ex)^2F^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{(d+ex)^3F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3),x]
```

```
[Out] (-6*e^3*F^(c*(a + b*x)))/(b^4*c^4*Log[F]^4) + (6*e^2*F^(c*(a + b*x))*(d + e
*x))/(b^3*c^3*Log[F]^3) - (3*e*F^(c*(a + b*x))*(d + e*x)^2)/(b^2*c^2*Log[F]
^2) + (F^(c*(a + b*x))*(d + e*x)^3)/(b*c*Log[F])
```

Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] &&  !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)dx=\int F^{c(a+bx)}(d+ex)^3\,dx$$
$$=\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}-\frac{(3e)\int F^{c(a+bx)}(d+ex)^2\,dx}{bc\log(F)}$$
$$=-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}+\frac{\left(6e^2\right)\int F^{c(a+bx)}(d+ex)\,dx}{b^2c^2\log^2(F)}$$
$$=\frac{6e^2F^{c(a+bx)}(d+ex)}{b^3c^3\log^3(F)}-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^3}{bc\log(F)}-\frac{\left(6e^3\right)\int F}{b^3c^3\,l}$$
$$=-\frac{6e^3F^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{6e^2F^{c(a+bx)}(d+ex)}{b^3c^3\log^3(F)}-\frac{3eF^{c(a+bx)}(d+ex)^2}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+}{bc\log(}$$

Mathematica [A] time = 0.0747424, size = 78, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(-3b^2c^2e\log^2(F)(d+ex)^2+b^3c^3\log^3(F)(d+ex)^3+6bce^2\log(F)(d+ex)-6e^3\right)}{b^4c^4\log^4(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3),x]
```

```
[Out] (F^(c*(a + b*x))*(-6*e^3 + 6*b*c*e^2*(d + e*x)*Log[F] - 3*b^2*c^2*e*(d + e*
x)^2*Log[F]^2 + b^3*c^3*(d + e*x)^3*Log[F]^3))/(b^4*c^4*Log[F]^4)
```

Maple [A] time = 0.006, size = 165, normalized size = 1.5

$$\frac{\left(e^3x^3b^3c^3\left(\ln(F)\right)^3+3\left(\ln(F)\right)^3b^3c^3de^2x^2+3\left(\ln(F)\right)^3b^3c^3d^2ex+b^3c^3\left(\ln(F)\right)^3d^3-3\left(\ln(F)\right)^2b^2c^2e^3x^2-6\left(\ln(F)\right)^2}{b^4c^4\left(\ln(F)\right)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x)
```

```
[Out] (e^3*x^3*b^3*c^3*ln(F)^3+3*ln(F)^3*b^3*c^3*d*e^2*x^2+3*ln(F)^3*b^3*c^3*d^2*
e*x+b^3*c^3*ln(F)^3*d^3-3*ln(F)^2*b^2*c^2*e^3*x^2-6*ln(F)^2*b^2*c^2*d*e^2*x
-3*b^2*c^2*ln(F)^2*e*d^2+6*ln(F)*b*c*e^3*x+6*d*e^2*b*c*ln(F)-6*e^3)*F^(c*(b
*x+a))/b^4/c^4/ln(F)^4
```

Maxima [A] time = 1.1271, size = 278, normalized size = 2.53

$$\frac{F^{bcx+ac}d^3}{bc\log(F)}+\frac{3\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}d^2e}{b^2c^2\log(F)^2}+\frac{3\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}de^2}{b^3c^3\log(F)^3}+\frac{\left(F^{ac}b^3c^3x^3\log\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="m
axima")
```

```
[Out] F^(b*c*x + a*c)*d^3/(b*c*log(F)) + 3*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d^2*e/(b^2*c^2*log(F)^2) + 3*(F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)
```

```
*b*c*x*log(F) + 2*F^(a*c))*F^(b*c*x)*d*e^2/(b^3*c^3*log(F)^3) + (F^(a*c)*b^
3*c^3*x^3*log(F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*log(F
) - 6*F^(a*c))*F^(b*c*x)*e^3/(b^4*c^4*log(F)^4)
```

Fricas [A] time = 1.53344, size = 312, normalized size = 2.84

$$\frac{\left(\left(b^3c^3e^3x^3 + 3\,b^3c^3de^2x^2 + 3\,b^3c^3d^2ex + b^3c^3d^3\right)\log\left(F\right)^3 - 6\,e^3 - 3\left(b^2c^2e^3x^2 + 2\,b^2c^2de^2x + b^2c^2d^2e\right)\log\left(F\right)^2 + 6\left(bce^3x \cdots\right.\right.}{b^4c^4\log\left(F\right)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="f
ricas")
```

```
[Out] ((b^3*c^3*e^3*x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d^3)*
log(F)^3 - 6*e^3 - 3*(b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*
log(F)^2 + 6*(b*c*e^3*x + b*c*d*e^2)*log(F))*F^(b*c*x + a*c)/(b^4*c^4*log(F
)^4)
```

Sympy [A] time = 0.318774, size = 231, normalized size = 2.1

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^3c^3d^3\log\left(F\right)^3+3b^3c^3d^2ex\log\left(F\right)^3+3b^3c^3de^2x^2\log\left(F\right)^3+b^3c^3e^3x^3\log\left(F\right)^3-3b^2c^2d^2e\log\left(F\right)^2-6b^2c^2de^2x\log\left(F\right)^2-3b^2c^2e^3x^2\log\left(F\right)^2+6bcde^2\log\left(F\right)+6\cdots\right.}{b^4c^4\log\left(F\right)^4} \\ d^3x + \frac{3d^2ex^2}{2} + de^2x^3 + \frac{e^3x^4}{4} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**3*x**3+3*d*e**2*x**2+3*d**2*e*x+d**3),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**3*c**3*d**3*log(F)**3 + 3*b**3*c**3*d**2*e*
x*log(F)**3 + 3*b**3*c**3*d*e**2*x**2*log(F)**3 + b**3*c**3*e**3*x**3*log(F
)**3 - 3*b**2*c**2*d**2*e*log(F)**2 - 6*b**2*c**2*d*e**2*x*log(F)**2 - 3*b*
*2*c**2*e**3*x**2*log(F)**2 + 6*b*c*d*e**2*log(F) + 6*b*c*e**3*x*log(F) - 6
*e**3)/(b**4*c**4*log(F)**4), Ne(b**4*c**4*log(F)**4, 0)), (d**3*x + 3*d**2
*e*x**2/2 + d*e**2*x**3 + e**3*x**4/4, True))
```

Giac [C] time = 1.40736, size = 6336, normalized size = 57.6

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="g
iac")
```

```
[Out] ((4*(pi^3*b^3*c^3*x^3*sgn(F) - 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - pi^3
*b^3*c^3*x^3 + 3*pi*b^3*c^3*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*x^2*log(abs(F)
)*sgn(F) - 6*pi*b^2*c^2*x^2*log(abs(F)) - 6*pi*b*c*x*sgn(F) + 6*pi*b*c*x)*(
pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^
4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^
2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^
```

```
2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b
^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs
(F))^3)^2) - (pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)*(3*pi
^2*b^3*c^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*x^3*log(abs(F)) + 2*b^3*
c^3*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*x^2*sgn(F) + 3*pi^2*b^2*c^2*x^2 - 6*
b^2*c^2*x^2*log(abs(F))^2 + 12*b*c*x*log(abs(F)) - 12)/((pi^4*b^4*c^4*sgn(F
) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log
(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(
F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^
4*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*s
gn(F) + 1/2*pi*a*c) + ((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*
sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F)
)^4)*(pi^3*b^3*c^3*x^3*sgn(F) - 3*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - pi^
3*b^3*c^3*x^3 + 3*pi*b^3*c^3*x^3*log(abs(F))^2 + 6*pi*b^2*c^2*x^2*log(abs(F
))*sgn(F) - 6*pi*b^2*c^2*x^2*log(abs(F)) - 6*pi*b*c*x*sgn(F) + 6*pi*b*c*x)/
((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4
+ 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*
c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log
(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(pi^3*b^4*c^4*log(abs(F))*sgn(F
) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4
*log(abs(F))^3)*(3*pi^2*b^3*c^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*x^3
*log(abs(F)) + 2*b^3*c^3*x^3*log(abs(F))^3 - 3*pi^2*b^2*c^2*x^2*sgn(F) + 3*
pi^2*b^2*c^2*x^2 - 6*b^2*c^2*x^2*log(abs(F))^2 + 12*b*c*x*log(abs(F)) - 12)
/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4
 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4
*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*lo
g(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi
*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(ab
s(F)) + 3) - 1/2*I*((8*pi^3*b^3*c^3*x^3*sgn(F) + 24*I*pi^2*b^3*c^3*x^3*log(
abs(F))*sgn(F) - 24*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*x^
3 - 24*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 24*pi*b^3*c^3*x^3*log(abs(F))^2 + 1
6*I*b^3*c^3*x^3*log(abs(F))^3 - 24*I*pi^2*b^2*c^2*x^2*sgn(F) + 48*pi*b^2*c^
2*x^2*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*x^2 - 48*pi*b^2*c^2*x^2*log(ab
s(F)) - 48*I*b^2*c^2*x^2*log(abs(F))^2 - 48*pi*b*c*x*sgn(F) + 48*pi*b*c*x +
 96*I*b*c*x*log(abs(F)) - 96*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x +
 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) + 32*I*pi^3*b^4
*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - 32*I*pi*b^
4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 - 32*I*pi^3*b^4*c^4*log(abs(F))
 + 48*pi^2*b^4*c^4*log(abs(F))^2 + 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*c
^4*log(abs(F))^4) + (8*pi^3*b^3*c^3*x^3*sgn(F) - 24*I*pi^2*b^3*c^3*x^3*log(
abs(F))*sgn(F) - 24*pi*b^3*c^3*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*x^
3 + 24*I*pi^2*b^3*c^3*x^3*log(abs(F)) + 24*pi*b^3*c^3*x^3*log(abs(F))^2 - 1
6*I*b^3*c^3*x^3*log(abs(F))^3 + 24*I*pi^2*b^2*c^2*x^2*sgn(F) + 48*pi*b^2*c^
2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*c^2*x^2 - 48*pi*b^2*c^2*x^2*log(ab
s(F)) + 48*I*b^2*c^2*x^2*log(abs(F))^2 - 48*pi*b*c*x*sgn(F) + 48*pi*b*c*x -
 96*I*b*c*x*log(abs(F)) + 96*I)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x
- 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) - 32*I*pi^3*b^
4*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) + 32*I*pi*b
^4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 + 32*I*pi^3*b^4*c^4*log(abs(F)
) + 48*pi^2*b^4*c^4*log(abs(F))^2 - 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*
c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 3) + 3*(((pi^2
*b^2*c^2*d*x^2*sgn(F) - pi^2*b^2*c^2*d*x^2 + 2*b^2*c^2*d*x^2*log(abs(F))^2
- 4*b*c*d*x*log(abs(F)) + 4*d)*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*
b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi
*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^
2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3
*c^3*log(abs(F))^3)^2) - 2*(pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^
2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)*(pi*b^2*c^2*d*x^2*log
```

```
(abs(F))*sgn(F) - pi*b^2*c^2*d*x^2*log(abs(F)) - pi*b*c*d*x*sgn(F) + pi*b*c
*d*x)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*
c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) -
3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x
*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^3*b^3*c^3*s
gn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log
(abs(F))^2)*(pi^2*b^2*c^2*d*x^2*sgn(F) - pi^2*b^2*c^2*d*x^2 + 2*b^2*c^2*d*x
^2*log(abs(F))^2 - 4*b*c*d*x*log(abs(F)) + 4*d)/((pi^3*b^3*c^3*sgn(F) - 3*p
i*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)
^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^
3*c^3*log(abs(F))^3)^2) + 2*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)*(pi*b^2*c^2*d*x^2*log(abs(F))*s
gn(F) - pi*b^2*c^2*d*x^2*log(abs(F)) - pi*b*c*d*x*sgn(F) + pi*b*c*d*x)/((pi
^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi
*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) +
1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*
log(abs(F)) + 2) + 1/2*I*((12*I*pi^2*b^2*c^2*d*x^2*sgn(F) - 24*pi*b^2*c^2*d
*x^2*log(abs(F))*sgn(F) - 12*I*pi^2*b^2*c^2*d*x^2 + 24*pi*b^2*c^2*d*x^2*log
(abs(F)) + 24*I*b^2*c^2*d*x^2*log(abs(F))^2 + 24*pi*b*c*d*x*sgn(F) - 24*pi*
b*c*d*x - 48*I*b*c*d*x*log(abs(F)) + 48*I*d)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2
*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*I*pi^3*b^3*c^3*sgn(F)
 + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F
) + 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*log(ab
s(F))^2 + 8*b^3*c^3*log(abs(F))^3) - (12*I*pi^2*b^2*c^2*d*x^2*sgn(F) + 24*p
i*b^2*c^2*d*x^2*log(abs(F))*sgn(F) - 12*I*pi^2*b^2*c^2*d*x^2 - 24*pi*b^2*c^
2*d*x^2*log(abs(F)) + 24*I*b^2*c^2*d*x^2*log(abs(F))^2 - 24*pi*b*c*d*x*sgn(
F) + 24*pi*b*c*d*x - 48*I*b*c*d*x*log(abs(F)) + 48*I*d)*e^(-1/2*I*pi*b*c*x*
sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3
*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(
F))^2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3
*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*l
og(abs(F)) + 2) + 3*(2*((pi*b*c*d^2*x*sgn(F) - pi*b*c*d^2*x)*(pi*b^2*c^2*lo
g(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2
*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b
^2*c^2*log(abs(F)))^2) + (pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*lo
g(abs(F))^2)*(b*c*d^2*x*log(abs(F)) - d^2)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2
*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b
^2*c^2*log(abs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*
c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*l
og(abs(F))^2)*(pi*b*c*d^2*x*sgn(F) - pi*b*c*d^2*x)/((pi^2*b^2*c^2*sgn(F) -
pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F
) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*
c^2*log(abs(F)))*(b*c*d^2*x*log(abs(F)) - d^2)/((pi^2*b^2*c^2*sgn(F) - pi^2
*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) -
pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*p
i*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) - 1
/2*I*((6*pi*b*c*d^2*x*sgn(F) - 6*pi*b*c*d^2*x - 12*I*b*c*d^2*x*log(abs(F))
+ 12*I*d^2)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F)
 - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F))*sgn(F)
 - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2) +
 (6*pi*b*c*d^2*x*sgn(F) - 6*pi*b*c*d^2*x + 12*I*b*c*d^2*x*log(abs(F)) - 12*
I*d^2)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1
/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2
*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b
*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d^3*cos(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^
2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d^
3*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)
```

```
/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(b*c*x*log(abs(F
)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^3*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi
*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c +
2*b*c*log(abs(F))) + 2*I*d^3*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1
/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*b*c + 2*b*c*log
(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.14 $\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)dx$

Optimal. Leaf size=79

$$-\frac{2e(d+ex)F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{(d+ex)^2F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (2*e^2*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (2*e*F^(c*(a + b*x))*(d + e*x)
)/(b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^2)/(b*c*Log[F])
```

Rubi [A] time = 0.0454934, antiderivative size = 79, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 26, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.115, Rules used = {27, 2176, 2194}

$$-\frac{2e(d+ex)F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{(d+ex)^2F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^2 + 2*d*e*x + e^2*x^2),x]
```

```
[Out] (2*e^2*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (2*e*F^(c*(a + b*x))*(d + e*x)
)/(b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^2)/(b*c*Log[F])
```

Rule 27

```
Int[(u_.)*((a_) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_.), x_Symbol] :> Int[u*Canc
el[(b/2 + c*x)^(2*p)/c^p], x] /; FreeQ[{a, b, c}, x] && EqQ[b^2 - 4*a*c, 0]
 && IntegerQ[p]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)dx &= \int F^{c(a+bx)}(d+ex)^2\,dx\\
&= \frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}-\frac{(2e)\int F^{c(a+bx)}(d+ex)\,dx}{bc\log(F)}\\
&= -\frac{2eF^{c(a+bx)}(d+ex)}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}+\frac{\left(2e^2\right)\int F^{c(a+bx)}\,dx}{b^2c^2\log^2(F)}\\
&= \frac{2e^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{2eF^{c(a+bx)}(d+ex)}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^2}{bc\log(F)}
\end{aligned}$$

Mathematica [A] time = 0.0385979, size = 56, normalized size = 0.71

$$\frac{F^{c(a+bx)}\left(b^2c^2\log^2(F)(d+ex)^2-2bce\log(F)(d+ex)+2e^2\right)}{b^3c^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^2 + 2*d*e*x + e^2*x^2),x]
```

```
[Out] (F^(c*(a + b*x))*(2*e^2 - 2*b*c*e*(d + e*x)*Log[F] + b^2*c^2*(d + e*x)^2*Lo
g[F]^2))/(b^3*c^3*Log[F]^3)
```

Maple [A] time = 0.004, size = 91, normalized size = 1.2

$$\frac{\left(e^2x^2b^2c^2\left(\ln(F)\right)^2+2\left(\ln(F)\right)^2b^2c^2dex+b^2c^2\left(\ln(F)\right)^2d^2-2\ln(F)bce^2x-2\ln(F)bced+2e^2\right)F^{c(bx+a)}}{b^3c^3\left(\ln(F)\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2),x)
```

```
[Out] (e^2*x^2*b^2*c^2*ln(F)^2+2*ln(F)^2*b^2*c^2*d*e*x+b^2*c^2*ln(F)^2*d^2-2*ln(F
)*b*c*e^2*x-2*ln(F)*b*c*e*d+2*e^2)*F^(c*(b*x+a))/b^3/c^3/ln(F)^3
```

Maxima [A] time = 1.15033, size = 166, normalized size = 2.1

$$\frac{F^{bcx+ac}d^2}{bc\log(F)}+\frac{2\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}de}{b^2c^2\log(F)^2}+\frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}e^2}{b^3c^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d^2/(b*c*log(F)) + 2*(F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*
c*x)*d*e/(b^2*c^2*log(F)^2) + (F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)*b*c
*x*log(F) + 2*F^(a*c))*F^(b*c*x)*e^2/(b^3*c^3*log(F)^3)
```

Fricas [A] time = 1.52873, size = 186, normalized size = 2.35

$$\frac{\left(\left(b^2c^2e^2x^2+2b^2c^2dex+b^2c^2d^2\right)\log(F)^2+2e^2-2\left(bce^2x+bcde\right)\log(F)\right)F^{bcx+ac}}{b^3c^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2),x, algorithm="fricas")
```

```
[Out] ((b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b^2*c^2*d^2)*log(F)^2 + 2*e^2 - 2*(b*
c*e^2*x + b*c*d*e)*log(F))*F^(b*c*x + a*c)/(b^3*c^3*log(F)^3)
```

Sympy [A] time = 0.274006, size = 133, normalized size = 1.68

$$\begin{cases} \frac{F^{c(a+bx)}(b^2c^2d^2\log(F)^2+2b^2c^2dex\log(F)^2+b^2c^2e^2x^2\log(F)^2-2bcde\log(F)-2bce^2x\log(F)+2e^2)}{b^3c^3\log(F)^3} & \text{for } b^3c^3\log(F)^3 \neq 0 \\ d^2x+dex^2+\frac{e^2x^3}{3} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**2*x**2+2*d*e*x+d**2),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**2*c**2*d**2*log(F)**2 + 2*b**2*c**2*d*e*x*l
og(F)**2 + b**2*c**2*e**2*x**2*log(F)**2 - 2*b*c*d*e*log(F) - 2*b*c*e**2*x*
log(F) + 2*e**2)/(b**3*c**3*log(F)**3), Ne(b**3*c**3*log(F)**3, 0)), (d**2*
x + d*e*x**2 + e**2*x**3/3, True))
```

Giac [C] time = 1.28433, size = 3367, normalized size = 42.62

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2),x, algorithm="giac")
```

```
[Out] (((3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c
^3*log(abs(F))^3)*(pi^2*b^2*c^2*x^2*sgn(F) - pi^2*b^2*c^2*x^2 + 2*b^2*c^2*x
^2*log(abs(F))^2 - 4*b*c*x*log(abs(F)) + 4)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^
3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 +
 (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^
3*log(abs(F))^3)^2) - 2*(pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*s
gn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)*(pi*b^2*c^2*x^2*log(abs(
F))*sgn(F) - pi*b^2*c^2*x^2*log(abs(F)) - pi*b*c*x*sgn(F) + pi*b*c*x)/((pi^
3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*
b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*
c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1
/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^3*b^3*c^3*sgn(F) - 3*p
i*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)
*(pi^2*b^2*c^2*x^2*sgn(F) - pi^2*b^2*c^2*x^2 + 2*b^2*c^2*x^2*log(abs(F))^2
- 4*b*c*x*log(abs(F)) + 4)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))
^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*
log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^
2) + 2*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*
b^3*c^3*log(abs(F))^3)*(pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*x^2*
log(abs(F)) - pi*b*c*x*sgn(F) + pi*b*c*x)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*
c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (
3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*
log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn
(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 2) + 1/2*I*((4*
I*pi^2*b^2*c^2*x^2*sgn(F) - 8*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*
b^2*c^2*x^2 + 8*pi*b^2*c^2*x^2*log(abs(F)) + 8*I*b^2*c^2*x^2*log(abs(F))^2
+ 8*pi*b*c*x*sgn(F) - 8*pi*b*c*x - 16*I*b*c*x*log(abs(F)) + 16*I)*e^(1/2*I*
pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*
I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^
3*log(abs(F))^2*sgn(F) + 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 1
2*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3) - (4*I*pi^2*b^2*c^2
*x^2*sgn(F) + 8*pi*b^2*c^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*x^2 -
8*pi*b^2*c^2*x^2*log(abs(F)) + 8*I*b^2*c^2*x^2*log(abs(F))^2 - 8*pi*b*c*x*s
```

```
gn(F) + 8*pi*b*c*x - 16*I*b*c*x*log(abs(F)) + 16*I)*e^(-1/2*I*pi*b*c*x*sgn(
F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3*c^3
*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(F))^
2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3*c^3
*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*log(a
bs(F)) + 2) + 2*(2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F))
)*(pi*b*c*d*x*sgn(F) - pi*b*c*d*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2
*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*l
og(abs(F)))^2) + (pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F)
)^2)*(b*c*d*x*log(abs(F)) - d)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2
*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(a
bs(F)))^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1
/2*pi*a*c) + ((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2
)*(pi*b*c*d*x*sgn(F) - pi*b*c*d*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2
*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*l
og(abs(F)))^2) - 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))
*(b*c*d*x*log(abs(F)) - d)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2
*log(abs(F))^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F
)))^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*p
i*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1) - 1/2*I*((4*pi*b*c*d*x*
sgn(F) - 4*pi*b*c*d*x - 8*I*b*c*d*x*log(abs(F)) + 8*I*d)*e^(1/2*I*pi*b*c*x*
sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c
^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2
*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2) + (4*pi*b*c*d*x*sgn(F) - 4*pi*b
*c*d*x + 8*I*b*c*d*x*log(abs(F)) - 8*I*d)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I
*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*
I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*c^2 + 4*I*pi*b^2*c^2*log(abs(F
)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)) + 1)
+ 2*(2*b*c*d^2*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F)
+ 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*
c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d^2*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*
x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)/(4*b^2*c^2*log(abs(F))^2 + (pi*b*c*sgn(
F) - pi*b*c)^2))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*(-2*I*d^2*
e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*
a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c + 2*b*c*log(abs(F))) + 2*I*d^2*e^(-1/2*I*p
i*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-I*p
i*b*c*sgn(F) + I*pi*b*c + 2*b*c*log(abs(F))))*e^(b*c*x*log(abs(F)) + a*c*lo
g(abs(F)))
```

3.15 $\int \frac{F^{c(a+bx)}}{d^2+2dex+e^2x^2}\,dx$

Optimal. Leaf size=57

$$\frac{bc\log(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e^2}-\frac{F^{c(a+bx)}}{e(d+ex)}$$

```
[Out] -(F^(c*(a + b*x))/(e*(d + e*x))) + (b*c*F^(c*(a - (b*d)/e))*ExpIntegralEi[(
b*c*(d + e*x)*Log[F])/e]*Log[F])/e^2
```

Rubi [A] time = 0.0426247, antiderivative size = 57, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 28, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.107, Rules used = {27, 2177, 2178}

$$\frac{bc\log(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{e^2}-\frac{F^{c(a+bx)}}{e(d+ex)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^2 + 2*d*e*x + e^2*x^2),x]
```

```
[Out] -(F^(c*(a + b*x))/(e*(d + e*x))) + (b*c*F^(c*(a - (b*d)/e))*ExpIntegralEi[(
b*c*(d + e*x)*Log[F])/e]*Log[F])/e^2
```

Rule 27

```
Int[(u_.)*((a_) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_.), x_Symbol] :> Int[u*Canc
el[(b/2 + c*x)^(2*p)/c^p], x] /; FreeQ[{a, b, c}, x] && EqQ[b^2 - 4*a*c, 0]
 && IntegerQ[p]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{d^2+2dex+e^2x^2}\,dx = \int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx$$
$$= -\frac{F^{c(a+bx)}}{e(d+ex)} + \frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{d+ex}\,dx}{e}$$
$$= -\frac{F^{c(a+bx)}}{e(d+ex)} + \frac{bcF^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log(F)}{e^2}$$

Mathematica [A] time = 0.0598772, size = 55, normalized size = 0.96

$$\frac{F^{ac}\left(bc\log(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)-\frac{eF^{bcx}}{d+ex}\right)}{e^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^2 + 2*d*e*x + e^2*x^2),x]
```

```
[Out] (F^(a*c)*(-((e*F^(b*c*x))/(d + e*x)) + (b*c*ExpIntegralEi[(b*c*(d + e*x)*Lo
g[F])/e]*Log[F])/F^((b*c*d)/e)))/e^2
```

Maple [A] time = 0.043, size = 99, normalized size = 1.7

$$-\frac{bc\ln(F)F^{bcx}F^{ac}}{e^2}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-1}-\frac{bc\ln(F)}{e^2}F^{\frac{c(ae-bd)}{e}}\text{Ei}\left(1,-bcx\ln(F)-ac\ln(F)-\frac{-\ln(F)ace+\ln(F)bcd}{e}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e^2*x^2+2*d*e*x+d^2),x)
```

```
[Out] -b*c*ln(F)/e^2*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-b*c*ln(F)/e^
2*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*a*c*e+ln(F)*b*c*d)/
e)
```

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

$$\int \frac{F^{(bx+a)c}}{e^2x^2+2\,dex+d^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^2*x^2+2*d*e*x+d^2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^2*x^2 + 2*d*e*x + d^2), x)
```

Fricas [A] time = 1.53621, size = 159, normalized size = 2.79

$$-\frac{F^{bcx+ac}e-\frac{(bcex+bcd)\text{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}}{e^3x+de^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^2*x^2+2*d*e*x+d^2),x, algorithm="fricas")
```

```
[Out] -(F^(b*c*x + a*c)*e - (b*c*e*x + b*c*d)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(
F)/F^((b*c*d - a*c*e)/e))/(e^3*x + d*e^2)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e**2*x**2+2*d*e*x+d**2),x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**2, x)
```

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

$$\int \frac{F^{(bx+a)c}}{e^2x^2+2\,dex+d^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^2*x^2+2*d*e*x+d^2),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^2*x^2 + 2*d*e*x + d^2), x)
```

3.16 $\int \frac{F^{c(a+bx)}}{d^3+3d^2ex+3de^2x^2+e^3x^3} \, dx$

Optimal. Leaf size=95

$$\frac{b^2c^2\log^2(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{2e^3}-\frac{bc\log(F)F^{c(a+bx)}}{2e^2(d+ex)}-\frac{F^{c(a+bx)}}{2e(d+ex)^2}$$

```
[Out] -F^(c*(a + b*x))/(2*e*(d + e*x)^2) - (b*c*F^(c*(a + b*x))*Log[F])/(2*e^2*(d
 + e*x)) + (b^2*c^2*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F]
)/e]*Log[F]^2)/(2*e^3)
```

Rubi [A] time = 0.097557, antiderivative size = 95, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 39, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.077, Rules used = {2187, 2177, 2178}

$$\frac{b^2c^2\log^2(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{2e^3}-\frac{bc\log(F)F^{c(a+bx)}}{2e^2(d+ex)}-\frac{F^{c(a+bx)}}{2e(d+ex)^2}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3),x]
```

```
[Out] -F^(c*(a + b*x))/(2*e*(d + e*x)^2) - (b*c*F^(c*(a + b*x))*Log[F])/(2*e^2*(d
 + e*x)) + (b^2*c^2*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F]
)/e]*Log[F]^2)/(2*e^3)
```

Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] && !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] && !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{d^3+3d^2ex+3de^2x^2+e^3x^3}\,dx = \int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx$$
$$= -\frac{F^{c(a+bx)}}{2e(d+ex)^2} + \frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx}{2e}$$
$$= -\frac{F^{c(a+bx)}}{2e(d+ex)^2} - \frac{bcF^{c(a+bx)}\log(F)}{2e^2(d+ex)} + \frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{d+ex}\,dx}{2e^2}$$
$$= -\frac{F^{c(a+bx)}}{2e(d+ex)^2} - \frac{bcF^{c(a+bx)}\log(F)}{2e^2(d+ex)} + \frac{b^2c^2F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^2(F)}{2e^3}$$

Mathematica [A] time = 0.0505127, size = 88, normalized size = 0.93

$$\frac{F^{c\left(a-\frac{bd}{e}\right)}\left(b^2c^2\log^2(F)(d+ex)^2\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right) - eF^{\frac{bc(d+ex)}{e}}(bc\log(F)(d+ex)+e)\right)}{2e^3(d+ex)^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3),x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(b^2*c^2*(d + e*x)^2*ExpIntegralEi[(b*c*(d + e*x)*Log[
F])/e]*Log[F]^2 - e*F^((b*c*(d + e*x))/e)*(e + b*c*(d + e*x)*Log[F])))/(2*e
^3*(d + e*x)^2)
```

Maple [A] time = 0.059, size = 155, normalized size = 1.6

$$-\frac{b^2c^2(\ln(F))^2F^{bcx}F^{ac}}{2e^3}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-2} - \frac{b^2c^2(\ln(F))^2F^{bcx}F^{ac}}{2e^3}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-1} - \frac{b^2c^2(\ln(F))^2}{2e^3}F^{\frac{c(ae-}{e}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x)
```

```
[Out] -1/2*b^2*c^2*ln(F)^2/e^3*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-
1/2*b^2*c^2*ln(F)^2/e^3*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/2
*b^2*c^2*ln(F)^2/e^3*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*
a*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{e^3x^3+3\,de^2x^2+3\,d^2ex+d^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="m
axima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3), x)
```

Fricas [A] time = 1.49918, size = 278, normalized size = 2.93

$$\frac{\frac{\left(b^2c^2e^2x^2+2\,b^2c^2dex+b^2c^2d^2\right)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^2}{F^{\frac{bcd-ace}{e}}}-\left(e^2+\left(bce^2x+bcde\right)\log\left(F\right)\right)F^{bcx+ac}}{2\left(e^5x^2+2\,de^4x+d^2e^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="f
ricas")
```

```
[Out] 1/2*((b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b^2*c^2*d^2)*Ei((b*c*e*x + b*c*d)
*log(F)/e)*log(F)^2/F^((b*c*d - a*c*e)/e) - (e^2 + (b*c*e^2*x + b*c*d*e)*lo
g(F))*F^(b*c*x + a*c))/(e^5*x^2 + 2*d*e^4*x + d^2*e^3)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e**3*x**3+3*d*e**2*x**2+3*d**2*e*x+d**3),x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**3, x)
```

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

$$\int \frac{F^{(bx+a)c}}{e^3x^3+3\,de^2x^2+3\,d^2ex+d^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3),x, algorithm="g
iac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3), x)
```

3.17 $\int \frac{F^{c(a+bx)}}{d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4}\,dx$

Optimal. Leaf size=128

$$\frac{b^3c^3\log^3(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{6e^4}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{6e^3(d+ex)}-\frac{bc\log(F)F^{c(a+bx)}}{6e^2(d+ex)^2}-\frac{F^{c(a+bx)}}{3e(d+ex)^3}$$

```
[Out] -F^(c*(a + b*x))/(3*e*(d + e*x)^3) - (b*c*F^(c*(a + b*x))*Log[F])/(6*e^2*(d
 + e*x)^2) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(6*e^3*(d + e*x)) + (b^3*c^
3*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/(6*
e^4)
```

Rubi [A] time = 0.133982, antiderivative size = 128, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 50, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.06, Rules used = {2187, 2177, 2178}

$$\frac{b^3c^3\log^3(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{6e^4}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{6e^3(d+ex)}-\frac{bc\log(F)F^{c(a+bx)}}{6e^2(d+ex)^2}-\frac{F^{c(a+bx)}}{3e(d+ex)^3}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 + e^4*x^
4),x]
```


```
[Out] -F^(c*(a + b*x))/(3*e*(d + e*x)^3) - (b*c*F^(c*(a + b*x))*Log[F])/(6*e^2*(d
 + e*x)^2) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(6*e^3*(d + e*x)) + (b^3*c^
3*F^(c*(a - (b*d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/(6*
e^4)
```


Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] &&  !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4}\,dx=\int \frac{F^{c(a+bx)}}{(d+ex)^4}\,dx$$
$$=-\frac{F^{c(a+bx)}}{3e(d+ex)^3}+\frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx}{3e}$$
$$=-\frac{F^{c(a+bx)}}{3e(d+ex)^3}-\frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2}+\frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx}{6e^2}$$
$$=-\frac{F^{c(a+bx)}}{3e(d+ex)^3}-\frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2}-\frac{b^2c^2F^{c(a+bx)}\log^2(F)}{6e^3(d+ex)}+\frac{\left(b^3c^3\log^3(F\right.}{6}$$
$$=-\frac{F^{c(a+bx)}}{3e(d+ex)^3}-\frac{bcF^{c(a+bx)}\log(F)}{6e^2(d+ex)^2}-\frac{b^2c^2F^{c(a+bx)}\log^2(F)}{6e^3(d+ex)}+\frac{b^3c^3F^{c\left(a-\frac{bd}{e}\right)}}{}$$

Mathematica [A] time = 0.0800948, size = 99, normalized size = 0.77

$$\frac{F^{ac}\left(b^3c^3\log^3(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)-\frac{eF^{bcx}\left(b^2c^2\log^2(F)(d+ex)^2+bce\log(F)(d+ex)+2e^2\right)}{(d+ex)^3}\right)}{6e^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 +
e^4*x^4),x]
```

```
[Out] (F^(a*c)*((b^3*c^3*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^3)/F^((b*
c*d)/e) - (e*F^(b*c*x)*(2*e^2 + b*c*e*(d + e*x)*Log[F] + b^2*c^2*(d + e*x)^
2*Log[F]^2))/(d + e*x)^3))/(6*e^4)
```

Maple [A] time = 0.076, size = 199, normalized size = 1.6

$$-\frac{b^3c^3(\ln(F))^3F^{bcx}F^{ac}}{3e^4}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-3}-\frac{b^3c^3(\ln(F))^3F^{bcx}F^{ac}}{6e^4}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-2}-\frac{b^3c^3(\ln(F))^3F}{6e^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x)
```

```
[Out] -1/3*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^3-
1/6*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-1
/6*b^3*c^3*ln(F)^3/e^4*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/6*
b^3*c^3*ln(F)^3/e^4*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F)*a
*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{e^4x^4+4\,de^3x^3+6\,d^2e^2x^2+4\,d^3ex+d^4}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^4*x^4 + 4*d*e^3*x^3 + 6*d^2*e^2*x^2 + 4*d^3*e*
x + d^4), x)
```

Fricas [A] time = 1.57511, size = 425, normalized size = 3.32

$$\frac{\frac{\left(b^3c^3e^3x^3+3\,b^3c^3de^2x^2+3\,b^3c^3d^2ex+b^3c^3d^3\right)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^3}{F^{\frac{bcd-ace}{e}}} - \left(2\,e^3 + \left(b^2c^2e^3x^2 + 2\,b^2c^2de^2x + b^2c^2d^2e\right)\log\left(F\right)^2 + \left(bce^3x + bc\right.}{6\left(e^7x^3 + 3\,de^6x^2 + 3\,d^2e^5x + d^3e^4\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="fricas")
```

```
[Out] 1/6*((b^3*c^3*e^3*x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d
^3)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(F)^3/F^((b*c*d - a*c*e)/e) - (2*e^3
+ (b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*log(F)^2 + (b*c*e^3
*x + b*c*d*e^2)*log(F))*F^(b*c*x + a*c))/(e^7*x^3 + 3*d*e^6*x^2 + 3*d^2*e^5
*x + d^3*e^4)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e**4*x**4+4*d*e**3*x**3+6*d**2*e**2*x**2+4*d**3*e
*x+d**4),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{e^4x^4 + 4\,de^3x^3 + 6\,d^2e^2x^2 + 4\,d^3ex + d^4}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4),x
, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^4*x^4 + 4*d*e^3*x^3 + 6*d^2*e^2*x^2 + 4*d^3*e*
x + d^4), x)
```

3.18 $\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5}\,dx$

Optimal. Leaf size=161

$$\frac{b^4c^4\log^4(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{24e^5}-\frac{b^3c^3\log^3(F)F^{c(a+bx)}}{24e^4(d+ex)}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{24e^3(d+ex)^2}-\frac{bc\log(F)F^{c(a+bx)}}{12e^2(d+ex)^3}-\frac{F^{c(a+bx)}}{4e(d+ex)^4}$$

```
[Out] -F^(c*(a + b*x))/(4*e*(d + e*x)^4) - (b*c*F^(c*(a + b*x))*Log[F])/(12*e^2*(
d + e*x)^3) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(24*e^3*(d + e*x)^2) - (b^
3*c^3*F^(c*(a + b*x))*Log[F]^3)/(24*e^4*(d + e*x)) + (b^4*c^4*F^(c*(a - (b*
d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/(24*e^5)
```

Rubi [A] time = 0.180379, antiderivative size = 161, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 61, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.049, Rules used = {2187, 2177, 2178}

$$\frac{b^4c^4\log^4(F)F^{c\left(a-\frac{bd}{e}\right)}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{24e^5}-\frac{b^3c^3\log^3(F)F^{c(a+bx)}}{24e^4(d+ex)}-\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{24e^3(d+ex)^2}-\frac{bc\log(F)F^{c(a+bx)}}{12e^2(d+ex)^3}-\frac{F^{c(a+bx)}}{4e(d+ex)^4}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^5 + 5*d^4*e*x + 10*d^3*e^2*x^2 + 10*d^2*e^3*x^3 + 5*
d*e^4*x^4 + e^5*x^5),x]
```


```
[Out] -F^(c*(a + b*x))/(4*e*(d + e*x)^4) - (b*c*F^(c*(a + b*x))*Log[F])/(12*e^2*(
d + e*x)^3) - (b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(24*e^3*(d + e*x)^2) - (b^
3*c^3*F^(c*(a + b*x))*Log[F]^3)/(24*e^4*(d + e*x)) + (b^4*c^4*F^(c*(a - (b*
d)/e))*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/(24*e^5)
```


Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] && !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] && !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5}\,dx = \int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} + \frac{(bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^4}\,dx}{4e}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} + \frac{\left(b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^3}\,dx}{12e^2}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} + \frac{(b^3 \cdots}{\cdots}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} - \frac{b^3c \cdots}{\cdots}$$

$$= -\frac{F^{c(a+bx)}}{4e(d+ex)^4} - \frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3} - \frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} - \frac{b^3c \cdots}{\cdots}$$

Mathematica [A] time = 0.0342022, size = 121, normalized size = 0.75

$$\frac{F^{ac}\left(b^4c^4\log^4(F)F^{-\frac{bcd}{e}}\text{Ei}\left(\frac{bc(d+ex)\log(F)}{e}\right) - \frac{eF^{bcx}\left(b^2c^2e\log^2(F)(d+ex)^2+b^3c^3\log^3(F)(d+ex)^3+2bce^2\log(F)(d+ex)+6e^3\right)}{(d+ex)^4}\right)}{24e^5}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^5 + 5*d^4*e*x + 10*d^3*e^2*x^2 + 10*d^2*e^3*x^
3 + 5*d*e^4*x^4 + e^5*x^5),x]
```

```
[Out] (F^(a*c)*((b^4*c^4*ExpIntegralEi[(b*c*(d + e*x)*Log[F])/e]*Log[F]^4)/F^((b*
c*d)/e) - (e*F^(b*c*x)*(6*e^3 + 2*b*c*e^2*(d + e*x)*Log[F] + b^2*c^2*e*(d +
 e*x)^2*Log[F]^2 + b^3*c^3*(d + e*x)^3*Log[F]^3))/(d + e*x)^4))/(24*e^5)
```

Maple [A] time = 0.096, size = 243, normalized size = 1.5

$$-\frac{b^4c^4(\ln(F))^4F^{bcx}F^{ac}}{4e^5}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-4} - \frac{b^4c^4(\ln(F))^4F^{bcx}F^{ac}}{12e^5}\left(bcx\ln(F)+\frac{\ln(F)bcd}{e}\right)^{-3} - \frac{b^4c^4(\ln(F))^4F^{bcx}F \cdots}{24e^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e^5*x^5+5*d*e^4*x^4+10*d^2*e^3*x^3+10*d^3*e^2*x^2+5*d^4*
e*x+d^5),x)
```

```
[Out] -1/4*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^4-
1/12*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^3-
1/24*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)^2-
1/24*b^4*c^4*ln(F)^4/e^5*F^(b*c*x)*F^(a*c)/(b*c*x*ln(F)+1/e*ln(F)*b*c*d)-1/
24*b^4*c^4*ln(F)^4/e^5*F^(c*(a*e-b*d)/e)*Ei(1,-b*c*x*ln(F)-a*c*ln(F)-(-ln(F
)*a*c*e+ln(F)*b*c*d)/e)
```

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

$$\int \frac{F^{(bx+a)c}}{e^5x^5+5\,de^4x^4+10\,d^2e^3x^3+10\,d^3e^2x^2+5\,d^4ex+d^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^5*x^5+5*d*e^4*x^4+10*d^2*e^3*x^3+10*d^3*e^2*x^2+
5*d^4*e*x+d^5),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^5*x^5 + 5*d*e^4*x^4 + 10*d^2*e^3*x^3 + 10*d^3*
e^2*x^2 + 5*d^4*e*x + d^5), x)
```

Fricas [A] time = 1.59425, size = 606, normalized size = 3.76

$$\frac{\frac{(b^4c^4e^4x^4+4\,b^4c^4de^3x^3+6\,b^4c^4d^2e^2x^2+4\,b^4c^4d^3ex+b^4c^4d^4)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^4}{F^{\frac{bcd-ace}{e}}} - (6\,e^4 + (b^3c^3e^4x^3 + 3\,b^3c^3de^3x^2 + 3\,b^3c^3d^2e^2x + b^3 \cdots}{24\,(e^9x^4 + 4\,de^8x^3 + 6\,d^2e^7x^2 + 4\,d \cdots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^5*x^5+5*d*e^4*x^4+10*d^2*e^3*x^3+10*d^3*e^2*x^2+
5*d^4*e*x+d^5),x, algorithm="fricas")
```

```
[Out] 1/24*((b^4*c^4*e^4*x^4 + 4*b^4*c^4*d*e^3*x^3 + 6*b^4*c^4*d^2*e^2*x^2 + 4*b^
4*c^4*d^3*e*x + b^4*c^4*d^4)*Ei((b*c*e*x + b*c*d)*log(F)/e)*log(F)^4/F^((b*
c*d - a*c*e)/e) - (6*e^4 + (b^3*c^3*e^4*x^3 + 3*b^3*c^3*d*e^3*x^2 + 3*b^3*c
^3*d^2*e^2*x + b^3*c^3*d^3*e)*log(F)^3 + (b^2*c^2*e^4*x^2 + 2*b^2*c^2*d*e^3
*x + b^2*c^2*d^2*e^2)*log(F)^2 + 2*(b*c*e^4*x + b*c*d*e^3)*log(F))*F^(b*c*x
 + a*c))/(e^9*x^4 + 4*d*e^8*x^3 + 6*d^2*e^7*x^2 + 4*d^3*e^6*x + d^4*e^5)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e**5*x**5+5*d*e**4*x**4+10*d**2*e**3*x**3+10*d**3
*e**2*x**2+5*d**4*e*x+d**5),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{e^5x^5 + 5\,de^4x^4 + 10\,d^2e^3x^3 + 10\,d^3e^2x^2 + 5\,d^4ex + d^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e^5*x^5+5*d*e^4*x^4+10*d^2*e^3*x^3+10*d^3*e^2*x^2+
5*d^4*e*x+d^5),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^5*x^5 + 5*d*e^4*x^4 + 10*d^2*e^3*x^3 + 10*d^3*
e^2*x^2 + 5*d^4*e*x + d^5), x)
```

3.19 $\int F^{c(a+bx)}\left((d+ex)^n\right)^m\,dx$

Optimal. Leaf size=72

$$\frac{\left((d+ex)^n\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-mn}\text{Gamma}\left(mn+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^n)^m*Gamma[1 + m*n, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(m*n))
```

Rubi [A] time = 0.0536632, antiderivative size = 72, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.105, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^n\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-mn}\text{Gamma}\left(mn+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*((d + e*x)^n)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^n)^m*Gamma[1 + m*n, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(m*n))
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] &&  !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) &&  !IntegerQ[m]
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}\left((d+ex)^n\right)^m\,dx &= (d+ex)^{-mn}\left((d+ex)^n\right)^m\int F^{ac+bcx}(d+ex)^{mn}\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^n\right)^m\Gamma\left(1+mn,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-mn}}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0130439, size = 72, normalized size = 1.

$$\frac{\left((d+ex)^n\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-mn}\text{Gamma}\left(mn+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*((d + e*x)^n)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^n)^m*Gamma[1 + m*n, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(m*n))
```

Maple [F] time = 0.043, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} \left((ex+d)^{n}\right)^{m} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*((e*x+d)^n)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*((e*x+d)^n)^m,x)
```

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

$$\int \left((ex+d)^{n}\right)^{m} F^{(bx+a)c}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*((e*x+d)^n)^m,x, algorithm="maxima")
```

```
[Out] integrate(((e*x + d)^n)^m*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.77738, size = 158, normalized size = 2.19

$$\frac{e^{\left(-\frac{emn\log\left(-\frac{bc\log(F)}{e}\right)+(bcd-ace)\log(F)}{e}\right)}\Gamma\left(mn+1,-\frac{(bcex+bcd)\log(F)}{e}\right)}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*((e*x+d)^n)^m,x, algorithm="fricas")
```

```
[Out] e^(-(e*m*n*log(-b*c*log(F)/e) + (b*c*d - a*c*e)*log(F))/e)*gamma(m*n + 1, -
(b*c*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*((e*x+d)**n)**m,x)
```

```
[Out] Timed out
```

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

$$\int \left((ex + d)^n\right)^m F^{(bx+a)c} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*((e*x+d)^n)^m,x, algorithm="giac")
```

```
[Out] integrate(((e*x + d)^n)^m*F^((b*x + a)*c), x)
```

3.20 $\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)^m\,dx$

Optimal. Leaf size=71

$$\frac{\left((d+ex)^4\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-4m}\text{Gamma}\left(4m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^4)^m*Gamma[1 + 4*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(4*m))
```

Rubi [A] time = 0.0699975, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 50, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.04, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^4\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-4m}\text{Gamma}\left(4m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 + e^4*x^
4)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^4)^m*Gamma[1 + 4*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(4*m))
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] &&  !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) &&  !IntegerQ[m]
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)^m\,dx=(d+ex)^{-4m}\left((d+ex)^4\right)^m\int F^{c(a+bx)}(d+ex)^{4m}\,dx$$

$$=\frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^4\right)^m\Gamma\left(1+4m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log\ldots}{e}\ldots\right)}{bc\log(F)}$$

Mathematica [A] time = 0.0147353, size = 71, normalized size = 1.

$$\frac{\left((d+ex)^4\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-4m}\text{Gamma}\left(4m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^4 + 4*d^3*e*x + 6*d^2*e^2*x^2 + 4*d*e^3*x^3 +
e^4*x^4)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^4)^m*Gamma[1 + 4*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(4*m))
```

Maple [F] time = 0.158, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} \left(e^4x^4 + 4\,de^3x^3 + 6\,d^2e^2x^2 + 4\,d^3ex + d^4\right)^m\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4)^m,x)
```

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

$$\int \left(e^4x^4 + 4\,de^3x^3 + 6\,d^2e^2x^2 + 4\,d^3ex + d^4\right)^m F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4)^m
,x, algorithm="maxima")
```

```
[Out] integrate((e^4*x^4 + 4*d*e^3*x^3 + 6*d^2*e^2*x^2 + 4*d^3*e*x + d^4)^m*F^((b
*x + a)*c), x)
```

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

$$\mathrm{integral}\left(\left(e^4x^4 + 4\,de^3x^3 + 6\,d^2e^2x^2 + 4\,d^3ex + d^4\right)^m F^{bcx+ac}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4)^m
,x, algorithm="fricas")
```

```
[Out] integral((e^4*x^4 + 4*d*e^3*x^3 + 6*d^2*e^2*x^2 + 4*d^3*e*x + d^4)^m*F^(b*c
*x + a*c), x)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**4*x**4+4*d*e**3*x**3+6*d**2*e**2*x**2+4*d**3*e
*x+d**4)**m,x)
```

```
[Out] Timed out
```

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

$$\int \left(e^4x^4 + 4\,de^3x^3 + 6\,d^2e^2x^2 + 4\,d^3ex + d^4\right)^m F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^4*x^4+4*d*e^3*x^3+6*d^2*e^2*x^2+4*d^3*e*x+d^4)^m
,x, algorithm="giac")
```

```
[Out] integrate((e^4*x^4 + 4*d*e^3*x^3 + 6*d^2*e^2*x^2 + 4*d^3*e*x + d^4)^m*F^((b
*x + a)*c), x)
```

3.21 $\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^m\,dx$

Optimal. Leaf size=71

$$\frac{\left((d+ex)^3\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-3m}\text{Gamma}\left(3m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^3)^m*Gamma[1 + 3*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(3*m))
```

Rubi [A] time = 0.0604419, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 39, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.051, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^3\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-3m}\text{Gamma}\left(3m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^3)^m*Gamma[1 + 3*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(3*m))
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] &&  !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) &&  !IntegerQ[m]
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^m\,dx=(d+ex)^{-3m}\left((d+ex)^3\right)^m\int F^{c(a+bx)}(d+ex)^{3m}\,dx$$
$$=\frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^m\Gamma\left(1+3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-3m}}{bc\log(F)}$$

Mathematica [A] time = 0.013664, size = 71, normalized size = 1.

$$\frac{\left((d+ex)^3\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-3m}\text{Gamma}\left(3m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^3)^m*Gamma[1 + 3*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(3*m))
```

Maple [F] time = 0.077, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} \left(e^3x^3 + 3\,de^2x^2 + 3\,d^2ex + d^3\right)^m \,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m,x)
```

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

$$\int \left(e^3x^3 + 3\,de^2x^2 + 3\,d^2ex + d^3\right)^m F^{(bx+a)c} \,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m,x, algorithm=
"maxima")
```

```
[Out] integrate((e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m*F^((b*x + a)*c), x)
```

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

$$\text{integral}\left(\left(e^3x^3 + 3\,de^2x^2 + 3\,d^2ex + d^3\right)^m F^{bcx+ac}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m,x, algorithm=
"fricas")
```

```
[Out] integral((e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m*F^(b*c*x + a*c), x)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**3*x**3+3*d*e**2*x**2+3*d**2*e*x+d**3)**m,x)
```

```
[Out] Timed out
```

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

$$\int \left(e^3x^3 + 3\,de^2x^2 + 3\,d^2ex + d^3\right)^m F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m,x, algorithm=
"giac")
```

```
[Out] integrate((e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m*F^((b*x + a)*c), x)
```

3.22 $\int F^{c(a+bx)} \left(d^2+2dex+e^2x^2\right)^m \, dx$

Optimal. Leaf size=71

$$\frac{\left((d+ex)^2\right)^m F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-2m} \text{Gamma}\left(2m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^2)^m*Gamma[1 + 2*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(2*m))
```

Rubi [A] time = 0.0569066, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 28, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.071, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^2\right)^m F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-2m} \text{Gamma}\left(2m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d^2 + 2*d*e*x + e^2*x^2)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^2)^m*Gamma[1 + 2*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(2*m))
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] && !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) && !IntegerQ[m]
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned} \int F^{c(a+bx)} \left(d^2+2dex+e^2x^2\right)^m \, dx &= (d+ex)^{-2m} \left((d+ex)^2\right)^m \int F^{c(a+bx)}(d+ex)^{2m} \, dx \\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)} \left((d+ex)^2\right)^m \Gamma\left(1+2m,-\frac{bc(d+ex)\log(F)}{e}\right) \left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-2m}}{bc\log(F)} \end{aligned}$$

Mathematica [A] time = 0.0140685, size = 71, normalized size = 1.

$$\frac{\left((d+ex)^2\right)^m F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-2m} \text{Gamma}\left(2m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d^2 + 2*d*e*x + e^2*x^2)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^2)^m*Gamma[1 + 2*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(2*m))
```

Maple [F] time = 0.103, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} \left(e^2x^2 + 2\,dex + d^2\right)^m \,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2)^m,x)
```

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

$$\int \left(e^2x^2 + 2\,dex + d^2\right)^m F^{(bx+a)c} \,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2)^m,x, algorithm="maxima")
```

```
[Out] integrate((e^2*x^2 + 2*d*e*x + d^2)^m*F^((b*x + a)*c), x)
```

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

$$\mathrm{integral}\left(\left(e^2x^2 + 2\,dex + d^2\right)^m F^{bcx+ac}, x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2)^m,x, algorithm="fricas")
```

```
[Out] integral((e^2*x^2 + 2*d*e*x + d^2)^m*F^(b*c*x + a*c), x)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e**2*x**2+2*d*e*x+d**2)**m,x)
```

```
[Out] Timed out
```

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

$$\int \left(e^2x^2+2\,dex+d^2\right)^m F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e^2*x^2+2*d*e*x+d^2)^m,x, algorithm="giac")
```

```
[Out] integrate((e^2*x^2 + 2*d*e*x + d^2)^m*F^((b*x + a)*c), x)
```

3.23 $\int F^{c(a+bx)}(d+ex)^m\,dx$

Optimal. Leaf size=67

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m}\text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

Rubi [A] time = 0.0216785, antiderivative size = 67, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2181}

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m}\text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^m\,dx=\frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^m\Gamma\left(1+m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-m}}{bc\log(F)}$$

Mathematica [A] time = 0.0122916, size = 67, normalized size = 1.

$$\frac{(d+ex)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-m}\text{Gamma}\left(m+1,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*(d + e*x)^m*Gamma[1 + m, -((b*c*(d + e*x)*Log[F])/e)])
/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^m)
```

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

$$\int F^{c(bx+a)} (ex+d)^m \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^m,x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^m,x)
```

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

$$\int (ex+d)^m F^{(bx+a)c} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^m*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.53953, size = 153, normalized size = 2.28

$$\frac{e^{\left(-\frac{em\log\left(-\frac{bc\log(F)}{e}\right)+(bcd-ace)\log(F)}{e}\right)}\Gamma\left(m+1,-\frac{(bcex+bcd)\log(F)}{e}\right)}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="fricas")
```

```
[Out] e^(-(e*m*log(-b*c*log(F)/e) + (b*c*d - a*c*e)*log(F))/e)*gamma(m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**m,x)
```

```
[Out] Timed out
```

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

$$\int (ex+d)^m F^{(bx+a)c} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="giac")
```

```
[Out] integrate((e*x + d)^m*F^((b*x + a)*c), x)
```

3.24 $\int F^{c(a+bx)}(d+ex)^{-m}\,dx$

Optimal. Leaf size=69

$$\frac{(d+ex)^{-m}F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^m \text{Gamma}\left(1-m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d +
 e*x)*Log[F])/e))^m)/(b*c*(d + e*x)^m*Log[F])
```

Rubi [A] time = 0.024389, antiderivative size = 69, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.053, Rules used = {2181}

$$\frac{(d+ex)^{-m}F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^m \text{Gamma}\left(1-m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d +
 e*x)*Log[F])/e))^m)/(b*c*(d + e*x)^m*Log[F])
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^{-m}\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^{-m}\Gamma\left(1-m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^m}{bc\log(F)}$$

Mathematica [A] time = 0.0148788, size = 69, normalized size = 1.

$$\frac{(d+ex)^{-m}F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^m \text{Gamma}\left(1-m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d +
 e*x)*Log[F])/e))^m)/(b*c*(d + e*x)^m*Log[F])
```

Maple [F] time = 0.045, size = 0, normalized size = 0.

$$\int \frac{F^{c(bx+a)}}{(ex+d)^m}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/((e*x+d)^m),x)
```

```
[Out] int(F^(c*(b*x+a))/((e*x+d)^m),x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^m}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e*x+d)^m),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^m, x)
```

Fricas [A] time = 1.56557, size = 153, normalized size = 2.22

$$\frac{e^{\left(\frac{em\log\left(-\frac{bc\log(F)}{e}\right)-(bcd-ace)\log(F)}{e}\right)}\Gamma\left(-m+1,-\frac{(bcex+bcd)\log(F)}{e}\right)}{bc\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e*x+d)^m),x, algorithm="fricas")
```

```
[Out] e^((e*m*log(-b*c*log(F)/e) - (b*c*d - a*c*e)*log(F))/e)*gamma(-m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/((e*x+d)**m),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^m}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e*x+d)^m),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^m, x)
```

3.25 $\int F^{c(a+bx)} \left(d^2+2dex+e^2x^2\right)^{-m} dx$

Optimal. Leaf size=73

$$\frac{\left((d+ex)^2\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{2m} \operatorname{Gamma}\left(1-2m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 2*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(2*m))/(b*c*((d + e*x)^2)^m*Log[F])
```

Rubi [A] time = 0.0566247, antiderivative size = 73, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 30, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.067, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^2\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{2m} \operatorname{Gamma}\left(1-2m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^2 + 2*d*e*x + e^2*x^2)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 2*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(2*m))/(b*c*((d + e*x)^2)^m*Log[F])
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] &&  !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) &&  !IntegerQ[m]
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)} \left(d^2+2dex+e^2x^2\right)^{-m} dx &= (d+ex)^{2m} \left((d+ex)^2\right)^{-m} \int F^{c(a+bx)}(d+ex)^{-2m}\, dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)} \left((d+ex)^2\right)^{-m} \Gamma\left(1-2m,-\frac{bc(d+ex)\log(F)}{e}\right) \left(-\frac{bc(d+ex)\log(F)}{e}\right)^{2m}}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0107577, size = 73, normalized size = 1.

$$\frac{\left((d+ex)^2\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{2m} \operatorname{Gamma}\left(1-2m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^2 + 2*d*e*x + e^2*x^2)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 2*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(2*m))/(b*c*((d + e*x)^2)^m*Log[F])
```

Maple [F] time = 0.099, size = 0, normalized size = 0.

$$\int \frac{F^{c(bx+a)}}{\left(e^{2}x^{2}+2\,dex+d^{2}\right)^{m}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/((e^2*x^2+2*d*e*x+d^2)^m),x)
```

```
[Out] int(F^(c*(b*x+a))/((e^2*x^2+2*d*e*x+d^2)^m),x)
```

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

$$\int \frac{F^{(bx+a)c}}{\left(e^{2}x^{2}+2\,dex+d^{2}\right)^{m}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^2*x^2+2*d*e*x+d^2)^m),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^2*x^2 + 2*d*e*x + d^2)^m, x)
```

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

$$\mathrm{integral}\left(\frac{F^{bcx+ac}}{\left(e^{2}x^{2}+2\,dex+d^{2}\right)^{m}},x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^2*x^2+2*d*e*x+d^2)^m),x, algorithm="fricas")
```

```
[Out] integral(F^(b*c*x + a*c)/(e^2*x^2 + 2*d*e*x + d^2)^m, x)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/((e**2*x**2+2*d*e*x+d**2)**m),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{\left(e^2x^2 + 2\,dex + d^2\right)^m}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^2*x^2+2*d*e*x+d^2)^m),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^2*x^2 + 2*d*e*x + d^2)^m, x)
```

3.26 $\int F^{c(a+bx)} \left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^{-m} dx$

Optimal. Leaf size=73

$$\frac{\left((d+ex)^3\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3m} \text{Gamma}\left(1-3m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 3*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(3*m))/(b*c*((d + e*x)^3)^m*Log[F])
```

Rubi [A] time = 0.0597445, antiderivative size = 73, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 41, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.049, Rules used = {2188, 2181}

$$\frac{\left((d+ex)^3\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3m} \text{Gamma}\left(1-3m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 3*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(3*m))/(b*c*((d + e*x)^3)^m*Log[F])
```

Rule 2188

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Module[{uu = NormalizePowerOfLinear[u, x], z}, Simp[z = If[PowerQ[uu] &&
FreeQ[uu[[2]], x], uu[[1]]^(m*uu[[2]]), uu^m]; (uu^m*Int[z*(a + b*(F^(g*Exp
andToSum[v, x]))^n)^p, x])/z, x]] /; FreeQ[{F, a, b, g, m, n, p}, x] && Lin
earQ[v, x] && PowerOfLinearQ[u, x] && !(LinearMatchQ[v, x] && PowerOfLinea
rMatchQ[u, x]) && !IntegerQ[m]
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)} \left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^{-m} dx &= (d+ex)^{3m} \left((d+ex)^3\right)^{-m} \int F^{c(a+bx)}(d+ex)^{-3m} dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)} \left((d+ex)^3\right)^{-m} \Gamma\left(1-3m,-\frac{bc(d+ex)\log(F)}{e}\right) \left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3m}}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0108804, size = 73, normalized size = 1.

$$\frac{\left((d+ex)^3\right)^{-m} F^{c\left(a-\frac{bd}{e}\right)} \left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3m} \text{Gamma}\left(1-3m,-\frac{bc\log(F)(d+ex)}{e}\right)}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 3*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(3*m))/(b*c*((d + e*x)^3)^m*Log[F])
```

Maple [F] time = 0.075, size = 0, normalized size = 0.

$$\int \frac{F^{c(bx+a)}}{\left(e^3x^3+3\,de^2x^2+3\,d^2ex+d^3\right)^m}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/((e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m),x)
```

```
[Out] int(F^(c*(b*x+a))/((e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m),x)
```

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

$$\int \frac{F^{(bx+a)c}}{\left(e^3x^3+3\,de^2x^2+3\,d^2ex+d^3\right)^m}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m),x, algorith
m="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m, x)
```

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

$$\text{integral}\left(\frac{F^{bcx+ac}}{\left(e^3x^3+3\,de^2x^2+3\,d^2ex+d^3\right)^m},x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m),x, algorith
m="fricas")
```

```
[Out] integral(F^(b*c*x + a*c)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m, x)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/((e**3*x**3+3*d*e**2*x**2+3*d**2*e*x+d**3)**m),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{\left(e^3x^3 + 3\,de^2x^2 + 3\,d^2ex + d^3\right)^m}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/((e^3*x^3+3*d*e^2*x^2+3*d^2*e*x+d^3)^m),x, algorith
m="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3)^m, x)
```

3.27 $\int F^{2+5x}\,dx$

Optimal. Leaf size=15

$$\frac{F^{5x+2}}{5\log(F)}$$

```
[Out] F^(2 + 5*x)/(5*Log[F])
```

Rubi [A] time = 0.002795, antiderivative size = 15, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2194}

$$\frac{F^{5x+2}}{5\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(2 + 5*x),x]
```

```
[Out] F^(2 + 5*x)/(5*Log[F])
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{2+5x}\,dx = \frac{F^{2+5x}}{5\log(F)}$$

Mathematica [A] time = 0.0036337, size = 15, normalized size = 1.

$$\frac{F^{5x+2}}{5\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(2 + 5*x),x]
```

```
[Out] F^(2 + 5*x)/(5*Log[F])
```

Maple [A] time = 0.004, size = 14, normalized size = 0.9

$$\frac{F^{2+5\,x}}{5\,\ln(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(2+5*x),x)
```

```
[Out] 1/5*F^(2+5*x)/ln(F)
```

Maxima [A] time = 1.12231, size = 18, normalized size = 1.2

$$\frac{F^{5\,x+2}}{5\,\log\left(F\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(2+5*x),x, algorithm="maxima")
```

```
[Out] 1/5*F^(5*x + 2)/log(F)
```

Fricas [A] time = 1.50043, size = 32, normalized size = 2.13

$$\frac{F^{5\,x+2}}{5\,\log\left(F\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(2+5*x),x, algorithm="fricas")
```

```
[Out] 1/5*F^(5*x + 2)/log(F)
```

Sympy [A] time = 0.094902, size = 15, normalized size = 1.

$$\begin{cases} \frac{F^{5x+2}}{5\log\left(F\right)} & \text{for}\: 5\log\left(F\right) \neq 0 \\ x & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(2+5*x),x)
```

```
[Out] Piecewise((F**(5*x + 2)/(5*log(F)), Ne(5*log(F), 0)), (x, True))
```

Giac [A] time = 1.21063, size = 18, normalized size = 1.2

$$\frac{F^{5\,x+2}}{5\,\log\left(F\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(2+5*x),x, algorithm="giac")
```

```
[Out] 1/5*F^(5*x + 2)/log(F)
```

3.28 $\int F^{a+bx}\,dx$

Optimal. Leaf size=15

$$\frac{F^{a+bx}}{b\log(F)}$$

```
[Out] F^(a + b*x)/(b*Log[F])
```

Rubi [A] time = 0.0028422, antiderivative size = 15, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2194}

$$\frac{F^{a+bx}}{b\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x),x]
```

```
[Out] F^(a + b*x)/(b*Log[F])
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{a+bx}\,dx=\frac{F^{a+bx}}{b\log(F)}$$

Mathematica [A] time = 0.0035217, size = 15, normalized size = 1.

$$\frac{F^{a+bx}}{b\log(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x),x]
```

```
[Out] F^(a + b*x)/(b*Log[F])
```

Maple [A] time = 0.006, size = 16, normalized size = 1.1

$$\frac{F^{bx+a}}{b\ln(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a),x)
```

```
[Out] F^(b*x+a)/b/ln(F)
```

Maxima [A] time = 1.05093, size = 20, normalized size = 1.33

$$\frac{F^{bx+a}}{b\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a),x, algorithm="maxima")
```

```
[Out] F^(b*x + a)/(b*log(F))
```

Fricas [A] time = 1.51011, size = 32, normalized size = 2.13

$$\frac{F^{bx+a}}{b\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a),x, algorithm="fricas")
```

```
[Out] F^(b*x + a)/(b*log(F))
```

Sympy [A] time = 0.092784, size = 15, normalized size = 1.

$$\begin{cases} \frac{F^{a+bx}}{b\log(F)} & \text{for } b\log(F) \neq 0 \\ x & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a),x)
```

```
[Out] Piecewise((F**(a + b*x)/(b*log(F)), Ne(b*log(F), 0)), (x, True))
```

Giac [A] time = 1.19125, size = 20, normalized size = 1.33

$$\frac{F^{bx+a}}{b\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a),x, algorithm="giac")
```

```
[Out] F^(b*x + a)/(b*log(F))
```

3.29 $\int 10^{2+5x}\,dx$

Optimal. Leaf size=19

$$\frac{2^{5x+2}5^{5x+1}}{\log(10)}$$

```
[Out] (2^(2 + 5*x)*5^(1 + 5*x))/Log[10]
```

Rubi [A] time = 0.0054357, antiderivative size = 19, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2194}

$$\frac{2^{5x+2}5^{5x+1}}{\log(10)}$$

Antiderivative was successfully verified.

```
[In] Int[10^(2 + 5*x),x]
```

```
[Out] (2^(2 + 5*x)*5^(1 + 5*x))/Log[10]
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int 10^{2+5x}\,dx = \frac{2^{2+5x}5^{1+5x}}{\log(10)}$$

Mathematica [A] time = 0.0049009, size = 19, normalized size = 1.

$$\frac{2^{5x+2}5^{5x+1}}{\log(10)}$$

Antiderivative was successfully verified.

```
[In] Integrate[10^(2 + 5*x),x]
```

```
[Out] (2^(2 + 5*x)*5^(1 + 5*x))/Log[10]
```

Maple [A] time = 0.013, size = 14, normalized size = 0.7

$$\frac{10^{2+5\,x}}{5\,\ln(10)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(10^(2+5*x),x)
```

```
[Out] 1/5/ln(10)*10^(2+5*x)
```

Maxima [A] time = 1.13901, size = 18, normalized size = 0.95

$$\frac{10^{5\,x+2}}{5\,\log\left(10\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(10^(2+5*x),x, algorithm="maxima")
```

```
[Out] 1/5*10^(5*x + 2)/log(10)
```

Fricas [A] time = 1.49225, size = 35, normalized size = 1.84

$$\frac{10^{5\,x+2}}{5\,\log\left(10\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(10^(2+5*x),x, algorithm="fricas")
```

```
[Out] 1/5*10^(5*x + 2)/log(10)
```

Sympy [A] time = 0.089954, size = 10, normalized size = 0.53

$$\frac{10^{5x+2}}{5\log\left(10\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(10**(2+5*x),x)
```

```
[Out] 10**(5*x + 2)/(5*log(10))
```

Giac [A] time = 1.23942, size = 18, normalized size = 0.95

$$\frac{10^{5\,x+2}}{5\,\log\left(10\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(10^(2+5*x),x, algorithm="giac")
```

```
[Out] 1/5*10^(5*x + 2)/log(10)
```

3.30 $\int F^{a+bx} x^{7/2} \, dx$

Optimal. Leaf size=131

$$\frac{105\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)}-\frac{7x^{5/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{35x^{3/2}F^{a+bx}}{4b^3\log^3(F)}-\frac{105\sqrt{x}F^{a+bx}}{8b^4\log^4(F)}+\frac{x^{7/2}F^{a+bx}}{b\log(F)}$$

```
[Out] (105*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(16*b^(9/2)*Log[F]^(9
/2)) - (105*F^(a + b*x)*Sqrt[x])/(8*b^4*Log[F]^4) + (35*F^(a + b*x)*x^(3/2)
)/(4*b^3*Log[F]^3) - (7*F^(a + b*x)*x^(5/2))/(2*b^2*Log[F]^2) + (F^(a + b*x
)*x^(7/2))/(b*Log[F])
```

Rubi [A] time = 0.147164, antiderivative size = 131, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2176, 2180, 2204}

$$\frac{105\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)}-\frac{7x^{5/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{35x^{3/2}F^{a+bx}}{4b^3\log^3(F)}-\frac{105\sqrt{x}F^{a+bx}}{8b^4\log^4(F)}+\frac{x^{7/2}F^{a+bx}}{b\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)*x^(7/2),x]
```

```
[Out] (105*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(16*b^(9/2)*Log[F]^(9
/2)) - (105*F^(a + b*x)*Sqrt[x])/(8*b^4*Log[F]^4) + (35*F^(a + b*x)*x^(3/2)
)/(4*b^3*Log[F]^3) - (7*F^(a + b*x)*x^(5/2))/(2*b^2*Log[F]^2) + (F^(a + b*x
)*x^(7/2))/(b*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

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]
```

Rubi steps

$$\begin{aligned}\int F^{a+bx}x^{7/2}\,dx &= \frac{F^{a+bx}x^{7/2}}{b\log(F)} - \frac{7\int F^{a+bx}x^{5/2}\,dx}{2b\log(F)}\\
&= -\frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{35\int F^{a+bx}x^{3/2}\,dx}{4b^2\log^2(F)}\\
&= \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} - \frac{105\int F^{a+bx}\sqrt{x}\,dx}{8b^3\log^3(F)}\\
&= -\frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{105\int\frac{F^{a+bx}}{\sqrt{x}}\,dx}{16b^4\log^4(F)}\\
&= -\frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{105\,\mathrm{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{8b^4\log^4(F)}\\
&= \frac{105F^a\sqrt{\pi}\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0062582, size = 36, normalized size = 0.27

$$\frac{F^a\sqrt{-bx\log(F)}\mathrm{Gamma}\left(\frac{9}{2}, -bx\log(F)\right)}{b^5\sqrt{x}\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)*x^(7/2),x]
```

```
[Out] (F^a*Gamma[9/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])])/(b^5*Sqrt[x]*Log[F]^5)
```

Maple [A] time = 0.022, size = 99, normalized size = 0.8

$$-\frac{F^a}{b}\left(-\frac{\left(-72\,b^3x^3\,(\ln(F))^3 + 252\,b^2x^2\,(\ln(F))^2 - 630\,b\ln(F)\,x + 945\right)\mathrm{e}^{b\ln(F)x}}{72\,b^4}\sqrt{x}\,(-b)^{\frac{9}{2}}\,\sqrt{\ln(F)} + \frac{105\sqrt{\pi}}{16}\,(-b)^{\frac{9}{2}}\,\mathrm{erfi}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)*x^(7/2),x)
```

```
[Out] -F^a/(-b)^(7/2)/ln(F)^(9/2)/b*(-1/72*x^(1/2)*(-b)^(9/2)*ln(F)^(1/2)*(-72*b^
3*x^3*ln(F)^3+252*b^2*x^2*ln(F)^2-630*b*ln(F)*x+945)/b^4*exp(b*ln(F)*x)+105
/16*(-b)^(9/2)/b^(9/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.22927, size = 32, normalized size = 0.24

$$-\frac{F^a x^{\frac{9}{2}}\Gamma\left(\frac{9}{2}, -bx\log(F)\right)}{(-bx\log(F))^{\frac{9}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(9/2)*gamma(9/2, -b*x*log(F))/(-b*x*log(F))^(9/2)
```

Fricas [A] time = 1.53279, size = 254, normalized size = 1.94

$$-\frac{105\sqrt{\pi}\sqrt{-b\log(F)}F^a\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)-2\left(8b^4x^3\log(F)^4-28b^3x^2\log(F)^3+70b^2x\log(F)^2-105b\log(F)\right)F^{bx+a}}{16b^5\log(F)^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="fricas")
```

```
[Out] -1/16*(105*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) - 2*(8
*b^4*x^3*log(F)^4 - 28*b^3*x^2*log(F)^3 + 70*b^2*x*log(F)^2 - 105*b*log(F))
*F^(b*x + a)*sqrt(x))/(b^5*log(F)^5)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)*x**(7/2),x)
```

```
[Out] Timed out
```

Giac [A] time = 1.2203, size = 127, normalized size = 0.97

$$-\frac{105\sqrt{\pi}F^a\operatorname{erf}\left(-\sqrt{-b\log(F)}\sqrt{x}\right)}{16\sqrt{-b\log(F)}b^4\log(F)^4}+\frac{\left(8b^3x^{\frac{7}{2}}\log(F)^3-28b^2x^{\frac{5}{2}}\log(F)^2+70bx^{\frac{3}{2}}\log(F)-105\sqrt{x}\right)e^{(bx\log(F)+a\log(F))}}{8b^4\log(F)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="giac")
```

```
[Out] -105/16*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^4*log
(F)^4) + 1/8*(8*b^3*x^(7/2)*log(F)^3 - 28*b^2*x^(5/2)*log(F)^2 + 70*b*x^(3/
2)*log(F) - 105*sqrt(x))*e^(b*x*log(F) + a*log(F))/(b^4*log(F)^4)
```

3.31 $\int F^{a+bx}x^{5/2}\,dx$

Optimal. Leaf size=108

$$-\frac{15\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)}-\frac{5x^{3/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{15\sqrt{x}F^{a+bx}}{4b^3\log^3(F)}+\frac{x^{5/2}F^{a+bx}}{b\log(F)}$$

```
[Out] (-15*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(8*b^(7/2)*Log[F]^(7/
2)) + (15*F^(a + b*x)*Sqrt[x])/(4*b^3*Log[F]^3) - (5*F^(a + b*x)*x^(3/2))/(
2*b^2*Log[F]^2) + (F^(a + b*x)*x^(5/2))/(b*Log[F])
```

Rubi [A] time = 0.0938183, antiderivative size = 108, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2176, 2180, 2204}

$$-\frac{15\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)}-\frac{5x^{3/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{15\sqrt{x}F^{a+bx}}{4b^3\log^3(F)}+\frac{x^{5/2}F^{a+bx}}{b\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)*x^(5/2),x]
```

```
[Out] (-15*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(8*b^(7/2)*Log[F]^(7/
2)) + (15*F^(a + b*x)*Sqrt[x])/(4*b^3*Log[F]^3) - (5*F^(a + b*x)*x^(3/2))/(
2*b^2*Log[F]^2) + (F^(a + b*x)*x^(5/2))/(b*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$
\begin{aligned}
\int F^{a+bx}x^{5/2}\,dx &= \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{5\int F^{a+bx}x^{3/2}\,dx}{2b\log(F)} \\
&= -\frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} + \frac{15\int F^{a+bx}\sqrt{x}\,dx}{4b^2\log^2(F)} \\
&= \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{15\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{8b^3\log^3(F)} \\
&= \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{15\,\mathrm{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{4b^3\log^3(F)} \\
&= -\frac{15F^a\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)}
\end{aligned}
$$

Mathematica [A] time = 0.0064971, size = 36, normalized size = 0.33

$$
\frac{\sqrt{x}F^a\,\mathrm{Gamma}\left(\frac{7}{2}, -bx\log(F)\right)}{b^3\log^3(F)\sqrt{-bx\log(F)}}
$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)*x^(5/2),x]
```

```
[Out] (F^a*Sqrt[x]*Gamma[7/2, -(b*x*Log[F])])/(b^3*Log[F]^3*Sqrt[-(b*x*Log[F])])
```

Maple [A] time = 0.01, size = 87, normalized size = 0.8

$$
-\frac{F^a}{b}\left(\frac{\left(28\,b^2x^2\left(\ln(F)\right)^2 - 70\,b\ln(F)\,x + 105\right)\mathrm{e}^{b\ln(F)x}}{28\,b^3}\sqrt{x}\,(-b)^{\frac{7}{2}}\sqrt{\ln(F)} - \frac{15\sqrt{\pi}}{8}(-b)^{\frac{7}{2}}\,\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)b^{-\frac{7}{2}}\right)(-b)^{-\frac{5}{2}}\,(\mathrm{l}
$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)*x^(5/2),x)
```

```
[Out] -F^a/(-b)^(5/2)/ln(F)^(7/2)/b*(1/28*x^(1/2)*(-b)^(7/2)*ln(F)^(1/2)*(28*b^2*
x^2*ln(F)^2-70*b*ln(F)*x+105)/b^3*exp(b*ln(F)*x)-15/8*(-b)^(7/2)/b^(7/2)*Pi
^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.22414, size = 32, normalized size = 0.3

$$
-\frac{F^a x^{\frac{7}{2}}\Gamma\left(\frac{7}{2}, -bx\log(F)\right)}{\left(-bx\log(F)\right)^{\frac{7}{2}}}
$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(7/2)*gamma(7/2, -b*x*log(F))/(-b*x*log(F))^(7/2)
```

Fricas [A] time = 1.51819, size = 219, normalized size = 2.03

$$\frac{15\,\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}\operatorname{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)+2\left(4\,b^{3}x^{2}\log\left(F\right)^{3}-10\,b^{2}x\log\left(F\right)^{2}+15\,b\log\left(F\right)\right)F^{bx+a}\sqrt{x}}{8\,b^{4}\log\left(F\right)^{4}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="fricas")
```

```
[Out] 1/8*(15*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) + 2*(4*b^
3*x^2*log(F)^3 - 10*b^2*x*log(F)^2 + 15*b*log(F))*F^(b*x + a)*sqrt(x))/(b^4
*log(F)^4)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)*x**(5/2),x)
```

```
[Out] Timed out
```

Giac [A] time = 1.25743, size = 111, normalized size = 1.03

$$\frac{15\,\sqrt{\pi}F^{a}\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{8\,\sqrt{-b\log\left(F\right)}b^{3}\log\left(F\right)^{3}}+\frac{\left(4\,b^{2}x^{\frac{5}{2}}\log\left(F\right)^{2}-10\,bx^{\frac{3}{2}}\log\left(F\right)+15\,\sqrt{x}\right)e^{\left(bx\log\left(F\right)+a\log\left(F\right)\right)}}{4\,b^{3}\log\left(F\right)^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="giac")
```

```
[Out] 15/8*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^3*log(F)
^3) + 1/4*(4*b^2*x^(5/2)*log(F)^2 - 10*b*x^(3/2)*log(F) + 15*sqrt(x))*e^(b*
x*log(F) + a*log(F))/(b^3*log(F)^3)
```

3.32 $\int F^{a+bx}x^{3/2}\,dx$

Optimal. Leaf size=85

$$\frac{3\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3\sqrt{x}F^{a+bx}}{2b^2\log^2(F)}+\frac{x^{3/2}F^{a+bx}}{b\log(F)}$$

```
[Out] (3*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(4*b^(5/2)*Log[F]^(5/2)
) - (3*F^(a + b*x)*Sqrt[x])/(2*b^2*Log[F]^2) + (F^(a + b*x)*x^(3/2))/(b*Log
[F])
```

Rubi [A] time = 0.06581, antiderivative size = 85, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2176, 2180, 2204}

$$\frac{3\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3\sqrt{x}F^{a+bx}}{2b^2\log^2(F)}+\frac{x^{3/2}F^{a+bx}}{b\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)*x^(3/2),x]
```

```
[Out] (3*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(4*b^(5/2)*Log[F]^(5/2)
) - (3*F^(a + b*x)*Sqrt[x])/(2*b^2*Log[F]^2) + (F^(a + b*x)*x^(3/2))/(b*Log
[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int F^{a+bx}x^{3/2}\,dx = \frac{F^{a+bx}x^{3/2}}{b\log(F)} - \frac{3\int F^{a+bx}\sqrt{x}\,dx}{2b\log(F)}$$
$$= -\frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)} + \frac{3\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{4b^2\log^2(F)}$$
$$= -\frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)} + \frac{3\,\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{2b^2\log^2(F)}$$
$$= \frac{3F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)} - \frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)}$$

Mathematica [A] time = 0.0059449, size = 36, normalized size = 0.42

$$\frac{F^a\sqrt{-bx\log(F)}\text{Gamma}\left(\frac{5}{2}, -bx\log(F)\right)}{b^3\sqrt{x}\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)*x^(3/2),x]
```

```
[Out] (F^a*Gamma[5/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])])/(b^3*Sqrt[x]*Log[F]^3)
```

Maple [A] time = 0.012, size = 75, normalized size = 0.9

$$-\frac{F^a}{b}\left(-\frac{(-10\,b\ln(F)\,x+15)\,e^{b\ln(F)x}}{10\,b^2}\sqrt{x}\,(-b)^{\frac{5}{2}}\sqrt{\ln(F)} + \frac{3\sqrt{\pi}}{4}(-b)^{\frac{5}{2}}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)b^{-\frac{5}{2}}\right)(-b)^{-\frac{3}{2}}(\ln(F))^{-\frac{5}{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)*x^(3/2),x)
```

```
[Out] -F^a/(-b)^(3/2)/ln(F)^(5/2)/b*(-1/10*x^(1/2)*(-b)^(5/2)*ln(F)^(1/2)*(-10*b*
ln(F)*x+15)/b^2*exp(b*ln(F)*x)+3/4*(-b)^(5/2)/b^(5/2)*Pi^(1/2)*erfi(b^(1/2)
*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.21725, size = 32, normalized size = 0.38

$$-\frac{F^a x^{\frac{5}{2}}\Gamma\left(\frac{5}{2}, -bx\log(F)\right)}{(-bx\log(F))^{\frac{5}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(3/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(5/2)*gamma(5/2, -b*x*log(F))/(-b*x*log(F))^(5/2)
```

Fricas [A] time = 1.49949, size = 188, normalized size = 2.21

$$-\frac{3\,\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}\operatorname{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)-2\left(2\,b^{2}x\log\left(F\right)^{2}-3\,b\log\left(F\right)\right)F^{bx+a}\sqrt{x}}{4\,b^{3}\log\left(F\right)^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(3/2),x, algorithm="fricas")
```

```
[Out] -1/4*(3*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) - 2*(2*b^
2*x*log(F)^2 - 3*b*log(F))*F^(b*x + a)*sqrt(x))/(b^3*log(F)^3)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)*x**(3/2),x)
```

```
[Out] Timed out
```

Giac [A] time = 1.24248, size = 95, normalized size = 1.12

$$-\frac{3\,\sqrt{\pi}F^{a}\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{4\,\sqrt{-b\log\left(F\right)}b^{2}\log\left(F\right)^{2}}+\frac{\left(2\,bx^{\frac{3}{2}}\log\left(F\right)-3\,\sqrt{x}\right)e^{\left(bx\log\left(F\right)+a\log\left(F\right)\right)}}{2\,b^{2}\log\left(F\right)^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(3/2),x, algorithm="giac")
```

```
[Out] -3/4*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^2*log(F)
^2) + 1/2*(2*b*x^(3/2)*log(F) - 3*sqrt(x))*e^(b*x*log(F) + a*log(F))/(b^2*l
og(F)^2)
```

3.33 $\int F^{a+bx}\sqrt{x}\,dx$

Optimal. Leaf size=62

$$\frac{\sqrt{x}F^{a+bx}}{b\log(F)}-\frac{\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)}$$

```
[Out] -(F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(2*b^(3/2)*Log[F]^(3/2))
 + (F^(a + b*x)*Sqrt[x])/(b*Log[F])
```

Rubi [A] time = 0.0443172, antiderivative size = 62, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2176, 2180, 2204}

$$\frac{\sqrt{x}F^{a+bx}}{b\log(F)}-\frac{\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)*Sqrt[x],x]
```

```
[Out] -(F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(2*b^(3/2)*Log[F]^(3/2))
 + (F^(a + b*x)*Sqrt[x])/(b*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\begin{aligned}\int F^{a+bx}\sqrt{x}\,dx&=\frac{F^{a+bx}\sqrt{x}}{b\log(F)}-\frac{\int\frac{F^{a+bx}}{\sqrt{x}}\,dx}{2b\log(F)}\\&=\frac{F^{a+bx}\sqrt{x}}{b\log(F)}-\frac{\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)}{b\log(F)}\\&=-\frac{F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)}+\frac{F^{a+bx}\sqrt{x}}{b\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0076998, size = 30, normalized size = 0.48

$$-\frac{x^{3/2}F^a\text{Gamma}\left(\frac{3}{2},-bx\log(F)\right)}{(-bx\log(F))^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)*Sqrt[x],x]
```

```
[Out] -((F^a*x^(3/2)*Gamma[3/2, -(b*x*Log[F])])/(-(b*x*Log[F]))^(3/2))
```

Maple [A] time = 0.008, size = 66, normalized size = 1.1

$$-\frac{F^a}{b}\left(\frac{e^{b\ln(F)x}}{b}\sqrt{x}\,(-b)^{\frac{3}{2}}\sqrt{\ln(F)}-\frac{\sqrt{\pi}}{2}(-b)^{\frac{3}{2}}\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)b^{-\frac{3}{2}}\right)\frac{1}{\sqrt{-b}}(\ln(F))^{-\frac{3}{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)*x^(1/2),x)
```

```
[Out] -F^a/(-b)^(1/2)/ln(F)^(3/2)/b*(x^(1/2)*(-b)^(3/2)*ln(F)^(1/2)/b*exp(b*ln(F)
*x)-1/2*(-b)^(3/2)/b^(3/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.24986, size = 32, normalized size = 0.52

$$-\frac{F^a x^{\frac{3}{2}}\Gamma\left(\frac{3}{2},-bx\log(F)\right)}{(-bx\log(F))^{\frac{3}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(3/2)*gamma(3/2, -b*x*log(F))/(-b*x*log(F))^(3/2)
```

Fricas [A] time = 1.5187, size = 153, normalized size = 2.47

$$\frac{2\,F^{bx+a}b\sqrt{x}\log(F)+\sqrt{\pi}\sqrt{-b\log(F)}F^a\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)}{2\,b^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="fricas")
```

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

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

$$\int F^{a+bx}\sqrt{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)*x**(1/2),x)
```

```
[Out] Integral(F**(a + b*x)*sqrt(x), x)
```

Giac [A] time = 1.22632, size = 78, normalized size = 1.26

$$\frac{\sqrt{\pi}F^{a}\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{2\sqrt{-b\log\left(F\right)}b\log\left(F\right)}+\frac{\sqrt{x}e^{\left(bx\log\left(F\right)+a\log\left(F\right)\right)}}{b\log\left(F\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="giac")
```

```
[Out] 1/2*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b*log(F)) +
 sqrt(x)*e^(b*x*log(F) + a*log(F))/(b*log(F))
```

3.34 $\int \frac{F^{a+bx}}{\sqrt{x}}\,dx$

Optimal. Leaf size=38

$$\frac{\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}$$

```
[Out] (F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(Sqrt[b]*Sqrt[Log[F]])
```

Rubi [A] time = 0.025179, antiderivative size = 38, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.154, Rules used = {2180, 2204}

$$\frac{\sqrt{\pi}F^a\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)/Sqrt[x],x]
```

```
[Out] (F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(Sqrt[b]*Sqrt[Log[F]])
```

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]
```

Rubi steps

$$\begin{aligned}\int \frac{F^{a+bx}}{\sqrt{x}}\,dx &= 2\,\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)\\ &= \frac{F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}\end{aligned}$$

Mathematica [A] time = 0.0063854, size = 30, normalized size = 0.79

$$-\frac{\sqrt{x}F^a\text{Gamma}\left(\frac{1}{2},-bx\log(F)\right)}{\sqrt{-bx\log(F)}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)/Sqrt[x],x]
```

```
[Out] -((F^a*Sqrt[x]*Gamma[1/2, -(b*x*Log[F])])/Sqrt[-(b*x*Log[F])])
```

Maple [A] time = 0.008, size = 27, normalized size = 0.7

$$F^{a}\sqrt{\pi}\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)\frac{1}{\sqrt{b}}\frac{1}{\sqrt{\ln(F)}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)/x^(1/2),x)
```

```
[Out] F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b^(1/2)/ln(F)^(1/2)
```

Maxima [A] time = 1.15337, size = 39, normalized size = 1.03

$$\frac{\sqrt{\pi}F^{a}\sqrt{x}\left(\mathrm{erf}\left(\sqrt{-bx\log(F)}\right)-1\right)}{\sqrt{-bx\log(F)}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="maxima")
```

```
[Out] sqrt(pi)*F^a*sqrt(x)*(erf(sqrt(-b*x*log(F))) - 1)/sqrt(-b*x*log(F))
```

Fricas [A] time = 1.5287, size = 96, normalized size = 2.53

$$-\frac{\sqrt{\pi}\sqrt{-b\log(F)}F^{a}\,\mathrm{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)}{b\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="fricas")
```

```
[Out] -sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x))/(b*log(F))
```

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

$$\int\frac{F^{a+bx}}{\sqrt{x}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)/x**(1/2),x)
```

```
[Out] Integral(F**(a + b*x)/sqrt(x), x)
```

Giac [A] time = 1.34626, size = 38, normalized size = 1.

$$-\frac{\sqrt{\pi}F^{a}\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{\sqrt{-b\log\left(F\right)}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="giac")
```

```
[Out] -sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/sqrt(-b*log(F))
```

3.35 $\int \frac{F^{a+bx}}{x^{3/2}}\,dx$

Optimal. Leaf size=54

$$2\sqrt{\pi}\sqrt{b}F^a\sqrt{\log(F)}\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{2F^{a+bx}}{\sqrt{x}}$$

```
[Out] (-2*F^(a + b*x))/Sqrt[x] + 2*Sqrt[b]*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt
[Log[F]]]*Sqrt[Log[F]]
```

Rubi [A] time = 0.0454763, antiderivative size = 54, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2177, 2180, 2204}

$$2\sqrt{\pi}\sqrt{b}F^a\sqrt{\log(F)}\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{2F^{a+bx}}{\sqrt{x}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)/x^(3/2),x]
```

```
[Out] (-2*F^(a + b*x))/Sqrt[x] + 2*Sqrt[b]*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt
[Log[F]]]*Sqrt[Log[F]]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\begin{aligned}\int \frac{F^{a+bx}}{x^{3/2}}\,dx &= -\frac{2F^{a+bx}}{\sqrt{x}}+(2b\log(F))\int \frac{F^{a+bx}}{\sqrt{x}}\,dx\\ &= -\frac{2F^{a+bx}}{\sqrt{x}}+(4b\log(F))\,\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)\\ &= -\frac{2F^{a+bx}}{\sqrt{x}}+2\sqrt{b}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\sqrt{\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0151075, size = 38, normalized size = 0.7

$$-\frac{2F^a\left(F^{bx}-\sqrt{-bx\log(F)}\text{Gamma}\left(\frac{1}{2},-bx\log(F)\right)\right)}{\sqrt{x}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)/x^(3/2),x]
```

```
[Out] (-2*F^a*(F^(b*x) - Gamma[1/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])]))/Sqrt[x]
```

Maple [A] time = 0.01, size = 64, normalized size = 1.2

$$-\frac{F^a}{b}(-b)^{\frac{3}{2}}\sqrt{\ln(F)}\left(-2\frac{e^{b\ln(F)x}}{\sqrt{x}\sqrt{-b}\sqrt{\ln(F)}}+2\frac{\sqrt{b}\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)}{\sqrt{-b}}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)/x^(3/2),x)
```

```
[Out] -F^a*(-b)^(3/2)*ln(F)^(1/2)/b*(-2/x^(1/2)/(-b)^(1/2)/ln(F)^(1/2)*exp(b*ln(F
)*x)+2/(-b)^(1/2)*b^(1/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.21438, size = 32, normalized size = 0.59

$$-\frac{\sqrt{-bx\log(F)}F^a\Gamma\left(-\frac{1}{2},-bx\log(F)\right)}{\sqrt{x}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="maxima")
```

```
[Out] -sqrt(-b*x*log(F))*F^a*gamma(-1/2, -b*x*log(F))/sqrt(x)
```

Fricas [A] time = 1.54878, size = 122, normalized size = 2.26

$$-\frac{2\left(\sqrt{\pi}\sqrt{-b\log(F)}F^a x\,\text{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)+F^{bx+a}\sqrt{x}\right)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="fricas")
```

```
[Out] -2*(sqrt(pi)*sqrt(-b*log(F))*F^a*x*erf(sqrt(-b*log(F))*sqrt(x)) + F^(b*x +
a)*sqrt(x))/x
```

Sympy [A] time = 6.77587, size = 34, normalized size = 0.63

$$4F^aF^{bx}b\sqrt{x}\log(F) - \frac{2F^aF^{bx}}{\sqrt{x}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)/x**(3/2),x)
```

```
[Out] 4*F**a*F**(b*x)*b*sqrt(x)*log(F) - 2*F**a*F**(b*x)/sqrt(x)
```

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

$$\int \frac{F^{bx+a}}{x^{\frac{3}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="giac")
```

```
[Out] integrate(F^(b*x + a)/x^(3/2), x)
```

3.36 $\int \frac{F^{a+bx}}{x^{5/2}}\,dx$

Optimal. Leaf size=77

$$\frac{4}{3}\sqrt{\pi}b^{3/2}F^a\log^{\frac{3}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4b\log(F)F^{a+bx}}{3\sqrt{x}}$$

```
[Out] (-2*F^(a + b*x))/(3*x^(3/2)) - (4*b*F^(a + b*x)*Log[F])/(3*Sqrt[x]) + (4*b^
(3/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(3/2))/3
```

Rubi [A] time = 0.064935, antiderivative size = 77, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2177, 2180, 2204}

$$\frac{4}{3}\sqrt{\pi}b^{3/2}F^a\log^{\frac{3}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4b\log(F)F^{a+bx}}{3\sqrt{x}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)/x^(5/2),x]
```

```
[Out] (-2*F^(a + b*x))/(3*x^(3/2)) - (4*b*F^(a + b*x)*Log[F])/(3*Sqrt[x]) + (4*b^
(3/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(3/2))/3
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\begin{aligned}
\int \frac{F^{a+bx}}{x^{5/2}}\,dx &= -\frac{2F^{a+bx}}{3x^{3/2}}+\frac{1}{3}(2b\log(F))\int \frac{F^{a+bx}}{x^{3/2}}\,dx\\
&= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{1}{3}\left(4b^2\log^2(F)\right)\int \frac{F^{a+bx}}{\sqrt{x}}\,dx\\
&= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{1}{3}\left(8b^2\log^2(F)\right)\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)\\
&= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{4}{3}b^{3/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{3}{2}}(F)
\end{aligned}$$

Mathematica [A] time = 0.0368925, size = 49, normalized size = 0.64

$$-\frac{2F^a\left(2(-bx\log(F))^{3/2}\text{Gamma}\left(\frac{1}{2},-bx\log(F)\right)+F^{bx}(2bx\log(F)+1)\right)}{3x^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)/x^(5/2),x]
```

```
[Out] (-2*F^a*(2*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(3/2) + F^(b*x)*(1 + 2
*b*x*Log[F])))/(3*x^(3/2))
```

Maple [A] time = 0.011, size = 72, normalized size = 0.9

$$-\frac{F^a}{b}(-b)^{\frac{5}{2}}(\ln(F))^{\frac{3}{2}}\left(-\frac{(4b\ln(F)x+2)e^{b\ln(F)x}}{3}x^{-\frac{3}{2}}(-b)^{-\frac{3}{2}}(\ln(F))^{-\frac{3}{2}}+\frac{4\sqrt{\pi}}{3}b^{\frac{3}{2}}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)(-b)^{-\frac{3}{2}}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)/x^(5/2),x)
```

```
[Out] -F^a*(-b)^(5/2)*ln(F)^(3/2)/b*(-2/3/x^(3/2)/(-b)^(3/2)/ln(F)^(3/2)*(2*b*ln(
F)*x+1)*exp(b*ln(F)*x)+4/3/(-b)^(3/2)*b^(3/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)
*ln(F)^(1/2)))
```

Maxima [A] time = 1.25236, size = 32, normalized size = 0.42

$$-\frac{(-bx\log(F))^{\frac{3}{2}}F^a\Gamma\left(-\frac{3}{2},-bx\log(F)\right)}{x^{\frac{3}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="maxima")
```

```
[Out] -(-b*x*log(F))^(3/2)*F^a*gamma(-3/2, -b*x*log(F))/x^(3/2)
```

Fricas [A] time = 1.54017, size = 170, normalized size = 2.21

$$-\frac{2\left(2\sqrt{\pi}\sqrt{-b\log(F)}F^abx^2\,\text{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)\log(F)+(2bx\log(F)+1)F^{bx+a}\sqrt{x}\right)}{3x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="fricas")
```

```
[Out] -2/3*(2*sqrt(pi)*sqrt(-b*log(F))*F^a*b*x^2*erf(sqrt(-b*log(F))*sqrt(x))*log
(F) + (2*b*x*log(F) + 1)*F^(b*x + a)*sqrt(x))/x^2
```

Sympy [A] time = 175.103, size = 39, normalized size = 0.51

$$-\frac{4F^aF^{bx}b\log(F)}{3\sqrt{x}}-\frac{2F^aF^{bx}}{3x^{\frac{3}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)/x**(5/2),x)
```

```
[Out] -4*F**a*F**(b*x)*b*log(F)/(3*sqrt(x)) - 2*F**a*F**(b*x)/(3*x**(3/2))
```

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

$$\int \frac{F^{bx+a}}{x^{\frac{5}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="giac")
```

```
[Out] integrate(F^(b*x + a)/x^(5/2), x)
```

3.37 $\int \frac{F^{a+bx}}{x^{7/2}}\,dx$

Optimal. Leaf size=100

$$\frac{8}{15}\sqrt{\pi}b^{5/2}F^a\log^{\frac{5}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{8b^2\log^2(F)F^{a+bx}}{15\sqrt{x}}-\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4b\log(F)F^{a+bx}}{15x^{3/2}}$$

```
[Out] (-2*F^(a + b*x))/(5*x^(5/2)) - (4*b*F^(a + b*x)*Log[F])/(15*x^(3/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(15*Sqrt[x]) + (8*b^(5/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b
]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(5/2))/15
```

Rubi [A] time = 0.0894239, antiderivative size = 100, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2177, 2180, 2204}

$$\frac{8}{15}\sqrt{\pi}b^{5/2}F^a\log^{\frac{5}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{8b^2\log^2(F)F^{a+bx}}{15\sqrt{x}}-\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4b\log(F)F^{a+bx}}{15x^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)/x^(7/2),x]
```


```
[Out] (-2*F^(a + b*x))/(5*x^(5/2)) - (4*b*F^(a + b*x)*Log[F])/(15*x^(3/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(15*Sqrt[x]) + (8*b^(5/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b
]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(5/2))/15
```


Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = -\frac{2F^{a+bx}}{5x^{5/2}} + \frac{1}{5}(2b\log(F))\int \frac{F^{a+bx}}{x^{5/2}}\,dx$$
$$= -\frac{2F^{a+bx}}{5x^{5/2}} - \frac{4bF^{a+bx}\log(F)}{15x^{3/2}} + \frac{1}{15}\left(4b^2\log^2(F)\right)\int \frac{F^{a+bx}}{x^{3/2}}\,dx$$
$$= -\frac{2F^{a+bx}}{5x^{5/2}} - \frac{4bF^{a+bx}\log(F)}{15x^{3/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}} + \frac{1}{15}\left(8b^3\log^3(F)\right)\int \frac{F^{a+bx}}{\sqrt{x}}\,dx$$
$$= -\frac{2F^{a+bx}}{5x^{5/2}} - \frac{4bF^{a+bx}\log(F)}{15x^{3/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}} + \frac{1}{15}\left(16b^3\log^3(F)\right)\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)$$
$$= -\frac{2F^{a+bx}}{5x^{5/2}} - \frac{4bF^{a+bx}\log(F)}{15x^{3/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}} + \frac{8}{15}b^{5/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{5}{2}}(F)$$

Mathematica [A] time = 0.0500716, size = 61, normalized size = 0.61

$$-\frac{2F^a\left(F^{bx}\left(4b^2x^2\log^2(F)+2bx\log(F)+3\right)-4(-bx\log(F))^{5/2}\text{Gamma}\left(\frac{1}{2},-bx\log(F)\right)\right)}{15x^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)/x^(7/2),x]
```

```
[Out] (-2*F^a*(-4*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(5/2) + F^(b*x)*(3 +
2*b*x*Log[F] + 4*b^2*x^2*Log[F]^2)))/(15*x^(5/2))
```

Maple [A] time = 0.012, size = 84, normalized size = 0.8

$$-\frac{F^a}{b}(-b)^{\frac{7}{2}}(\ln(F))^{\frac{5}{2}}\left(-\frac{2\,e^{b\ln(F)x}}{5}\left(\frac{4\,b^2x^2(\ln(F))^2}{3}+\frac{2\,b\ln(F)\,x}{3}+1\right)x^{-\frac{5}{2}}(-b)^{-\frac{5}{2}}(\ln(F))^{-\frac{5}{2}}+\frac{8\sqrt{\pi}}{15}b^{\frac{5}{2}}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)\ldots$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)/x^(7/2),x)
```

```
[Out] -F^a*(-b)^(7/2)*ln(F)^(5/2)/b*(-2/5/x^(5/2)/(-b)^(5/2)/ln(F)^(5/2)*(4/3*b^2
*x^2*ln(F)^2+2/3*b*ln(F)*x+1)*exp(b*ln(F)*x)+8/15/(-b)^(5/2)*b^(5/2)*Pi^(1/
2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.25492, size = 32, normalized size = 0.32

$$-\frac{(-bx\log(F))^{\frac{5}{2}}F^a\Gamma\left(-\frac{5}{2},-bx\log(F)\right)}{x^{\frac{5}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="maxima")
```

```
[Out] -(-b*x*log(F))^(5/2)*F^a*gamma(-5/2, -b*x*log(F))/x^(5/2)
```

Fricas [A] time = 1.52355, size = 205, normalized size = 2.05

$$-\frac{2\left(4\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}b^{2}x^{3}\operatorname{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)\log\left(F\right)^{2}+\left(4\,b^{2}x^{2}\log\left(F\right)^{2}+2\,bx\log\left(F\right)+3\right)F^{bx+a}\sqrt{x}\right)}{15\,x^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="fricas")
```

```
[Out] -2/15*(4*sqrt(pi)*sqrt(-b*log(F))*F^a*b^2*x^3*erf(sqrt(-b*log(F))*sqrt(x))*
log(F)^2 + (4*b^2*x^2*log(F)^2 + 2*b*x*log(F) + 3)*F^(b*x + a)*sqrt(x))/x^3
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)/x**(7/2),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{bx+a}}{x^{\frac{7}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="giac")
```

```
[Out] integrate(F^(b*x + a)/x^(7/2), x)
```

3.38 $\int \frac{F^{a+bx}}{x^{9/2}}\,dx$

Optimal. Leaf size=123

$$\frac{16}{105}\sqrt{\pi}b^{7/2}F^a\log^{\frac{7}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{8b^2\log^2(F)F^{a+bx}}{105x^{3/2}}-\frac{16b^3\log^3(F)F^{a+bx}}{105\sqrt{x}}-\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4b\log(F)F^{a+bx}}{35x^{5/2}}$$

```
[Out] (-2*F^(a + b*x))/(7*x^(7/2)) - (4*b*F^(a + b*x)*Log[F])/(35*x^(5/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(105*x^(3/2)) - (16*b^3*F^(a + b*x)*Log[F]^3)/(105
*Sqrt[x]) + (16*b^(7/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log
[F]^(7/2))/105
```

Rubi [A] time = 0.1082, antiderivative size = 123, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2177, 2180, 2204}

$$\frac{16}{105}\sqrt{\pi}b^{7/2}F^a\log^{\frac{7}{2}}(F)\text{Erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{8b^2\log^2(F)F^{a+bx}}{105x^{3/2}}-\frac{16b^3\log^3(F)F^{a+bx}}{105\sqrt{x}}-\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4b\log(F)F^{a+bx}}{35x^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*x)/x^(9/2),x]
```

```
[Out] (-2*F^(a + b*x))/(7*x^(7/2)) - (4*b*F^(a + b*x)*Log[F])/(35*x^(5/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(105*x^(3/2)) - (16*b^3*F^(a + b*x)*Log[F]^3)/(105
*Sqrt[x]) + (16*b^(7/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log
[F]^(7/2))/105
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{2F^{a+bx}}{7x^{7/2}} + \frac{1}{7}(2b\log(F))\int \frac{F^{a+bx}}{x^{7/2}}\,dx$$
$$= -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} + \frac{1}{35}\left(4b^2\log^2(F)\right)\int \frac{F^{a+bx}}{x^{5/2}}\,dx$$
$$= -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}} + \frac{1}{105}\left(8b^3\log^3(F)\right)\int \frac{F^{a+bx}}{x^{3/2}}\,dx$$
$$= -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}} - \frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}} + \frac{1}{105}\left(16b^4\log^4(F)\right)\int \frac{F^{a+bx}}{\sqrt{x}}\,dx$$
$$= -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}} - \frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}} + \frac{1}{105}\left(32b^4\log^4(F)\right)\text{Subst}\left(\int F^{a-}\right.$$
$$= -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}} - \frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}} + \frac{16}{105}b^{7/2}F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right.$$

Mathematica [A] time = 0.0620532, size = 73, normalized size = 0.59

$$-\frac{2F^a\left(8(-bx\log(F))^{7/2}\text{Gamma}\left(\frac{1}{2},-bx\log(F)\right)+F^{bx}\left(8b^3x^3\log^3(F)+4b^2x^2\log^2(F)+6bx\log(F)+15\right)\right)}{105x^{7/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*x)/x^(9/2),x]
```

```
[Out] (-2*F^a*(8*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(7/2) + F^(b*x)*(15 +
6*b*x*Log[F] + 4*b^2*x^2*Log[F]^2 + 8*b^3*x^3*Log[F]^3)))/(105*x^(7/2))
```

Maple [A] time = 0.013, size = 96, normalized size = 0.8

$$-\frac{F^a}{b}(-b)^{\frac{9}{2}}(\ln(F))^{\frac{7}{2}}\left(-\frac{2\,e^{b\ln(F)x}}{7}\left(\frac{8\,b^3x^3(\ln(F))^3}{15}+\frac{4\,b^2x^2(\ln(F))^2}{15}+\frac{2\,b\ln(F)\,x}{5}+1\right)x^{-\frac{7}{2}}(-b)^{-\frac{7}{2}}(\ln(F))^{-\frac{7}{2}}+\frac{16\sqrt{\pi}}{105}b\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(b*x+a)/x^(9/2),x)
```

```
[Out] -F^a*(-b)^(9/2)*ln(F)^(7/2)/b*(-2/7/x^(7/2)/(-b)^(7/2)/ln(F)^(7/2)*(8/15*b^
3*x^3*ln(F)^3+4/15*b^2*x^2*ln(F)^2+2/5*b*ln(F)*x+1)*exp(b*ln(F)*x)+16/105/(
-b)^(7/2)*b^(7/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Maxima [A] time = 1.29661, size = 32, normalized size = 0.26

$$-\frac{(-bx\log(F))^{\frac{7}{2}}F^a\Gamma\left(-\frac{7}{2},-bx\log(F)\right)}{x^{\frac{7}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="maxima")
```

```
[Out] -(-b*x*log(F))^(7/2)*F^a*gamma(-7/2, -b*x*log(F))/x^(7/2)
```

Fricas [A] time = 1.48007, size = 236, normalized size = 1.92

$$-\frac{2\left(8\sqrt{\pi}\sqrt{-b\log(F)}F^ab^3x^4\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)\log(F)^3+\left(8b^3x^3\log(F)^3+4b^2x^2\log(F)^2+6bx\log(F)+15\right)F^{bx+a}\sqrt{x}\right)}{105x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="fricas")
```

```
[Out] -2/105*(8*sqrt(pi)*sqrt(-b*log(F))*F^a*b^3*x^4*erf(sqrt(-b*log(F))*sqrt(x))
*log(F)^3 + (8*b^3*x^3*log(F)^3 + 4*b^2*x^2*log(F)^2 + 6*b*x*log(F) + 15)*F
^(b*x + a)*sqrt(x))/x^4
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(b*x+a)/x**(9/2),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{bx+a}}{x^{\frac{9}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="giac")
```

```
[Out] integrate(F^(b*x + a)/x^(9/2), x)
```

3.39 $\int F^{c(a+bx)}(d+ex)^{7/2}\,dx$

Optimal. Leaf size=208

$$\frac{105\sqrt{\pi}e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)}+\frac{35e^2(d+ex)^{3/2}F^{c(a+bx)}}{4b^3c^3\log^3(F)}-\frac{105e^3\sqrt{d+ex}F^{c(a+bx)}}{8b^4c^4\log^4(F)}-\frac{7e(d+ex)^{5/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+$$

```
[Out] (105*e^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(16*b^(9/2)*c^(9/2)*Log[F]^(9/2)) - (105*e^3*F^(
c*(a + b*x))*Sqrt[d + e*x])/(8*b^4*c^4*Log[F]^4) + (35*e^2*F^(c*(a + b*x))*
(d + e*x)^(3/2))/(4*b^3*c^3*Log[F]^3) - (7*e*F^(c*(a + b*x))*(d + e*x)^(5/2
))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(7/2))/(b*c*Log[F])
```

Rubi [A] time = 0.266096, antiderivative size = 208, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2176, 2180, 2204}

$$\frac{105\sqrt{\pi}e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)}+\frac{35e^2(d+ex)^{3/2}F^{c(a+bx)}}{4b^3c^3\log^3(F)}-\frac{105e^3\sqrt{d+ex}F^{c(a+bx)}}{8b^4c^4\log^4(F)}-\frac{7e(d+ex)^{5/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^(7/2),x]
```

```
[Out] (105*e^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(16*b^(9/2)*c^(9/2)*Log[F]^(9/2)) - (105*e^3*F^(
c*(a + b*x))*Sqrt[d + e*x])/(8*b^4*c^4*Log[F]^4) + (35*e^2*F^(c*(a + b*x))*
(d + e*x)^(3/2))/(4*b^3*c^3*Log[F]^3) - (7*e*F^(c*(a + b*x))*(d + e*x)^(5/2
))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(7/2))/(b*c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} - \frac{(7e)\int F^{c(a+bx)}(d+ex)^{5/2}\,dx}{2bc\log(F)}$$

$$= -\frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} + \frac{\left(35e^2\right)\int F^{c(a+bx)}(d+ex)^{3/2}\,dx}{4b^2c^2\log^2(F)}$$

$$= \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} - \frac{\left(105e^3\right)\int F^{c(a+bx)}\sqrt{d+e}}{8b^3c^3\log^3(F)}$$

$$= -\frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} +$$

$$= -\frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} +$$

$$= \frac{105e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} -$$

Mathematica [A] time = 0.0296248, size = 72, normalized size = 0.35

$$\frac{e^4F^{c\left(a-\frac{bd}{e}\right)}\sqrt{-\frac{bc\log(F)(d+ex)}{e}}\,\mathrm{Gamma}\left(\frac{9}{2},-\frac{bc\log(F)(d+ex)}{e}\right)}{b^5c^5\log^5(F)\sqrt{d+ex}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(7/2),x]
```

```
[Out] (e^4*F^(c*(a - (b*d)/e))*Gamma[9/2, -((b*c*(d + e*x)*Log[F])/e)]*Sqrt[-((b*
c*(d + e*x)*Log[F])/e)])/(b^5*c^5*Sqrt[d + e*x]*Log[F]^5)
```

Maple [F] time = 0.02, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{\frac{7}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(7/2),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(7/2),x)
```

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

$$\int (ex+d)^{\frac{7}{2}}F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^(7/2)*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.55591, size = 516, normalized size = 2.48

$$-\frac{\frac{105\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^4\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}} + 2\left(105\,bce^3\log(F) - 8\left(b^4c^4e^3x^3 + 3\,b^4c^4de^2x^2 + 3\,b^4c^4d^2ex + b^4c^4d^3\right)\log(F)^4 \right.}{16\,b^5c^5\log(F)^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="fricas")
```

```
[Out] -1/16*(105*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^4*erf(sqrt(e*x + d)*sqrt(-b*c*log
(F)/e))/F^((b*c*d - a*c*e)/e) + 2*(105*b*c*e^3*log(F) - 8*(b^4*c^4*e^3*x^3
+ 3*b^4*c^4*d*e^2*x^2 + 3*b^4*c^4*d^2*e*x + b^4*c^4*d^3)*log(F)^4 + 28*(b^3
*c^3*e^3*x^2 + 2*b^3*c^3*d*e^2*x + b^3*c^3*d^2*e)*log(F)^3 - 70*(b^2*c^2*e^
3*x + b^2*c^2*d*e^2)*log(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^5*c^5*log(
F)^5)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(7/2),x)
```

```
[Out] Timed out
```

Giac [B] time = 1.37808, size = 1301, normalized size = 6.25

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="giac")
```

```
[Out] 1/16*(8*d^3*(sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b
*c*d*log(F) - a*c*e*log(F))*e^(-1) + 2)/(sqrt(-b*c*e*log(F))*b*c*log(F)) +
2*sqrt(x*e + d)*e^(((x*e + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(
-1) + 1)/(b*c*log(F))) - 12*d^2*(sqrt(pi)*(2*b*c*d*e*log(F) + 3*e^2)*erf(-s
qrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F) - a*c*e*log(F))*
e^(-1) + 1)/(sqrt(-b*c*e*log(F))*b^2*c^2*log(F)^2) - 2*(2*(x*e + d)^(3/2)*b
*c*e*log(F) - 2*sqrt(x*e + d)*b*c*d*e*log(F) - 3*sqrt(x*e + d)*e^2)*e^(((x*
e + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-1))/(b^2*c^2*log(F)^2)
) + 6*d*(sqrt(pi)*(4*b^2*c^2*d^2*e*log(F)^2 + 12*b*c*d*e^2*log(F) + 15*e^3)
*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F) - a*c*e*l
og(F) + 2*e)*e^(-1) + 1)/(sqrt(-b*c*e*log(F))*b^3*c^3*log(F)^3) + 2*(4*(x*e
 + d)^(5/2)*b^2*c^2*e*log(F)^2 - 8*(x*e + d)^(3/2)*b^2*c^2*d*e*log(F)^2 + 4
*sqrt(x*e + d)*b^2*c^2*d^2*e*log(F)^2 - 10*(x*e + d)^(3/2)*b*c*e^2*log(F) +
 12*sqrt(x*e + d)*b*c*d*e^2*log(F) + 15*sqrt(x*e + d)*e^3)*e^(((x*e + d)*b*
```

```
c*log(F) - b*c*d*log(F) + a*c*e*log(F) - 2*e)*e^(-1))/(b^3*c^3*log(F)^3))*e
^2 - (sqrt(pi)*(8*b^3*c^3*d^3*e*log(F)^3 + 36*b^2*c^2*d^2*e^2*log(F)^2 + 90
*b*c*d*e^3*log(F) + 105*e^4)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))
*e^(-(b*c*d*log(F) - a*c*e*log(F) + 3*e)*e^(-1) + 1)/(sqrt(-b*c*e*log(F))*b
^4*c^4*log(F)^4) - 2*(8*(x*e + d)^(7/2)*b^3*c^3*e*log(F)^3 - 24*(x*e + d)^(
5/2)*b^3*c^3*d*e*log(F)^3 + 24*(x*e + d)^(3/2)*b^3*c^3*d^2*e*log(F)^3 - 8*s
qrt(x*e + d)*b^3*c^3*d^3*e*log(F)^3 - 28*(x*e + d)^(5/2)*b^2*c^2*e^2*log(F)
^2 + 60*(x*e + d)^(3/2)*b^2*c^2*d*e^2*log(F)^2 - 36*sqrt(x*e + d)*b^2*c^2*d
^2*e^2*log(F)^2 + 70*(x*e + d)^(3/2)*b*c*e^3*log(F) - 90*sqrt(x*e + d)*b*c*
d*e^3*log(F) - 105*sqrt(x*e + d)*e^4)*e^(((x*e + d)*b*c*log(F) - b*c*d*log(
F) + a*c*e*log(F) - 3*e)*e^(-1))/(b^4*c^4*log(F)^4))*e^3)*e^(-1)
```

3.40 $\int F^{c(a+bx)}(d+ex)^{5/2}\,dx$

Optimal. Leaf size=173

$$-\frac{15\sqrt{\pi}e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)}+\frac{15e^2\sqrt{d+ex}F^{c(a+bx)}}{4b^3c^3\log^3(F)}-\frac{5e(d+ex)^{3/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+\frac{(d+ex)^{5/2}F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (-15*e^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(8*b^(7/2)*c^(7/2)*Log[F]^(7/2)) + (15*e^2*F^(c*
(a + b*x))*Sqrt[d + e*x])/(4*b^3*c^3*Log[F]^3) - (5*e*F^(c*(a + b*x))*(d +
e*x)^(3/2))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(5/2))/(b*c*L
og[F])
```

Rubi [A] time = 0.165517, antiderivative size = 173, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2176, 2180, 2204}

$$-\frac{15\sqrt{\pi}e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)}+\frac{15e^2\sqrt{d+ex}F^{c(a+bx)}}{4b^3c^3\log^3(F)}-\frac{5e(d+ex)^{3/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+\frac{(d+ex)^{5/2}F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^(5/2),x]
```

```
[Out] (-15*e^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(8*b^(7/2)*c^(7/2)*Log[F]^(7/2)) + (15*e^2*F^(c*
(a + b*x))*Sqrt[d + e*x])/(4*b^3*c^3*Log[F]^3) - (5*e*F^(c*(a + b*x))*(d +
e*x)^(3/2))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(5/2))/(b*c*L
og[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} - \frac{(5e)\int F^{c(a+bx)}(d+ex)^{3/2}\,dx}{2bc\log(F)}$$

$$= -\frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} + \frac{(15e^2)\int F^{c(a+bx)}\sqrt{d+ex}\,dx}{4b^2c^2\log^2(F)}$$

$$= \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} - \frac{(15e^3)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{8b^3c^3\log^3(F)}$$

$$= \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} - \frac{(15e^2)\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bc}{\ldots}}\right.}{4b^3c^3\log^3(\ldots}$$

$$= -\frac{15e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a\ldots}}{}$$

Mathematica [A] time = 0.0266816, size = 72, normalized size = 0.42

$$\frac{e^2\sqrt{d+ex}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{7}{2},-\frac{bc\log(F)(d+ex)}{e}\right)}{b^3c^3\log^3(F)\sqrt{-\frac{bc\log(F)(d+ex)}{e}}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(5/2),x]
```

```
[Out] (e^2*F^(c*(a - (b*d)/e))*Sqrt[d + e*x]*Gamma[7/2, -((b*c*(d + e*x)*Log[F])/
e)])/(b^3*c^3*Log[F]^3*Sqrt[-((b*c*(d + e*x)*Log[F])/e)])
```

Maple [F] time = 0.019, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{\frac{5}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(5/2),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(5/2),x)
```

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

$$\int (ex+d)^{\frac{5}{2}}F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(5/2),x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^(5/2)*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.54212, size = 383, normalized size = 2.21

$$\frac{\frac{15\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^3\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}+2\left(15\,bce^2\log(F)+4\left(b^3c^3e^2x^2+2\,b^3c^3dex+b^3c^3d^2\right)\log(F)^3-10\left(b^2c^2e^2x+b^2c\right.\right.}{8\,b^4c^4\log(F)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(5/2),x, algorithm="fricas")
```

```
[Out] 1/8*(15*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^3*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)
/e))/F^((b*c*d - a*c*e)/e) + 2*(15*b*c*e^2*log(F) + 4*(b^3*c^3*e^2*x^2 + 2*
b^3*c^3*d*e*x + b^3*c^3*d^2)*log(F)^3 - 10*(b^2*c^2*e^2*x + b^2*c^2*d*e)*lo
g(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^4*c^4*log(F)^4)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(5/2),x)
```

```
[Out] Timed out
```

Giac [B] time = 1.33364, size = 779, normalized size = 4.5

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(5/2),x, algorithm="giac")
```

```
[Out] 1/8*(4*d^2*(sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*
c*d*log(F) - a*c*e*log(F))*e^(-1) + 2)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2
*sqrt(x*e + d)*e^(((x*e + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-
1) + 1)/(b*c*log(F))) - 4*d*(sqrt(pi)*(2*b*c*d*e*log(F) + 3*e^2)*erf(-sqrt(
-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F) - a*c*e*log(F))*e^(-
1) + 1)/(sqrt(-b*c*e*log(F))*b^2*c^2*log(F)^2) - 2*(2*(x*e + d)^(3/2)*b*c*e
*log(F) - 2*sqrt(x*e + d)*b*c*d*e*log(F) - 3*sqrt(x*e + d)*e^2)*e^(((x*e +
d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-1))/(b^2*c^2*log(F)^2)) +
(sqrt(pi)*(4*b^2*c^2*d^2*e*log(F)^2 + 12*b*c*d*e^2*log(F) + 15*e^3)*erf(-sq
rt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F) - a*c*e*log(F) +
2*e)*e^(-1) + 1)/(sqrt(-b*c*e*log(F))*b^3*c^3*log(F)^3) + 2*(4*(x*e + d)^(5
/2)*b^2*c^2*e*log(F)^2 - 8*(x*e + d)^(3/2)*b^2*c^2*d*e*log(F)^2 + 4*sqrt(x*
e + d)*b^2*c^2*d^2*e*log(F)^2 - 10*(x*e + d)^(3/2)*b*c*e^2*log(F) + 12*sqrt
(x*e + d)*b*c*d*e^2*log(F) + 15*sqrt(x*e + d)*e^3)*e^(((x*e + d)*b*c*log(F)
 - b*c*d*log(F) + a*c*e*log(F) - 2*e)*e^(-1))/(b^3*c^3*log(F)^3))*e^2)*e^(-
1)
```

3.41 $\int F^{c(a+bx)}(d+ex)^{3/2}\,dx$

Optimal. Leaf size=138

$$\frac{3\sqrt{\pi}e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3e\sqrt{d+ex}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+\frac{(d+ex)^{3/2}F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (3*e^(3/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]
*Sqrt[Log[F]])/Sqrt[e]])/(4*b^(5/2)*c^(5/2)*Log[F]^(5/2)) - (3*e*F^(c*(a +
b*x))*Sqrt[d + e*x])/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(3/2
))/(b*c*Log[F])
```

Rubi [A] time = 0.11937, antiderivative size = 138, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2176, 2180, 2204}

$$\frac{3\sqrt{\pi}e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3e\sqrt{d+ex}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+\frac{(d+ex)^{3/2}F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^(3/2),x]
```


```
[Out] (3*e^(3/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]
*Sqrt[Log[F]])/Sqrt[e]])/(4*b^(5/2)*c^(5/2)*Log[F]^(5/2)) - (3*e*F^(c*(a +
b*x))*Sqrt[d + e*x])/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(3/2
))/(b*c*Log[F])
```


Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx = \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} - \frac{(3e)\int F^{c(a+bx)}\sqrt{d+ex}\,dx}{2bc\log(F)}$$
$$= -\frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} + \frac{\left(3e^2\right)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{4b^2c^2\log^2(F)}$$
$$= -\frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} + \frac{(3e)\,\mathrm{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{2b^2c^2\log^2(F)}$$
$$= \frac{3e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)} - \frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)}$$

Mathematica [A] time = 0.0700684, size = 63, normalized size = 0.46

$$-\frac{(d+ex)^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Gamma}\left(\frac{5}{2},-\frac{bc\log(F)(d+ex)}{e}\right)}{e\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(3/2),x]
```

```
[Out] -((F^(c*(a - (b*d)/e))*(d + e*x)^(5/2)*Gamma[5/2, -((b*c*(d + e*x)*Log[F])/
e)])/(e*(-((b*c*(d + e*x)*Log[F])/e))^(5/2)))
```

Maple [F] time = 0.02, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{\frac{3}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(3/2),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(3/2),x)
```

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

$$\int (ex+d)^{\frac{3}{2}}F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(3/2),x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^(3/2)*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.91564, size = 288, normalized size = 2.09

$$-\frac{\frac{3\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^2\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}+2\left(3\,bce\log(F)-2\left(b^2c^2ex+b^2c^2d\right)\log(F)^2\right)\sqrt{ex+d}F^{bcx+ac}}{4\,b^3c^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(3/2),x, algorithm="fricas")
```

```
[Out] -1/4*(3*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^2*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)
/e))/F^((b*c*d - a*c*e)/e) + 2*(3*b*c*e*log(F) - 2*(b^2*c^2*e*x + b^2*c^2*d
)*log(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^3*c^3*log(F)^3)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(3/2),x)
```

```
[Out] Timed out
```

Giac [B] time = 1.19088, size = 408, normalized size = 2.96

$$\frac{1}{4}\left(2\,d\left(\frac{\sqrt{\pi}\operatorname{erf}\left(-\sqrt{-bce\log(F)}\sqrt{xe+d}e^{(-1)}\right)e^{\left(-(bcd\log(F)-ace\log(F))e^{(-1)}+2\right)}}{\sqrt{-bce\log(F)}bc\log(F)}+\frac{2\sqrt{xe+d}e^{\left(((xe+d)bc\log(F)-bcd\log(F)+ace\log(F))e^{(-1)}+\right.}}{bc\log(F)}\right.\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(3/2),x, algorithm="giac")
```

```
[Out] 1/4*(2*d*(sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*
d*log(F) - a*c*e*log(F))*e^(-1) + 2)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2*s
qrt(x*e + d)*e^(((x*e + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-1)
 + 1)/(b*c*log(F))) - sqrt(pi)*(2*b*c*d*e*log(F) + 3*e^2)*erf(-sqrt(-b*c*e*
log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F) - a*c*e*log(F))*e^(-1) + 1)
/(sqrt(-b*c*e*log(F))*b^2*c^2*log(F)^2) + 2*(2*(x*e + d)^(3/2)*b*c*e*log(F)
 - 2*sqrt(x*e + d)*b*c*d*e*log(F) - 3*sqrt(x*e + d)*e^2)*e^(((x*e + d)*b*c*
log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-1))/(b^2*c^2*log(F)^2))*e^(-1)
```

3.42 $\int F^{c(a+bx)}\sqrt{d+ex}\,dx$

Optimal. Leaf size=105

$$\frac{\sqrt{d+ex}F^{c(a+bx)}}{bc\log(F)}-\frac{\sqrt{\pi}\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)}$$

```
[Out] -(Sqrt[e]*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*
Sqrt[Log[F]])/Sqrt[e]])/(2*b^(3/2)*c^(3/2)*Log[F]^(3/2)) + (F^(c*(a + b*x))
*Sqrt[d + e*x])/(b*c*Log[F])
```

Rubi [A] time = 0.0772365, antiderivative size = 105, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2176, 2180, 2204}

$$\frac{\sqrt{d+ex}F^{c(a+bx)}}{bc\log(F)}-\frac{\sqrt{\pi}\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*Sqrt[d + e*x],x]
```

```
[Out] -(Sqrt[e]*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*
Sqrt[Log[F]])/Sqrt[e]])/(2*b^(3/2)*c^(3/2)*Log[F]^(3/2)) + (F^(c*(a + b*x))
*Sqrt[d + e*x])/(b*c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx = \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)} - \frac{e\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}dx}{2bc\log(F)}$$
$$= \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)} - \frac{\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}dx, x, \sqrt{d+ex}\right)}{bc\log(F)}$$
$$= -\frac{\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)} + \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)}$$

Mathematica [A] time = 0.0380728, size = 63, normalized size = 0.6

$$-\frac{(d+ex)^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{3}{2}, -\frac{bc\log(F)(d+ex)}{e}\right)}{e\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*Sqrt[d + e*x],x]
```

```
[Out] -((F^(c*(a - (b*d)/e))*(d + e*x)^(3/2)*Gamma[3/2, -((b*c*(d + e*x)*Log[F])/
e)])/(e*(-((b*c*(d + e*x)*Log[F])/e))^(3/2)))
```

Maple [F] time = 0.019, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\sqrt{ex+d}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(1/2),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(1/2),x)
```

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

$$\int \sqrt{ex+d}F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="maxima")
```

```
[Out] integrate(sqrt(e*x + d)*F^((b*x + a)*c), x)
```

Fricas [A] time = 2.08921, size = 220, normalized size = 2.1

$$\frac{2\sqrt{ex+d}F^{bcx+ac}bc\log(F) + \frac{\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e\,\text{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}}{2b^2c^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="fricas")
```

```
[Out] 1/2*(2*sqrt(e*x + d)*F^(b*c*x + a*c)*b*c*log(F) + sqrt(pi)*sqrt(-b*c*log(F)
/e)*e*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))/F^((b*c*d - a*c*e)/e))/(b^2*c^
2*log(F)^2)
```

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

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(1/2),x)
```

```
[Out] Integral(F**(c*(a + b*x))*sqrt(d + e*x), x)
```

Giac [A] time = 1.30169, size = 170, normalized size = 1.62

$$\frac{1}{2}\left(\frac{\sqrt{\pi}\operatorname{erf}\left(-\sqrt{-bce\log(F)}\sqrt{xe+d}e^{(-1)}\right)e^{\left(-(bcd\log(F)-ace\log(F))e^{(-1)}+2\right)}}{\sqrt{-bce\log(F)}bc\log(F)}+\frac{2\sqrt{xe+d}e^{\left(((xe+d)bc\log(F)-bcd\log(F)+ace\log(F))e^{(-1)}+1\right.}}{bc\log(F)}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="giac")
```

```
[Out] 1/2*(sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log
(F) - a*c*e*log(F))*e^(-1) + 2)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2*sqrt(x
*e + d)*e^(((x*e + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))*e^(-1) + 1)
/(b*c*log(F)))*e^(-1)
```

3.43 $\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx$

Optimal. Leaf size=72

$$\frac{\sqrt{\pi}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}$$

```
[Out] (F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[
F]])/Sqrt[e]])/(Sqrt[b]*Sqrt[c]*Sqrt[e]*Sqrt[Log[F]])
```

Rubi [A] time = 0.0454783, antiderivative size = 72, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.105, Rules used = {2180, 2204}

$$\frac{\sqrt{\pi}F^{c\left(a-\frac{bd}{e}\right)}\text{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/Sqrt[d + e*x],x]
```

```
[Out] (F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[
F]])/Sqrt[e]])/(Sqrt[b]*Sqrt[c]*Sqrt[e]*Sqrt[Log[F]])
```

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]
```

Rubi steps

$$\begin{aligned}\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx &= \frac{2\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{e}\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}\end{aligned}$$

Mathematica [A] time = 0.0279241, size = 63, normalized size = 0.88

$$-\frac{\sqrt{d+ex}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{1}{2},-\frac{bc\log(F)(d+ex)}{e}\right)}{e\sqrt{-\frac{bc\log(F)(d+ex)}{e}}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/Sqrt[d + e*x],x]
```

```
[Out] -((F^(c*(a - (b*d)/e))*Sqrt[d + e*x]*Gamma[1/2, -((b*c*(d + e*x)*Log[F])/e)
])/(e*Sqrt[-((b*c*(d + e*x)*Log[F])/e)]))
```

Maple [F] time = 0.022, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\frac{1}{\sqrt{ex+d}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(1/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(1/2),x)
```

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

$$\int \frac{F^{(bx+a)c}}{\sqrt{ex+d}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/sqrt(e*x + d), x)
```

Fricas [A] time = 2.04574, size = 142, normalized size = 1.97

$$-\frac{\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}bc\log\left(F\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="fricas")
```

```
[Out] -sqrt(pi)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))/(F^((b
*c*d - a*c*e)/e)*b*c*log(F))
```

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

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(1/2),x)
```

```
[Out] Integral(F**(c*(a + b*x))/sqrt(d + e*x), x)
```

Giac [A] time = 1.25441, size = 78, normalized size = 1.08

$$-\frac{\sqrt{\pi}\operatorname{erf}\left(-\sqrt{-bce\log\left(F\right)}\sqrt{xe+d}e^{(-1)}\right)e^{\left(-(bcd\log(F)-ace\log(F))e^{(-1)}\right)}}{\sqrt{-bce\log\left(F\right)}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="giac")
```

```
[Out] -sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(x*e + d)*e^(-1))*e^(-(b*c*d*log(F)
- a*c*e*log(F))*e^(-1))/sqrt(-b*c*e*log(F))
```

3.44 $\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx$

Optimal. Leaf size=97

$$\frac{2\sqrt{\pi}\sqrt{b}\sqrt{c}\sqrt{\log(F)}F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{e^{3/2}}-\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}}$$

```
[Out] (-2*F^(c*(a + b*x)))/(e*Sqrt[d + e*x]) + (2*Sqrt[b]*Sqrt[c]*F^(c*(a - (b*d)
/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Sq
rt[Log[F]])/e^(3/2)
```

Rubi [A] time = 0.0854085, antiderivative size = 97, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2177, 2180, 2204}

$$\frac{2\sqrt{\pi}\sqrt{b}\sqrt{c}\sqrt{\log(F)}F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{e^{3/2}}-\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(3/2),x]
```

```
[Out] (-2*F^(c*(a + b*x)))/(e*Sqrt[d + e*x]) + (2*Sqrt[b]*Sqrt[c]*F^(c*(a - (b*d)
/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Sq
rt[Log[F]])/e^(3/2)
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx = -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{(2bc\log(F))\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{e}$$
$$= -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{(4bc\log(F))\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{e^2}$$
$$= -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{2\sqrt{b}\sqrt{c}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\sqrt{\log(F)}}{e^{3/2}}$$

Mathematica [A] time = 0.0744716, size = 75, normalized size = 0.77

$$-\frac{2\left(F^{c(a+bx)} - F^{c\left(a-\frac{bd}{e}\right)}\sqrt{-\frac{bc\log(F)(d+ex)}{e}}\,\text{Gamma}\left(\frac{1}{2}, -\frac{bc\log(F)(d+ex)}{e}\right)\right)}{e\sqrt{d+ex}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(3/2),x]
```

```
[Out] (-2*(F^(c*(a + b*x)) - F^(c*(a - (b*d)/e))*Gamma[1/2, -((b*c*(d + e*x)*Log[
F])/e)]*Sqrt[-((b*c*(d + e*x)*Log[F])/e)]))/(e*Sqrt[d + e*x])
```

Maple [F] time = 0.02, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{-\frac{3}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(3/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(3/2),x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{3}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(3/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(3/2), x)
```

Fricas [A] time = 1.83572, size = 205, normalized size = 2.11

$$-\frac{2\left(\frac{\sqrt{\pi}(ex+d)\sqrt{-\frac{bc\log(F)}{e}}\,\text{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}} + \sqrt{ex+d}F^{bcx+ac}\right)}{e^2x+de}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(3/2),x, algorithm="fricas")
```

```
[Out] -2*(sqrt(pi)*(e*x + d)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x + d)*sqrt(-b*c*log(
F)/e))/F^((b*c*d - a*c*e)/e) + sqrt(e*x + d)*F^(b*c*x + a*c))/(e^2*x + d*e)
```

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

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{\frac{3}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(3/2),x)
```

```
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**(3/2), x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{3}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(3/2),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(3/2), x)
```

3.45 $\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx$

Optimal. Leaf size=130

$$\frac{4\sqrt{\pi}b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{3e^{5/2}}-\frac{4bc\log(F)F^{c(a+bx)}}{3e^2\sqrt{d+ex}}-\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}$$

```
[Out] (-2*F^(c*(a + b*x)))/(3*e*(d + e*x)^(3/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(3*e^2*Sqrt[d + e*x]) + (4*b^(3/2)*c^(3/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Er
fi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(3/2))/(3*e
^(5/2))
```

Rubi [A] time = 0.119372, antiderivative size = 130, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2177, 2180, 2204}

$$\frac{4\sqrt{\pi}b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\operatorname{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{3e^{5/2}}-\frac{4bc\log(F)F^{c(a+bx)}}{3e^2\sqrt{d+ex}}-\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(5/2),x]
```

```
[Out] (-2*F^(c*(a + b*x)))/(3*e*(d + e*x)^(3/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(3*e^2*Sqrt[d + e*x]) + (4*b^(3/2)*c^(3/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Er
fi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(3/2))/(3*e
^(5/2))
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}} + \frac{(2bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{3e}$$

$$= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}} + \frac{\left(4b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{3e^2}$$

$$= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}} + \frac{\left(8b^2c^2\log^2(F)\right)\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{3e^3}$$

$$= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}} + \frac{4b^{3/2}c^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{3}{2}}(F)}{3e^{5/2}}$$

Mathematica [A] time = 0.234234, size = 92, normalized size = 0.71

$$-\frac{2\left(2eF^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3/2}\text{Gamma}\left(\frac{1}{2},-\frac{bc\log(F)(d+ex)}{e}\right)+F^{c(a+bx)}(2bc\log(F)(d+ex)+e)\right)}{3e^2(d+ex)^{3/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(5/2),x]
```

```
[Out] (-2*(2*e*F^(c*(a - (b*d)/e))*Gamma[1/2, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*
c*(d + e*x)*Log[F])/e))^(3/2) + F^(c*(a + b*x))*(e + 2*b*c*(d + e*x)*Log[F]
)))/(3*e^2*(d + e*x)^(3/2))
```

Maple [F] time = 0.018, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{-\frac{5}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(5/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(5/2),x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{5}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(5/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(5/2), x)
```

Fricas [A] time = 1.57267, size = 327, normalized size = 2.52

$$-\frac{2\left(\frac{2\sqrt{\pi}\left(bce^2x^2+2\,bcdex+bcd^2\right)\sqrt{-\frac{bc\log(F)}{e}}\,\mathrm{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}+\sqrt{ex+d}(2\,(bcex+bcd)\log\left(F\right)+e)F^{bcx+ac}\right)}{3\left(e^4x^2+2\,de^3x+d^2e^2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(5/2),x, algorithm="fricas")
```

```
[Out] -2/3*(2*sqrt(pi)*(b*c*e^2*x^2 + 2*b*c*d*e*x + b*c*d^2)*sqrt(-b*c*log(F)/e)*
erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))*log(F)/F^((b*c*d - a*c*e)/e) + sqrt(
e*x + d)*(2*(b*c*e*x + b*c*d)*log(F) + e)*F^(b*c*x + a*c))/(e^4*x^2 + 2*d*e
^3*x + d^2*e^2)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(5/2),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{5}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(5/2),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(5/2), x)
```

3.46 $\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx$

Optimal. Leaf size=165

$$\frac{8\sqrt{\pi}b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{15e^{7/2}}-\frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{15e^3\sqrt{d+ex}}-\frac{4bc\log(F)F^{c(a+bx)}}{15e^2(d+ex)^{3/2}}-\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}$$

```
[Out] (-2*F^(c*(a + b*x)))/(5*e*(d + e*x)^(5/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(15*e^2*(d + e*x)^(3/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(15*e^3*Sq
rt[d + e*x]) + (8*b^(5/2)*c^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b
]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(5/2))/(15*e^(7/2))
```

Rubi [A] time = 0.164663, antiderivative size = 165, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2177, 2180, 2204}

$$\frac{8\sqrt{\pi}b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{15e^{7/2}}-\frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{15e^3\sqrt{d+ex}}-\frac{4bc\log(F)F^{c(a+bx)}}{15e^2(d+ex)^{3/2}}-\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(7/2),x]
```

```
[Out] (-2*F^(c*(a + b*x)))/(5*e*(d + e*x)^(5/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(15*e^2*(d + e*x)^(3/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(15*e^3*Sq
rt[d + e*x]) + (8*b^(5/2)*c^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b
]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(5/2))/(15*e^(7/2))
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] && !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} + \frac{(2bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx}{5e}$$
$$= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}} + \frac{\left(4b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{15e^2}$$
$$= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}} + \frac{\left(8b^3c^3\log^3(F)\right)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{15e^3}$$
$$= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}} + \frac{\left(16b^3c^3\log^3(F)\right)\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\right.}{15e^4}$$
$$= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}} + \frac{8b^{5/2}c^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(}}{\sqrt{e}}\right.}{15e^{7/2}}$$

Mathematica [A] time = 0.137881, size = 118, normalized size = 0.72

$$\frac{2\left(-2bc\log(F)(d+ex)\left(2eF^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3/2}\text{Gamma}\left(\frac{1}{2},-\frac{bc\log(F)(d+ex)}{e}\right)+F^{c(a+bx)}(2bc\log(F)(d+ex)+e)\right)-3e^{2}\right.}{15e^3(d+ex)^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(7/2),x]
```

```
[Out] (2*(-3*e^2*F^(c*(a + b*x)) - 2*b*c*(d + e*x)*Log[F]*(2*e*F^(c*(a - (b*d)/e)
)*Gamma[1/2, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d + e*x)*Log[F])/e))^(3/
2) + F^(c*(a + b*x))*(e + 2*b*c*(d + e*x)*Log[F]))))/(15*e^3*(d + e*x)^(5/2
))
```

Maple [F] time = 0.019, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{-\frac{7}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(7/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(7/2),x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{7}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(7/2), x)
```

Fricas [A] time = 1.56885, size = 497, normalized size = 3.01

$$-\frac{2\left(\frac{4\sqrt{\pi}\left(b^2c^2e^3x^3+3\,b^2c^2de^2x^2+3\,b^2c^2d^2ex+b^2c^2d^3\right)\sqrt{-\frac{bc\log(F)}{e}}\,\mathrm{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)^2}{F^{\frac{bcd-ace}{e}}}+\left(4\left(b^2c^2e^2x^2+2\,b^2c^2dex+b^2c^2d^2\right)\log(F\right.\right.}{15\left(e^6x^3+3\,de^5x^2+3\,d^2e^4x+d^3e^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="fricas")
```

```
[Out] -2/15*(4*sqrt(pi)*(b^2*c^2*e^3*x^3 + 3*b^2*c^2*d*e^2*x^2 + 3*b^2*c^2*d^2*e*
x + b^2*c^2*d^3)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))
*log(F)^2/F^((b*c*d - a*c*e)/e) + (4*(b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b
^2*c^2*d^2)*log(F)^2 + 3*e^2 + 2*(b*c*e^2*x + b*c*d*e)*log(F))*sqrt(e*x + d
)*F^(b*c*x + a*c))/(e^6*x^3 + 3*d*e^5*x^2 + 3*d^2*e^4*x + d^3*e^3)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(7/2),x)
```

```
[Out] Timed out
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{7}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="giac")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(7/2), x)
```

3.47 $\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx$

Optimal. Leaf size=200

$$\frac{16\sqrt{\pi}b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{105e^{9/2}}-\frac{16b^3c^3\log^3(F)F^{c(a+bx)}}{105e^4\sqrt{d+ex}}-\frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{105e^3(d+ex)^{3/2}}-\frac{4bc\log(F)F^{c(a+bx)}}{35e^2(d+ex)^{5/2}}$$

```
[Out] (-2*F^(c*(a + b*x)))/(7*e*(d + e*x)^(7/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(35*e^2*(d + e*x)^(5/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(105*e^3*(
d + e*x)^(3/2)) - (16*b^3*c^3*F^(c*(a + b*x))*Log[F]^3)/(105*e^4*Sqrt[d + e
*x]) + (16*b^(7/2)*c^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[
c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(7/2))/(105*e^(9/2))
```

Rubi [A] time = 0.203384, antiderivative size = 200, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2177, 2180, 2204}

$$\frac{16\sqrt{\pi}b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{Erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{105e^{9/2}}-\frac{16b^3c^3\log^3(F)F^{c(a+bx)}}{105e^4\sqrt{d+ex}}-\frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{105e^3(d+ex)^{3/2}}-\frac{4bc\log(F)F^{c(a+bx)}}{35e^2(d+ex)^{5/2}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(9/2),x]
```


```
[Out] (-2*F^(c*(a + b*x)))/(7*e*(d + e*x)^(7/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(35*e^2*(d + e*x)^(5/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(105*e^3*(
d + e*x)^(3/2)) - (16*b^3*c^3*F^(c*(a + b*x))*Log[F]^3)/(105*e^4*Sqrt[d + e
*x]) + (16*b^(7/2)*c^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[
c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(7/2))/(105*e^(9/2))
```


Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} + \frac{(2bc\log(F))\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx}{7e}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} + \frac{\left(4b^2c^2\log^2(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx}{35e^2}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} + \frac{\left(8b^3c^3\log^3(F)\right)\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{105e^3}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{\left(16b^4c^4\log\right.}{}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{\left(32b^4c^4\log\right.}{}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{16b^{7/2}c^{7/2}F}{}$$

Mathematica [A] time = 0.165273, size = 144, normalized size = 0.72

$$\frac{2\left(2bc\log(F)(d+ex)\left(-2bc\log(F)(d+ex)\left(2eF^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3/2}\text{Gamma}\left(\frac{1}{2},-\frac{bc\log(F)(d+ex)}{e}\right)+F^{c(a+bx)}(2bc\log\right.\right.\right.}{105e^4(d+ex)^{7/2}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(9/2),x]
```

```
[Out] (2*(-15*e^3*F^(c*(a + b*x)) + 2*b*c*(d + e*x)*Log[F]*(-3*e^2*F^(c*(a + b*x)
) - 2*b*c*(d + e*x)*Log[F]*(2*e*F^(c*(a - (b*d)/e))*Gamma[1/2, -((b*c*(d +
e*x)*Log[F])/e)]*(-((b*c*(d + e*x)*Log[F])/e))^(3/2) + F^(c*(a + b*x))*(e +
 2*b*c*(d + e*x)*Log[F])))))/(105*e^4*(d + e*x)^(7/2))
```

Maple [F] time = 0.019, size = 0, normalized size = 0.

$$\int F^{c(bx+a)}\,(ex+d)^{-\frac{9}{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(9/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(9/2),x)
```

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

$$\int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{9}{2}}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(9/2), x)
```

Fricas [A] time = 1.59008, size = 679, normalized size = 3.4

$$-\frac{2\left(\frac{8\sqrt{\pi}\left(b^3c^3e^4x^4+4b^3c^3de^3x^3+6b^3c^3d^2e^2x^2+4b^3c^3d^3ex+b^3c^3d^4\right)\sqrt{-\frac{bc\log(F)}{e}}\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)^3}{F^{\frac{bcd-ace}{e}}}+\left(8\left(b^3c^3e^3x^3+3b^3c^3de^2x^2+3b^3\right.\right.\right.}{105\left(e^8x^4+4de^7x^3+\right.}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="fricas")
```

```
[Out] -2/105*(8*sqrt(pi)*(b^3*c^3*e^4*x^4 + 4*b^3*c^3*d*e^3*x^3 + 6*b^3*c^3*d^2*e
^2*x^2 + 4*b^3*c^3*d^3*e*x + b^3*c^3*d^4)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x
+ d)*sqrt(-b*c*log(F)/e))*log(F)^3/F^((b*c*d - a*c*e)/e) + (8*(b^3*c^3*e^3*
x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d^3)*log(F)^3 + 15*
e^3 + 4*(b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*log(F)^2 + 6*
(b*c*e^3*x + b*c*d*e^2)*log(F))*sqrt(e*x + d)*F^(b*c*x + a*c))/(e^8*x^4 + 4
*d*e^7*x^3 + 6*d^2*e^6*x^2 + 4*d^3*e^5*x + d^4*e^4)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(9/2),x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.48 $\int e^{-bx} x^{13/2}\,dx$

Optimal. Leaf size=151

$$\frac{135135\sqrt{\pi}\operatorname{Erf}\left(\sqrt{b}\sqrt{x}\right)}{128b^{15/2}}-\frac{13x^{11/2}e^{-bx}}{2b^2}-\frac{143x^{9/2}e^{-bx}}{4b^3}-\frac{1287x^{7/2}e^{-bx}}{8b^4}-\frac{9009x^{5/2}e^{-bx}}{16b^5}-\frac{45045x^{3/2}e^{-bx}}{32b^6}-\frac{135135\sqrt{x}e^{-bx}}{64b^7}$$

```
[Out] (-135135*Sqrt[x])/(64*b^7*E^(b*x)) - (45045*x^(3/2))/(32*b^6*E^(b*x)) - (90
09*x^(5/2))/(16*b^5*E^(b*x)) - (1287*x^(7/2))/(8*b^4*E^(b*x)) - (143*x^(9/2
))/(4*b^3*E^(b*x)) - (13*x^(11/2))/(2*b^2*E^(b*x)) - x^(13/2)/(b*E^(b*x)) +
 (135135*Sqrt[Pi]*Erf[Sqrt[b]*Sqrt[x]])/(128*b^(15/2))
```

Rubi [A] time = 0.154831, antiderivative size = 151, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 3, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.25, Rules used = {2176, 2180, 2205}

$$\frac{135135\sqrt{\pi}\operatorname{Erf}\left(\sqrt{b}\sqrt{x}\right)}{128b^{15/2}}-\frac{13x^{11/2}e^{-bx}}{2b^2}-\frac{143x^{9/2}e^{-bx}}{4b^3}-\frac{1287x^{7/2}e^{-bx}}{8b^4}-\frac{9009x^{5/2}e^{-bx}}{16b^5}-\frac{45045x^{3/2}e^{-bx}}{32b^6}-\frac{135135\sqrt{x}e^{-bx}}{64b^7}$$

Antiderivative was successfully verified.

```
[In] Int[x^(13/2)/E^(b*x),x]
```

```
[Out] (-135135*Sqrt[x])/(64*b^7*E^(b*x)) - (45045*x^(3/2))/(32*b^6*E^(b*x)) - (90
09*x^(5/2))/(16*b^5*E^(b*x)) - (1287*x^(7/2))/(8*b^4*E^(b*x)) - (143*x^(9/2
))/(4*b^3*E^(b*x)) - (13*x^(11/2))/(2*b^2*E^(b*x)) - x^(13/2)/(b*E^(b*x)) +
 (135135*Sqrt[Pi]*Erf[Sqrt[b]*Sqrt[x]])/(128*b^(15/2))
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

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]
```

Rubi steps

$$\int e^{-bx}x^{13/2}\,dx = -\frac{e^{-bx}x^{13/2}}{b} + \frac{13\int e^{-bx}x^{11/2}\,dx}{2b}$$
$$= -\frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{143\int e^{-bx}x^{9/2}\,dx}{4b^2}$$
$$= -\frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{1287\int e^{-bx}x^{7/2}\,dx}{8b^3}$$
$$= -\frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{9009\int e^{-bx}x^{5/2}\,dx}{16b^4}$$
$$= -\frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{45045\int e^{-bx}x^{3/2}\,dx}{32b^5}$$
$$= -\frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{135135\int e^{-b}}{64b^6}$$
$$= -\frac{135135e^{-bx}\sqrt{x}}{64b^7} - \frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/}}{b}$$
$$= -\frac{135135e^{-bx}\sqrt{x}}{64b^7} - \frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/}}{b}$$
$$= -\frac{135135e^{-bx}\sqrt{x}}{64b^7} - \frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/}}{b}$$

Mathematica [A] time = 0.0041943, size = 24, normalized size = 0.16

$$-\frac{\sqrt{bx}\,\text{Gamma}\left(\frac{15}{2}, bx\right)}{b^8\sqrt{x}}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^(13/2)/E^(b*x),x]
```

```
[Out] -((Sqrt[b*x]*Gamma[15/2, b*x])/(b^8*Sqrt[x]))
```

Maple [A] time = 0.135, size = 145, normalized size = 1.

$$-\frac{e^{-bx}}{b}x^{\frac{13}{2}} + 13\frac{1}{b}\left(-1/2\frac{x^{11/2}e^{-bx}}{b} + 11/2\frac{1}{b}\left(-1/2\frac{x^{9/2}e^{-bx}}{b} + 9/2\frac{1}{b}\left(-1/2\frac{x^{7/2}e^{-bx}}{b} + 7/2\frac{1}{b}\left(-1/2\frac{x^{5/2}e^{-bx}}{b} + 5/2\frac{1}{b}\left(-1/2\frac{x^{3/2}}{}\right.\right.\right.\right.\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^(13/2)/exp(b*x),x)
```

```
[Out] -1/b*x^(13/2)*exp(-b*x)+13/b*(-1/2/b*x^(11/2)*exp(-b*x)+11/2/b*(-1/2/b*x^(9
/2)*exp(-b*x)+9/2/b*(-1/2/b*x^(7/2)*exp(-b*x)+7/2/b*(-1/2/b*x^(5/2)*exp(-b*
x)+5/2/b*(-1/2/b*x^(3/2)*exp(-b*x)+3/2/b*(-1/2/b*x^(1/2)*exp(-b*x)+1/4/b^(3
/2)*Pi^(1/2)*erf(b^(1/2)*x^(1/2)))))))
```

Maxima [A] time = 1.07258, size = 107, normalized size = 0.71

$$-\frac{\left(64\,b^6x^{\frac{13}{2}} + 416\,b^5x^{\frac{11}{2}} + 2288\,b^4x^{\frac{9}{2}} + 10296\,b^3x^{\frac{7}{2}} + 36036\,b^2x^{\frac{5}{2}} + 90090\,bx^{\frac{3}{2}} + 135135\,\sqrt{x}\right)e^{(-bx)}}{64\,b^7} + \frac{135135\,\sqrt{\pi}\,\text{erf}\left(\sqrt{b}\right.}{128\,b^{\frac{15}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="maxima")
```

```
[Out] -1/64*(64*b^6*x^(13/2) + 416*b^5*x^(11/2) + 2288*b^4*x^(9/2) + 10296*b^3*x^
(7/2) + 36036*b^2*x^(5/2) + 90090*b*x^(3/2) + 135135*sqrt(x))*e^(-b*x)/b^7
+ 135135/128*sqrt(pi)*erf(sqrt(b)*sqrt(x))/b^(15/2)
```

Fricas [A] time = 1.51932, size = 242, normalized size = 1.6

$$-\frac{2\left(64\,b^7x^6+416\,b^6x^5+2288\,b^5x^4+10296\,b^4x^3+36036\,b^3x^2+90090\,b^2x+135135\,b\right)\sqrt{x}e^{(-bx)}-135135\,\sqrt{\pi}\sqrt{b}\,\mathrm{erf}\left(\sqrt{b}\sqrt{x}\right)}{128\,b^8}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="fricas")
```

```
[Out] -1/128*(2*(64*b^7*x^6 + 416*b^6*x^5 + 2288*b^5*x^4 + 10296*b^4*x^3 + 36036*
b^3*x^2 + 90090*b^2*x + 135135*b)*sqrt(x)*e^(-b*x) - 135135*sqrt(pi)*sqrt(b
)*erf(sqrt(b)*sqrt(x)))/b^8
```

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**(13/2)/exp(b*x),x)
```

```
[Out] Timed out
```

Giac [A] time = 1.1608, size = 108, normalized size = 0.72

$$-\frac{\left(64\,b^6x^{\frac{13}{2}}+416\,b^5x^{\frac{11}{2}}+2288\,b^4x^{\frac{9}{2}}+10296\,b^3x^{\frac{7}{2}}+36036\,b^2x^{\frac{5}{2}}+90090\,bx^{\frac{3}{2}}+135135\,\sqrt{x}\right)e^{(-bx)}}{64\,b^7}-\frac{135135\,\sqrt{\pi}\,\mathrm{erf}\left(-\sqrt{b}\sqrt{x}\right)}{128\,b^{\frac{15}{2}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="giac")
```

```
[Out] -1/64*(64*b^6*x^(13/2) + 416*b^5*x^(11/2) + 2288*b^4*x^(9/2) + 10296*b^3*x^
(7/2) + 36036*b^2*x^(5/2) + 90090*b*x^(3/2) + 135135*sqrt(x))*e^(-b*x)/b^7
- 135135/128*sqrt(pi)*erf(-sqrt(b)*sqrt(x))/b^(15/2)
```

3.49 $\int F^{c(a+bx)}(d+ex)^{4/3}\,dx$

Optimal. Leaf size=71

$$-\frac{e\sqrt[3]{d+ex}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{7}{3},-\frac{bc\log(F)(d+ex)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc\log(F)(d+ex)}{e}}}$$

```
[Out] -((e*F^(c*(a - (b*d)/e))*(d + e*x)^(1/3)*Gamma[7/3, -((b*c*(d + e*x)*Log[F]
)/e)])/(b^2*c^2*Log[F]^2*(-((b*c*(d + e*x)*Log[F])/e))^(1/3)))
```

Rubi [A] time = 0.0313849, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.053, Rules used = {2181}

$$-\frac{e\sqrt[3]{d+ex}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{7}{3},-\frac{bc\log(F)(d+ex)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc\log(F)(d+ex)}{e}}}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^(4/3),x]
```

```
[Out] -((e*F^(c*(a - (b*d)/e))*(d + e*x)^(1/3)*Gamma[7/3, -((b*c*(d + e*x)*Log[F]
)/e)])/(b^2*c^2*Log[F]^2*(-((b*c*(d + e*x)*Log[F])/e))^(1/3)))
```

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*Lo
g[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] && !I
ntegerQ[m]
```

Rubi steps

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = -\frac{eF^{c\left(a-\frac{bd}{e}\right)}\sqrt[3]{d+ex}\Gamma\left(\frac{7}{3},-\frac{bc(d+ex)\log(F)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc(d+ex)\log(F)}{e}}}$$

Mathematica [A] time = 0.0802949, size = 63, normalized size = 0.89

$$-\frac{(d+ex)^{7/3}F^{c\left(a-\frac{bd}{e}\right)}\text{Gamma}\left(\frac{7}{3},-\frac{bc\log(F)(d+ex)}{e}\right)}{e\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{7/3}}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(4/3),x]
```

```
[Out] -((F^(c*(a - (b*d)/e))*(d + e*x)^(7/3)*Gamma[7/3, -((b*c*(d + e*x)*Log[F])/
e)])/(e*(-((b*c*(d + e*x)*Log[F])/e))^(7/3)))
```

Maple [F] time = 0.018, size = 0, normalized size = 0.

$$\int F^{c(bx+a)} (ex+d)^{\frac{4}{3}}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(4/3),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(4/3),x)
```

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

$$\int (ex+d)^{\frac{4}{3}} F^{(bx+a)c}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(4/3),x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^(4/3)*F^((b*x + a)*c), x)
```

Fricas [A] time = 1.57135, size = 281, normalized size = 3.96

$$\frac{\frac{4\left(-\frac{bc\log(F)}{e}\right)^{\frac{2}{3}} e^2 \Gamma\left(\frac{1}{3}, -\frac{(bcex+bcd)\log(F)}{e}\right)}{F^{\frac{bcd-ace}{e}}} - 3\left(4\,bce\log(F) - 3\left(b^2c^2ex + b^2c^2d\right)\log(F)^2\right)(ex+d)^{\frac{1}{3}} F^{bcx+ac}}{9\,b^3c^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(4/3),x, algorithm="fricas")
```

```
[Out] 1/9*(4*(-b*c*log(F)/e)^(2/3)*e^2*gamma(1/3, -(b*c*e*x + b*c*d)*log(F)/e)/F^
((b*c*d - a*c*e)/e) - 3*(4*b*c*e*log(F) - 3*(b^2*c^2*e*x + b^2*c^2*d)*log(F
)^2)*(e*x + d)^(1/3)*F^(b*c*x + a*c))/(b^3*c^3*log(F)^3)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(4/3),x)
```

```
[Out] Timed out
```

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

$$\int (ex+d)^{\frac{4}{3}} F^{(bx+a)c}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(4/3),x, algorithm="giac")
```

```
[Out] integrate((e*x + d)^(4/3)*F^((b*x + a)*c), x)
```

3.50 $\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx$

Optimal. Leaf size=98

$$-\frac{e\sqrt[3]{d+ex}\left(F^{c(a+bx)}\right)^n F^{cn\left(a-\frac{bd}{e}\right)-cn(a+bx)}\text{Gamma}\left(\frac{7}{3},-\frac{bcn\log(F)(d+ex)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn\log(F)(d+ex)}{e}}}$$

```
[Out] -((e*F^(c*(a - (b*d)/e)*n - c*n*(a + b*x))*(F^(c*(a + b*x)))^n*(d + e*x)^(1
/3)*Gamma[7/3, -((b*c*n*(d + e*x)*Log[F])/e)])/(b^2*c^2*n^2*Log[F]^2*(-((b*
c*n*(d + e*x)*Log[F])/e))^(1/3)))
```

Rubi [A] time = 0.104381, antiderivative size = 98, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.095, Rules used = {2182, 2181}

$$-\frac{e\sqrt[3]{d+ex}\left(F^{c(a+bx)}\right)^n F^{cn\left(a-\frac{bd}{e}\right)-cn(a+bx)}\text{Gamma}\left(\frac{7}{3},-\frac{bcn\log(F)(d+ex)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn\log(F)(d+ex)}{e}}}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(c*(a + b*x)))^n*(d + e*x)^(4/3),x]
```

```
[Out] -((e*F^(c*(a - (b*d)/e)*n - c*n*(a + b*x))*(F^(c*(a + b*x)))^n*(d + e*x)^(1
/3)*Gamma[7/3, -((b*c*n*(d + e*x)*Log[F])/e)])/(b^2*c^2*n^2*Log[F]^2*(-((b*
c*n*(d + e*x)*Log[F])/e))^(1/3)))
```

Rule 2182

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, 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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx &= \left(F^{-cn(a+bx)}\left(F^{c(a+bx)}\right)^n\right)\int F^{cn(a+bx)}(d+ex)^{4/3}\,dx\\ &= -\frac{eF^{c\left(a-\frac{bd}{e}\right)n-cn(a+bx)}\left(F^{c(a+bx)}\right)^n\sqrt[3]{d+ex}\,\Gamma\left(\frac{7}{3},-\frac{bcn(d+ex)\log(F)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn(d+ex)\log(F)}{e}}}\end{aligned}$$

Mathematica [A] time = 0.134194, size = 78, normalized size = 0.8

$$-\frac{(d+ex)^{7/3}\left(F^{c(a+bx)}\right)^n F^{-\frac{bcn(d+ex)}{e}}\text{Gamma}\left(\frac{7}{3},-\frac{bcn\log(F)(d+ex)}{e}\right)}{e\left(-\frac{bcn\log(F)(d+ex)}{e}\right)^{7/3}}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(c*(a + b*x)))^n*(d + e*x)^(4/3),x]
```

```
[Out] -(((F^(c*(a + b*x)))^n*(d + e*x)^(7/3)*Gamma[7/3, -((b*c*n*(d + e*x)*Log[F]
)/e)])/(e*F^((b*c*n*(d + e*x))/e)*(-((b*c*n*(d + e*x)*Log[F])/e))^(7/3)))
```

Maple [F] time = 0.044, size = 0, normalized size = 0.

$$\int \left(F^{c(bx+a)}\right)^n (ex+d)^{\frac{4}{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x)
```

```
[Out] int((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x)
```

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

$$\int (ex+d)^{\frac{4}{3}}\left(F^{(bx+a)c}\right)^n\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x, algorithm="maxima")
```

```
[Out] integrate((e*x + d)^(4/3)*(F^((b*x + a)*c))^n, x)
```

Fricas [A] time = 1.55899, size = 316, normalized size = 3.22

$$\frac{\frac{4\left(-\frac{bcn\log(F)}{e}\right)^{\frac{2}{3}}e^2\Gamma\left(\frac{1}{3},-\frac{(bcenx+bcdn)\log(F)}{e}\right)}{F^{\frac{(bcd-ace)n}{e}}} - 3\left(4\,bcen\log(F) - 3\left(b^2c^2en^2x + b^2c^2dn^2\right)\log(F)^2\right)(ex+d)^{\frac{1}{3}}F^{bcnx+acn}}{9\,b^3c^3n^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x, algorithm="fricas")
```

```
[Out] 1/9*(4*(-b*c*n*log(F)/e)^(2/3)*e^2*gamma(1/3, -(b*c*e*n*x + b*c*d*n)*log(F)
/e)/F^((b*c*d - a*c*e)*n/e) - 3*(4*b*c*e*n*log(F) - 3*(b^2*c^2*e*n^2*x + b^
2*c^2*d*n^2)*log(F)^2)*(e*x + d)^(1/3)*F^(b*c*n*x + a*c*n))/(b^3*c^3*n^3*lo
g(F)^3)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((F**(c*(b*x+a)))**n*(e*x+d)**(4/3),x)
```

```
[Out] Timed out
```

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

$$\int (ex+d)^{\frac{4}{3}} \left(F^{(bx+a)c}\right)^n \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x, algorithm="giac")
```

```
[Out] integrate((e*x + d)^(4/3)*(F^((b*x + a)*c))^n, x)
```

3.51 $\int F^{c(a+bx)}(d+ex)\,dx$

Optimal. Leaf size=48

$$\frac{(d+ex)F^{c(a+bx)}}{bc\log(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}$$

```
[Out] -((e*F^(c*(a + b*x)))/(b^2*c^2*Log[F]^2)) + (F^(c*(a + b*x))*(d + e*x))/(b*
c*Log[F])
```

Rubi [A] time = 0.0171887, antiderivative size = 48, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2176, 2194}

$$\frac{(d+ex)F^{c(a+bx)}}{bc\log(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x),x]
```

```
[Out] -((e*F^(c*(a + b*x)))/(b^2*c^2*Log[F]^2)) + (F^(c*(a + b*x))*(d + e*x))/(b*
c*Log[F])
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int F^{c(a+bx)}(d+ex)\,dx &= \frac{F^{c(a+bx)}(d+ex)}{bc\log(F)}-\frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)}\\ &= -\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)}{bc\log(F)}\end{aligned}$$

Mathematica [A] time = 0.0231951, size = 34, normalized size = 0.71

$$\frac{F^{c(a+bx)}(bc\log(F)(d+ex)-e)}{b^2c^2\log^2(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x),x]
```

```
[Out] (F^(c*(a + b*x))*(-e + b*c*(d + e*x)*Log[F]))/(b^2*c^2*Log[F]^2)
```

Maple [A] time = 0., size = 38, normalized size = 0.8

$$\frac{(\ln(F)\,bcex + \ln(F)\,bcd - e)\,F^{c(bx+a)}}{b^2c^2\,(\ln(F))^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(e*x+d),x)
```

```
[Out] (ln(F)*b*c*e*x+ln(F)*b*c*d-e)*F^(c*(b*x+a))/b^2/c^2/ln(F)^2
```

Maxima [A] time = 1.04137, size = 81, normalized size = 1.69

$$\frac{F^{bcx+ac}d}{bc\log(F)} + \frac{(F^{ac}bcx\log(F) - F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d/(b*c*log(F)) + (F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*c*x)
*e/(b^2*c^2*log(F)^2)
```

Fricas [A] time = 1.54877, size = 90, normalized size = 1.88

$$\frac{((bcex + bcd)\log(F) - e)F^{bcx+ac}}{b^2c^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="fricas")
```

```
[Out] ((b*c*e*x + b*c*d)*log(F) - e)*F^(b*c*x + a*c)/(b^2*c^2*log(F)^2)
```

Sympy [A] time = 0.128976, size = 60, normalized size = 1.25

$$\begin{cases} \frac{F^{c(a+bx)}(bcd\log(F)+bcex\log(F)-e)}{b^2c^2\log(F)^2} & \text{for } b^2c^2\log(F)^2 \neq 0 \\ dx + \frac{ex^2}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(e*x+d),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b*c*d*log(F) + b*c*e*x*log(F) - e)/(b**2*c**2*
log(F)**2), Ne(b**2*c**2*log(F)**2, 0)), (d*x + e*x**2/2, True))
```

Giac [C] time = 1.29588, size = 1462, normalized size = 30.46

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(e*x+d),x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(pi*b*c*x*sgn(
F) - pi*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))
^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi
^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(b*c*x*log(abs(
F)) - 1)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*p
i*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(pi*b*c*x*sgn(F) - p
i*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2
*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(b*c*x*log(abs(F)) - 1)/(
(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^
2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F))
 + a*c*log(abs(F)) + 1) - 1/2*I*((2*pi*b*c*x*sgn(F) - 2*pi*b*c*x - 4*I*b*c*
x*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a
*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F
))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs
(F))^2) + (2*pi*b*c*x*sgn(F) - 2*pi*b*c*x + 4*I*b*c*x*log(abs(F)) - 4*I)*e^
(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a
*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2
*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 1) + 2*(2*b*c*d*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*
pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)*log(abs(F))/(4*b^2*c^2*log(abs(F
))^2 + (pi*b*c*sgn(F) - pi*b*c)^2) - (pi*b*c*sgn(F) - pi*b*c)*d*sin(-1/2*pi
*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c)/(4*b^2*c^2*l
og(abs(F))^2 + (pi*b*c*sgn(F) - pi*b*c)^2))*e^(b*c*x*log(abs(F)) + a*c*log(
abs(F))) - 1/2*I*(-2*I*d*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*
pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(I*pi*b*c*sgn(F) - I*pi*b*c + 2*b*c*log(abs(F
))) + 2*I*d*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F
) + 1/2*I*pi*a*c)/(-I*pi*b*c*sgn(F) + I*pi*b*c + 2*b*c*log(abs(F))))*e^(b*c
*x*log(abs(F)) + a*c*log(abs(F)))
```

3.52 $\int F^{c(a+bx)}\left(d+ex+fx^2\right)dx$

Optimal. Leaf size=135

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+\frac{fx^2F^{c(a+bx)}}{bc\log(F)}$$

```
[Out] (2*f*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x)))/(b^2*c^2*Log
[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) + (d*F^(c*(a + b*x)))/(
b*c*Log[F]) + (e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F^(c*(a + b*x))*x^2)/
(b*c*Log[F])
```

Rubi [A] time = 0.102553, antiderivative size = 135, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 3, integrand size = 20, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.15, Rules used = {2196, 2194, 2176}

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+\frac{fx^2F^{c(a+bx)}}{bc\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x + f*x^2),x]
```


```
[Out] (2*f*F^(c*(a + b*x)))/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x)))/(b^2*c^2*Log
[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) + (d*F^(c*(a + b*x)))/(
b*c*Log[F]) + (e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F^(c*(a + b*x))*x^2)/
(b*c*Log[F])
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)dx = \int \left(dF^{c(a+bx)}+eF^{c(a+bx)}x+fF^{c(a+bx)}x^2\right)dx$$
$$= d\int F^{c(a+bx)}\,dx + e\int F^{c(a+bx)}x\,dx + f\int F^{c(a+bx)}x^2\,dx$$
$$= \frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}-\frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)}-\frac{(2f)\int F^{c(a+bx)}x\,dx}{bc\log(F)}$$
$$= -\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}+\frac{(2f)\int F^{c(a+bx)}\,dx}{b^2c^2\log^2(F)}$$
$$= \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}$$

Mathematica [A] time = 0.0749048, size = 56, normalized size = 0.41

$$\frac{F^{c(a+bx)}\left(b^2c^2\log^2(F)(d+x(e+fx))-bc\log(F)(e+2fx)+2f\right)}{b^3c^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x + f*x^2),x]
```

```
[Out] (F^(c*(a + b*x))*(2*f - b*c*(e + 2*f*x)*Log[F] + b^2*c^2*(d + x*(e + f*x))*
Log[F]^2))/(b^3*c^3*Log[F]^3)
```

Maple [A] time = 0.003, size = 80, normalized size = 0.6

$$\frac{\left(fx^2b^2c^2(\ln(F))^2+(\ln(F))^2b^2c^2ex+b^2c^2(\ln(F))^2d-2\ln(F)bcfx-\ln(F)bce+2f\right)F^{c(bx+a)}}{b^3c^3(\ln(F))^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(f*x^2+e*x+d),x)
```

```
[Out] (f*x^2*b^2*c^2*ln(F)^2+ln(F)^2*b^2*c^2*e*x+b^2*c^2*ln(F)^2*d-2*ln(F)*b*c*f*
x-ln(F)*b*c*e+2*f)*F^(c*(b*x+a))/b^3/c^3/ln(F)^3
```

Maxima [A] time = 1.1881, size = 158, normalized size = 1.17

$$\frac{F^{bcx+ac}d}{bc\log(F)}+\frac{(F^{ac}bcx\log(F)-F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}+\frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}f}{b^3c^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(f*x^2+e*x+d),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d/(b*c*log(F)) + (F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*c*x)
*e/(b^2*c^2*log(F)^2) + (F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)*b*c*x*log
(F) + 2*F^(a*c))*F^(b*c*x)*f/(b^3*c^3*log(F)^3)
```

Fricas [A] time = 1.51259, size = 167, normalized size = 1.24

$$\frac{\left(\left(b^2c^2fx^2 + b^2c^2ex + b^2c^2d\right)\log\left(F\right)^2 - \left(2\,bcfx + bce\right)\log\left(F\right) + 2\,f\right)F^{bcx+ac}}{b^3c^3\log\left(F\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(f*x^2+e*x+d),x, algorithm="fricas")
```

```
[Out] ((b^2*c^2*f*x^2 + b^2*c^2*e*x + b^2*c^2*d)*log(F)^2 - (2*b*c*f*x + b*c*e)*l
og(F) + 2*f)*F^(b*c*x + a*c)/(b^3*c^3*log(F)^3)
```

Sympy [A] time = 0.155854, size = 116, normalized size = 0.86

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^2c^2d\log\left(F\right)^2+b^2c^2ex\log\left(F\right)^2+b^2c^2fx^2\log\left(F\right)^2-bce\log\left(F\right)-2bcfx\log\left(F\right)+2f\right)}{b^3c^3\log\left(F\right)^3} & \text{for}\ b^3c^3\log\left(F\right)^3 \neq 0 \\ dx + \frac{ex^2}{2} + \frac{fx^3}{3} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(f*x**2+e*x+d),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**2*c**2*d*log(F)**2 + b**2*c**2*e*x*log(F)**
2 + b**2*c**2*f*x**2*log(F)**2 - b*c*e*log(F) - 2*b*c*f*x*log(F) + 2*f)/(b*
*3*c**3*log(F)**3), Ne(b**3*c**3*log(F)**3, 0)), (d*x + e*x**2/2 + f*x**3/3
, True))
```

Giac [C] time = 1.3837, size = 3362, normalized size = 24.9

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(f*x^2+e*x+d),x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(pi*b*c*x*sgn(
F) - pi*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))
^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi
^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(b*c*x*log(abs(
F)) - 1)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*p
i*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(pi*b*c*x*sgn(F) - p
i*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2
*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(b*c*x*log(abs(F)) - 1)/(
(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^
2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F))
 + a*c*log(abs(F)) + 1) - 1/2*I*((2*pi*b*c*x*sgn(F) - 2*pi*b*c*x - 4*I*b*c*
x*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a
*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F
))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs
```

```
(F))^2) + (2*pi*b*c*x*sgn(F) - 2*pi*b*c*x + 4*I*b*c*x*log(abs(F)) - 4*I)*e^
(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a
*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2
*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 1) + (((pi^2*b^2*c^2*f*x^2*sgn(F) - pi^2*b^2*c^
2*f*x^2 + 2*b^2*c^2*f*x^2*log(abs(F))^2 + pi^2*b^2*c^2*d*sgn(F) - pi^2*b^2*
c^2*d + 2*b^2*c^2*d*log(abs(F))^2 - 4*b*c*f*x*log(abs(F)) + 4*f)*(3*pi^2*b^
3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F
))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*
c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) -
3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) - 2*(pi^3*b^3*c^3*
sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*lo
g(abs(F))^2)*(pi*b^2*c^2*f*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*f*x^2*log(ab
s(F)) + pi*b^2*c^2*d*log(abs(F))*sgn(F) - pi*b^2*c^2*d*log(abs(F)) - pi*b*c
*f*x*sgn(F) + pi*b*c*f*x)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^
2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*l
og(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2
))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c
) + ((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^
3 + 3*pi*b^3*c^3*log(abs(F))^2)*(pi^2*b^2*c^2*f*x^2*sgn(F) - pi^2*b^2*c^2*f
*x^2 + 2*b^2*c^2*f*x^2*log(abs(F))^2 + pi^2*b^2*c^2*d*sgn(F) - pi^2*b^2*c^2
*d + 2*b^2*c^2*d*log(abs(F))^2 - 4*b*c*f*x*log(abs(F)) + 4*f)/((pi^3*b^3*c^
3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*
log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(
abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) + 2*(3*pi^2*b^3*c^3*log(abs(F))*sgn(F
) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)*(pi*b^2*c^2*f*x^2
*log(abs(F))*sgn(F) - pi*b^2*c^2*f*x^2*log(abs(F)) + pi*b^2*c^2*d*log(abs(F
))*sgn(F) - pi*b^2*c^2*d*log(abs(F)) - pi*b*c*f*x*sgn(F) + pi*b*c*f*x)/((pi
^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi
*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) +
1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*
log(abs(F))) + 1/2*I*((4*I*pi^2*b^2*c^2*f*x^2*sgn(F) - 8*pi*b^2*c^2*f*x^2*l
og(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*f*x^2 + 8*pi*b^2*c^2*f*x^2*log(abs(F))
 + 8*I*b^2*c^2*f*x^2*log(abs(F))^2 + 4*I*pi^2*b^2*c^2*d*sgn(F) - 8*pi*b^2*c
^2*d*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*d + 8*pi*b^2*c^2*d*log(abs(F)) +
 8*I*b^2*c^2*d*log(abs(F))^2 + 8*pi*b*c*f*x*sgn(F) - 8*pi*b*c*f*x - 16*I*b*
c*f*x*log(abs(F)) + 16*I*f)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2
*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(-4*I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^
3*log(abs(F))*sgn(F) + 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F) + 4*I*pi^3*b^3*
c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c
^3*log(abs(F))^3) - (4*I*pi^2*b^2*c^2*f*x^2*sgn(F) + 8*pi*b^2*c^2*f*x^2*log
(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*f*x^2 - 8*pi*b^2*c^2*f*x^2*log(abs(F)) +
 8*I*b^2*c^2*f*x^2*log(abs(F))^2 + 4*I*pi^2*b^2*c^2*d*sgn(F) + 8*pi*b^2*c^2
*d*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*c^2*d - 8*pi*b^2*c^2*d*log(abs(F)) + 8
*I*b^2*c^2*d*log(abs(F))^2 - 8*pi*b*c*f*x*sgn(F) + 8*pi*b*c*f*x - 16*I*b*c*
f*x*log(abs(F)) + 16*I*f)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*
I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*
log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F) - 4*I*pi^3*b^3*c^
3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3
*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.53 $\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)dx$

Optimal. Leaf size=229

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+$$

```
[Out] (-6*F^(c*(a + b*x))*g)/(b^4*c^4*Log[F]^4) + (2*f*F^(c*(a + b*x)))/(b^3*c^3*
Log[F]^3) + (6*F^(c*(a + b*x))*g*x)/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x))
)/(b^2*c^2*Log[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) - (3*F^(c
*(a + b*x))*g*x^2)/(b^2*c^2*Log[F]^2) + (d*F^(c*(a + b*x)))/(b*c*Log[F]) +
(e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F^(c*(a + b*x))*x^2)/(b*c*Log[F]) +
 (F^(c*(a + b*x))*g*x^3)/(b*c*Log[F])
```

Rubi [A] time = 0.191302, antiderivative size = 229, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 3, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.12, Rules used = {2196, 2194, 2176}

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x + f*x^2 + g*x^3),x]
```


```
[Out] (-6*F^(c*(a + b*x))*g)/(b^4*c^4*Log[F]^4) + (2*f*F^(c*(a + b*x)))/(b^3*c^3*
Log[F]^3) + (6*F^(c*(a + b*x))*g*x)/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x))
)/(b^2*c^2*Log[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) - (3*F^(c
*(a + b*x))*g*x^2)/(b^2*c^2*Log[F]^2) + (d*F^(c*(a + b*x)))/(b*c*Log[F]) +
(e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F^(c*(a + b*x))*x^2)/(b*c*Log[F]) +
 (F^(c*(a + b*x))*g*x^3)/(b*c*Log[F])
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)dx = \int \left(dF^{c(a+bx)}+eF^{c(a+bx)}x+fF^{c(a+bx)}x^2+F^{c(a+bx)}gx^3\right)dx$$
$$= d\int F^{c(a+bx)}\,dx + e\int F^{c(a+bx)}x\,dx + f\int F^{c(a+bx)}x^2\,dx + g\int F^{c(a+bx)}x^3\,dx$$
$$= \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} - \frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)} - \frac{(2f)\int F^{c(a+b}}{bc\log(F}$$
$$= -\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)}$$
$$= \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} + \frac{dF^{c(a+}}{bc\log(}$$
$$= -\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)} + \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a}}{b^2c^2}$$

Mathematica [A] time = 0.110618, size = 84, normalized size = 0.37

$$\frac{F^{c(a+bx)}\left(b^3c^3\log^3(F)(d+x(e+x(f+gx)))-b^2c^2\log^2(F)(e+x(2f+3gx))+2bc\log(F)(f+3gx)-6g\right)}{b^4c^4\log^4(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x + f*x^2 + g*x^3),x]
```

```
[Out] (F^(c*(a + b*x))*(-6*g + 2*b*c*(f + 3*g*x)*Log[F] - b^2*c^2*(e + x*(2*f + 3
*g*x))*Log[F]^2 + b^3*c^3*(d + x*(e + x*(f + g*x)))*Log[F]^3))/(b^4*c^4*Log
[F]^4)
```

Maple [A] time = 0.004, size = 138, normalized size = 0.6

$$\frac{\left(gx^3b^3c^3\left(\ln(F)\right)^3+\left(\ln(F)\right)^3b^3c^3fx^2+\left(\ln(F)\right)^3b^3c^3ex+b^3c^3\left(\ln(F)\right)^3d-3\left(\ln(F)\right)^2b^2c^2gx^2-2\left(\ln(F)\right)^2b^2c^2fx-b^2c^2}{b^4c^4\left(\ln(F)\right)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(g*x^3+f*x^2+e*x+d),x)
```

```
[Out] (g*x^3*b^3*c^3*ln(F)^3+ln(F)^3*b^3*c^3*f*x^2+ln(F)^3*b^3*c^3*e*x+b^3*c^3*ln
(F)^3*d-3*ln(F)^2*b^2*c^2*g*x^2-2*ln(F)^2*b^2*c^2*f*x-b^2*c^2*ln(F)^2*e+6*l
n(F)*b*c*g*x+2*f*b*c*ln(F)-6*g)*F^(c*(b*x+a))/b^4/c^4/ln(F)^4
```

Maxima [A] time = 1.13206, size = 262, normalized size = 1.14

$$\frac{F^{bcx+ac}d}{bc\log(F)} + \frac{\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}e}{b^2c^2\log(F)^2} + \frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2\,F^{ac}bcx\log(F)+2\,F^{ac}\right)F^{bcx}f}{b^3c^3\log(F)^3} + \frac{\left(F^{ac}b^3c^3x^3\log(F)^3-3\,F\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(g*x^3+f*x^2+e*x+d),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d/(b*c*log(F)) + (F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*c*x)
*e/(b^2*c^2*log(F)^2) + (F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)*b*c*x*log
```

```
(F) + 2*F^(a*c))*F^(b*c*x)*f/(b^3*c^3*log(F)^3) + (F^(a*c)*b^3*c^3*x^3*log(
F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*log(F) - 6*F^(a*c))
*F^(b*c*x)*g/(b^4*c^4*log(F)^4)
```

Fricas [A] time = 1.51232, size = 269, normalized size = 1.17

$$\frac{\left(\left(b^3c^3gx^3 + b^3c^3fx^2 + b^3c^3ex + b^3c^3d\right)\log\left(F\right)^3 - \left(3\,b^2c^2gx^2 + 2\,b^2c^2fx + b^2c^2e\right)\log\left(F\right)^2 + 2\left(3\,bcgx + bcf\right)\log\left(F\right) - \right.}{b^4c^4\log\left(F\right)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(g*x^3+f*x^2+e*x+d),x, algorithm="fricas")
```

```
[Out] ((b^3*c^3*g*x^3 + b^3*c^3*f*x^2 + b^3*c^3*e*x + b^3*c^3*d)*log(F)^3 - (3*b^
2*c^2*g*x^2 + 2*b^2*c^2*f*x + b^2*c^2*e)*log(F)^2 + 2*(3*b*c*g*x + b*c*f)*l
og(F) - 6*g)*F^(b*c*x + a*c)/(b^4*c^4*log(F)^4)
```

Sympy [A] time = 0.184252, size = 190, normalized size = 0.83

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^3c^3d\log\left(F\right)^3+b^3c^3ex\log\left(F\right)^3+b^3c^3fx^2\log\left(F\right)^3+b^3c^3gx^3\log\left(F\right)^3-b^2c^2e\log\left(F\right)^2-2b^2c^2fx\log\left(F\right)^2-3b^2c^2gx^2\log\left(F\right)^2+2bcf\log\left(F\right)+6bcgx\log\left(F\right)\right.}{b^4c^4\log\left(F\right)^4} \\ dx + \frac{ex^2}{2} + \frac{fx^3}{3} + \frac{gx^4}{4} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(g*x**3+f*x**2+e*x+d),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**3*c**3*d*log(F)**3 + b**3*c**3*e*x*log(F)**
3 + b**3*c**3*f*x**2*log(F)**3 + b**3*c**3*g*x**3*log(F)**3 - b**2*c**2*e*l
og(F)**2 - 2*b**2*c**2*f*x*log(F)**2 - 3*b**2*c**2*g*x**2*log(F)**2 + 2*b*c
*f*log(F) + 6*b*c*g*x*log(F) - 6*g)/(b**4*c**4*log(F)**4), Ne(b**4*c**4*log
(F)**4, 0)), (d*x + e*x**2/2 + f*x**3/3 + g*x**4/4, True))
```

Giac [C] time = 1.41631, size = 5787, normalized size = 25.27

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(g*x^3+f*x^2+e*x+d),x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(pi*b*c*x*sgn(
F) - pi*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))
^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi
^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(b*c*x*log(abs(
F)) - 1)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*p
i*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(pi*b*c*x*sgn(F) - p
i*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2
```

```
*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(b*c*x*log(abs(F)) - 1)/(
(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^
2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F))
 + a*c*log(abs(F)) + 1) - 1/2*I*((2*pi*b*c*x*sgn(F) - 2*pi*b*c*x - 4*I*b*c*
x*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a
*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F
))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs
(F))^2) + (2*pi*b*c*x*sgn(F) - 2*pi*b*c*x + 4*I*b*c*x*log(abs(F)) - 4*I)*e^
(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a
*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2
*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 1) - (((3*pi^2*b^3*c^3*g*x^3*log(abs(F))*sgn(F)
 - 3*pi^2*b^3*c^3*g*x^3*log(abs(F)) + 2*b^3*c^3*g*x^3*log(abs(F))^3 + 3*pi^
2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*f*x^2*log(abs(F)) + 2*b
^3*c^3*f*x^2*log(abs(F))^3 + 3*pi^2*b^3*c^3*d*log(abs(F))*sgn(F) - 3*pi^2*b
^3*c^3*d*log(abs(F)) + 2*b^3*c^3*d*log(abs(F))^3 - 3*pi^2*b^2*c^2*g*x^2*sgn
(F) + 3*pi^2*b^2*c^2*g*x^2 - 6*b^2*c^2*g*x^2*log(abs(F))^2 - 2*pi^2*b^2*c^2
*f*x*sgn(F) + 2*pi^2*b^2*c^2*f*x - 4*b^2*c^2*f*x*log(abs(F))^2 + 12*b*c*g*x
*log(abs(F)) + 4*b*c*f*log(abs(F)) - 12*g)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^
4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 -
2*b^4*c^4*log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))
^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs
(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*
sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*
b^3*c^3*g*x^3*sgn(F) - 3*pi*b^3*c^3*g*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c
^3*g*x^3 + 3*pi*b^3*c^3*g*x^3*log(abs(F))^2 + pi^3*b^3*c^3*f*x^2*sgn(F) - 3
*pi*b^3*c^3*f*x^2*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 + 3*pi*b^3*c^3*
f*x^2*log(abs(F))^2 + pi^3*b^3*c^3*d*sgn(F) - 3*pi*b^3*c^3*d*log(abs(F))^2*
sgn(F) - pi^3*b^3*c^3*d + 3*pi*b^3*c^3*d*log(abs(F))^2 + 6*pi*b^2*c^2*g*x^2
*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*g*x^2*log(abs(F)) + 4*pi*b^2*c^2*f*x*log
(abs(F))*sgn(F) - 4*pi*b^2*c^2*f*x*log(abs(F)) - 6*pi*b*c*g*x*sgn(F) + 6*pi
*b*c*g*x - 2*pi*b*c*f*sgn(F) + 2*pi*b*c*f)*(pi^3*b^4*c^4*log(abs(F))*sgn(F)
 - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*
log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F)
- pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2
+ 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - p
i^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*s
gn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^3*b^3*c^3*g*x
^3*sgn(F) - 3*pi*b^3*c^3*g*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*g*x^3 +
3*pi*b^3*c^3*g*x^3*log(abs(F))^2 + pi^3*b^3*c^3*f*x^2*sgn(F) - 3*pi*b^3*c^3
*f*x^2*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 + 3*pi*b^3*c^3*f*x^2*log(a
bs(F))^2 + pi^3*b^3*c^3*d*sgn(F) - 3*pi*b^3*c^3*d*log(abs(F))^2*sgn(F) - pi
^3*b^3*c^3*d + 3*pi*b^3*c^3*d*log(abs(F))^2 + 6*pi*b^2*c^2*g*x^2*log(abs(F)
)*sgn(F) - 6*pi*b^2*c^2*g*x^2*log(abs(F)) + 4*pi*b^2*c^2*f*x*log(abs(F))*sg
n(F) - 4*pi*b^2*c^2*f*x*log(abs(F)) - 6*pi*b*c*g*x*sgn(F) + 6*pi*b*c*g*x -
2*pi*b*c*f*sgn(F) + 2*pi*b*c*f)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(a
bs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*l
og(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) -
 pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 +
 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi
^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(3*pi^2*b^3*c^3*g
*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*g*x^3*log(abs(F)) + 2*b^3*c^3*g*x^
3*log(abs(F))^3 + 3*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*
f*x^2*log(abs(F)) + 2*b^3*c^3*f*x^2*log(abs(F))^3 + 3*pi^2*b^3*c^3*d*log(ab
s(F))*sgn(F) - 3*pi^2*b^3*c^3*d*log(abs(F)) + 2*b^3*c^3*d*log(abs(F))^3 - 3
*pi^2*b^2*c^2*g*x^2*sgn(F) + 3*pi^2*b^2*c^2*g*x^2 - 6*b^2*c^2*g*x^2*log(abs
(F))^2 - 2*pi^2*b^2*c^2*f*x*sgn(F) + 2*pi^2*b^2*c^2*f*x - 4*b^2*c^2*f*x*log
(abs(F))^2 + 12*b*c*g*x*log(abs(F)) + 4*b*c*f*log(abs(F)) - 12*g)*(pi^3*b^4
```

```
*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*lo
g(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^
4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^
4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*l
og(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^
2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*
c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*((8*pi^3*b^3*c^3*g*x^3*
sgn(F) + 24*I*pi^2*b^3*c^3*g*x^3*log(abs(F))*sgn(F) - 24*pi*b^3*c^3*g*x^3*l
og(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*g*x^3 - 24*I*pi^2*b^3*c^3*g*x^3*log(ab
s(F)) + 24*pi*b^3*c^3*g*x^3*log(abs(F))^2 + 16*I*b^3*c^3*g*x^3*log(abs(F))^
3 + 8*pi^3*b^3*c^3*f*x^2*sgn(F) + 24*I*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F
) - 24*pi*b^3*c^3*f*x^2*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*f*x^2 - 24*I*
pi^2*b^3*c^3*f*x^2*log(abs(F)) + 24*pi*b^3*c^3*f*x^2*log(abs(F))^2 + 16*I*b
^3*c^3*f*x^2*log(abs(F))^3 + 8*pi^3*b^3*c^3*d*sgn(F) + 24*I*pi^2*b^3*c^3*d*
log(abs(F))*sgn(F) - 24*pi*b^3*c^3*d*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*
d - 24*I*pi^2*b^3*c^3*d*log(abs(F)) + 24*pi*b^3*c^3*d*log(abs(F))^2 + 16*I*
b^3*c^3*d*log(abs(F))^3 - 24*I*pi^2*b^2*c^2*g*x^2*sgn(F) + 48*pi*b^2*c^2*g*
x^2*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*g*x^2 - 48*pi*b^2*c^2*g*x^2*log(
abs(F)) - 48*I*b^2*c^2*g*x^2*log(abs(F))^2 - 16*I*pi^2*b^2*c^2*f*x*sgn(F) +
 32*pi*b^2*c^2*f*x*log(abs(F))*sgn(F) + 16*I*pi^2*b^2*c^2*f*x - 32*pi*b^2*c
^2*f*x*log(abs(F)) - 32*I*b^2*c^2*f*x*log(abs(F))^2 - 48*pi*b*c*g*x*sgn(F)
+ 48*pi*b*c*g*x + 96*I*b*c*g*x*log(abs(F)) - 16*pi*b*c*f*sgn(F) + 16*pi*b*c
*f + 32*I*b*c*f*log(abs(F)) - 96*I*g)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b
*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) + 32*I*pi
^3*b^4*c^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - 32*I
*pi*b^4*c^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*c^4 - 32*I*pi^3*b^4*c^4*log(a
bs(F)) + 48*pi^2*b^4*c^4*log(abs(F))^2 + 32*I*pi*b^4*c^4*log(abs(F))^3 - 16
*b^4*c^4*log(abs(F))^4) + (8*pi^3*b^3*c^3*g*x^3*sgn(F) - 24*I*pi^2*b^3*c^3*
g*x^3*log(abs(F))*sgn(F) - 24*pi*b^3*c^3*g*x^3*log(abs(F))^2*sgn(F) - 8*pi^
3*b^3*c^3*g*x^3 + 24*I*pi^2*b^3*c^3*g*x^3*log(abs(F)) + 24*pi*b^3*c^3*g*x^3
*log(abs(F))^2 - 16*I*b^3*c^3*g*x^3*log(abs(F))^3 + 8*pi^3*b^3*c^3*f*x^2*sg
n(F) - 24*I*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 24*pi*b^3*c^3*f*x^2*log
(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*f*x^2 + 24*I*pi^2*b^3*c^3*f*x^2*log(abs(
F)) + 24*pi*b^3*c^3*f*x^2*log(abs(F))^2 - 16*I*b^3*c^3*f*x^2*log(abs(F))^3
+ 8*pi^3*b^3*c^3*d*sgn(F) - 24*I*pi^2*b^3*c^3*d*log(abs(F))*sgn(F) - 24*pi*
b^3*c^3*d*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*c^3*d + 24*I*pi^2*b^3*c^3*d*log
(abs(F)) + 24*pi*b^3*c^3*d*log(abs(F))^2 - 16*I*b^3*c^3*d*log(abs(F))^3 + 2
4*I*pi^2*b^2*c^2*g*x^2*sgn(F) + 48*pi*b^2*c^2*g*x^2*log(abs(F))*sgn(F) - 24
*I*pi^2*b^2*c^2*g*x^2 - 48*pi*b^2*c^2*g*x^2*log(abs(F)) + 48*I*b^2*c^2*g*x^
2*log(abs(F))^2 + 16*I*pi^2*b^2*c^2*f*x*sgn(F) + 32*pi*b^2*c^2*f*x*log(abs(
F))*sgn(F) - 16*I*pi^2*b^2*c^2*f*x - 32*pi*b^2*c^2*f*x*log(abs(F)) + 32*I*b
^2*c^2*f*x*log(abs(F))^2 - 48*pi*b*c*g*x*sgn(F) + 48*pi*b*c*g*x - 96*I*b*c*
g*x*log(abs(F)) - 16*pi*b*c*f*sgn(F) + 16*pi*b*c*f - 32*I*b*c*f*log(abs(F))
 + 96*I*g)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F)
 + 1/2*I*pi*a*c)/(8*pi^4*b^4*c^4*sgn(F) - 32*I*pi^3*b^4*c^4*log(abs(F))*sgn
(F) - 48*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) + 32*I*pi*b^4*c^4*log(abs(F))^3*
sgn(F) - 8*pi^4*b^4*c^4 + 32*I*pi^3*b^4*c^4*log(abs(F)) + 48*pi^2*b^4*c^4*l
og(abs(F))^2 - 32*I*pi*b^4*c^4*log(abs(F))^3 - 16*b^4*c^4*log(abs(F))^4))*e
^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.54 $\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)dx$

Optimal. Leaf size=348

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4hx^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{12hx^2F^{c(a+bx)}}{b^3c^3\log^3(F)}$$

```
[Out] (24*F^(c*(a + b*x))*h)/(b^5*c^5*Log[F]^5) - (6*F^(c*(a + b*x))*g)/(b^4*c^4*
Log[F]^4) - (24*F^(c*(a + b*x))*h*x)/(b^4*c^4*Log[F]^4) + (2*f*F^(c*(a + b*
x)))/(b^3*c^3*Log[F]^3) + (6*F^(c*(a + b*x))*g*x)/(b^3*c^3*Log[F]^3) + (12*
F^(c*(a + b*x))*h*x^2)/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x)))/(b^2*c^2*Lo
g[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) - (3*F^(c*(a + b*x))*g
*x^2)/(b^2*c^2*Log[F]^2) - (4*F^(c*(a + b*x))*h*x^3)/(b^2*c^2*Log[F]^2) + (
d*F^(c*(a + b*x)))/(b*c*Log[F]) + (e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F
^(c*(a + b*x))*x^2)/(b*c*Log[F]) + (F^(c*(a + b*x))*g*x^3)/(b*c*Log[F]) + (
F^(c*(a + b*x))*h*x^4)/(b*c*Log[F])
```

Rubi [A] time = 0.312263, antiderivative size = 348, normalized size of antiderivative = 1., number of steps used = 17, number of rules used = 3, integrand size = 30, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.1, Rules used = {2196, 2194, 2176}

$$-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{4hx^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{12hx^2F^{c(a+bx)}}{b^3c^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*(d + e*x + f*x^2 + g*x^3 + h*x^4),x]
```



```
[Out] (24*F^(c*(a + b*x))*h)/(b^5*c^5*Log[F]^5) - (6*F^(c*(a + b*x))*g)/(b^4*c^4*
Log[F]^4) - (24*F^(c*(a + b*x))*h*x)/(b^4*c^4*Log[F]^4) + (2*f*F^(c*(a + b*
x)))/(b^3*c^3*Log[F]^3) + (6*F^(c*(a + b*x))*g*x)/(b^3*c^3*Log[F]^3) + (12*
F^(c*(a + b*x))*h*x^2)/(b^3*c^3*Log[F]^3) - (e*F^(c*(a + b*x)))/(b^2*c^2*Lo
g[F]^2) - (2*f*F^(c*(a + b*x))*x)/(b^2*c^2*Log[F]^2) - (3*F^(c*(a + b*x))*g
*x^2)/(b^2*c^2*Log[F]^2) - (4*F^(c*(a + b*x))*h*x^3)/(b^2*c^2*Log[F]^2) + (
d*F^(c*(a + b*x)))/(b*c*Log[F]) + (e*F^(c*(a + b*x))*x)/(b*c*Log[F]) + (f*F
^(c*(a + b*x))*x^2)/(b*c*Log[F]) + (F^(c*(a + b*x))*g*x^3)/(b*c*Log[F]) + (
F^(c*(a + b*x))*h*x^4)/(b*c*Log[F])
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)dx=\int\left(dF^{c(a+bx)}+eF^{c(a+bx)}x+fF^{c(a+bx)}x^2+F^{c(a+bx)}gx^3+F^{c(a+bx)}hx^4\right)dx$$
$$=d\int F^{c(a+bx)}\,dx+e\int F^{c(a+bx)}x\,dx+f\int F^{c(a+bx)}x^2\,dx+g\int F^{c(a+bx)}x^3\,dx$$
$$=\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}+\frac{F^{c(a+bx)}gx^3}{bc\log(F)}+\frac{F^{c(a+bx)}hx^4}{bc\log(F)}-\frac{e\int F^{c}}{bc\,l}$$
$$=-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}-\frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)}-\frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+$$
$$=\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)}+\frac{12F^{c(a+bx)}hx^2}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F}$$
$$=-\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)}-\frac{24F^{c(a+bx)}hx}{b^4c^4\log^4(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)}+\frac{12F^{c(a+bx)}h}{b^3c^3\log^3(}$$
$$=\frac{24F^{c(a+bx)}h}{b^5c^5\log^5(F)}-\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)}-\frac{24F^{c(a+bx)}hx}{b^4c^4\log^4(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)}$$

Mathematica [A] time = 0.161942, size = 117, normalized size = 0.34

$$\frac{F^{c(a+bx)}\left(b^4c^4\log^4(F)(d+x(e+x(f+x(g+hx))))-b^3c^3\log^3(F)\left(e+x\left(2f+3gx+4hx^2\right)\right)+2b^2c^2\log^2(F)(f+3x(g\right.}{b^5c^5\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x + f*x^2 + g*x^3 + h*x^4),x]
```

```
[Out] (F^(c*(a + b*x))*(24*h - 6*b*c*(g + 4*h*x)*Log[F] + 2*b^2*c^2*(f + 3*x*(g +
 2*h*x))*Log[F]^2 - b^3*c^3*(e + x*(2*f + 3*g*x + 4*h*x^2))*Log[F]^3 + b^4*
c^4*(d + x*(e + x*(f + x*(g + h*x))))*Log[F]^4))/(b^5*c^5*Log[F]^5)
```

Maple [A] time = 0.005, size = 212, normalized size = 0.6

$$\frac{\left(hx^4b^4c^4(\ln(F))^4+(\ln(F))^4b^4c^4gx^3+(\ln(F))^4b^4c^4fx^2+(\ln(F))^4b^4c^4ex+(\ln(F))^4b^4c^4d-4(\ln(F))^3b^3c^3hx^3-3(\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*(h*x^4+g*x^3+f*x^2+e*x+d),x)
```

```
[Out] (h*x^4*b^4*c^4*ln(F)^4+ln(F)^4*b^4*c^4*g*x^3+ln(F)^4*b^4*c^4*f*x^2+ln(F)^4*
b^4*c^4*e*x+ln(F)^4*b^4*c^4*d-4*ln(F)^3*b^3*c^3*h*x^3-3*ln(F)^3*b^3*c^3*g*x
^2-2*ln(F)^3*b^3*c^3*f*x-ln(F)^3*b^3*c^3*e+12*ln(F)^2*b^2*c^2*h*x^2+6*ln(F)
^2*b^2*c^2*g*x+2*b^2*c^2*ln(F)^2*f-24*ln(F)*b*c*h*x-6*g*b*c*ln(F)+24*h)*F^(
c*(b*x+a))/b^5/c^5/ln(F)^5
```

Maxima [A] time = 1.06509, size = 393, normalized size = 1.13

$$\frac{F^{bcx+ac}d}{bc\log(F)}+\frac{\left(F^{ac}bcx\log(F)-F^{ac}\right)F^{bcx}e}{b^2c^2\log(F)^2}+\frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}f}{b^3c^3\log(F)^3}+\frac{\left(F^{ac}b^3c^3x^3\log(F)^3-\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(h*x^4+g*x^3+f*x^2+e*x+d),x, algorithm="maxima")
```

```
[Out] F^(b*c*x + a*c)*d/(b*c*log(F)) + (F^(a*c)*b*c*x*log(F) - F^(a*c))*F^(b*c*x)
*e/(b^2*c^2*log(F)^2) + (F^(a*c)*b^2*c^2*x^2*log(F)^2 - 2*F^(a*c)*b*c*x*log
(F) + 2*F^(a*c))*F^(b*c*x)*f/(b^3*c^3*log(F)^3) + (F^(a*c)*b^3*c^3*x^3*log(
F)^3 - 3*F^(a*c)*b^2*c^2*x^2*log(F)^2 + 6*F^(a*c)*b*c*x*log(F) - 6*F^(a*c))
*F^(b*c*x)*g/(b^4*c^4*log(F)^4) + (F^(a*c)*b^4*c^4*x^4*log(F)^4 - 4*F^(a*c)
*b^3*c^3*x^3*log(F)^3 + 12*F^(a*c)*b^2*c^2*x^2*log(F)^2 - 24*F^(a*c)*b*c*x*
log(F) + 24*F^(a*c))*F^(b*c*x)*h/(b^5*c^5*log(F)^5)
```

Fricas [A] time = 1.56461, size = 396, normalized size = 1.14

$$\frac{\left(\left(b^4c^4hx^4 + b^4c^4gx^3 + b^4c^4fx^2 + b^4c^4ex + b^4c^4d\right)\log\left(F\right)^4 - \left(4\,b^3c^3hx^3 + 3\,b^3c^3gx^2 + 2\,b^3c^3fx + b^3c^3e\right)\log\left(F\right)^3 + 2\left(6\,b^2c\right.\right.}{b^5c^5\log\left(F\right)^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(h*x^4+g*x^3+f*x^2+e*x+d),x, algorithm="fricas")
```

```
[Out] ((b^4*c^4*h*x^4 + b^4*c^4*g*x^3 + b^4*c^4*f*x^2 + b^4*c^4*e*x + b^4*c^4*d)*
log(F)^4 - (4*b^3*c^3*h*x^3 + 3*b^3*c^3*g*x^2 + 2*b^3*c^3*f*x + b^3*c^3*e)*
log(F)^3 + 2*(6*b^2*c^2*h*x^2 + 3*b^2*c^2*g*x + b^2*c^2*f)*log(F)^2 - 6*(4*
b*c*h*x + b*c*g)*log(F) + 24*h)*F^(b*c*x + a*c)/(b^5*c^5*log(F)^5)
```

Sympy [A] time = 0.216861, size = 284, normalized size = 0.82

$$\begin{cases} \frac{F^{c(a+bx)}\left(b^4c^4d\log\left(F\right)^4+b^4c^4ex\log\left(F\right)^4+b^4c^4fx^2\log\left(F\right)^4+b^4c^4gx^3\log\left(F\right)^4+b^4c^4hx^4\log\left(F\right)^4-b^3c^3e\log\left(F\right)^3-2b^3c^3fx\log\left(F\right)^3-3b^3c^3gx^2\log\left(F\right)^3-4b^3c^3hx^3\log\right.}{b^5c^5\log\left(F\right)^5} \\ dx + \frac{ex^2}{2} + \frac{fx^3}{3} + \frac{gx^4}{4} + \frac{hx^5}{5} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*(h*x**4+g*x**3+f*x**2+e*x+d),x)
```

```
[Out] Piecewise((F**(c*(a + b*x))*(b**4*c**4*d*log(F)**4 + b**4*c**4*e*x*log(F)**
4 + b**4*c**4*f*x**2*log(F)**4 + b**4*c**4*g*x**3*log(F)**4 + b**4*c**4*h*x
**4*log(F)**4 - b**3*c**3*e*log(F)**3 - 2*b**3*c**3*f*x*log(F)**3 - 3*b**3*
c**3*g*x**2*log(F)**3 - 4*b**3*c**3*h*x**3*log(F)**3 + 2*b**2*c**2*f*log(F)
**2 + 6*b**2*c**2*g*x*log(F)**2 + 12*b**2*c**2*h*x**2*log(F)**2 - 6*b*c*g*l
og(F) - 24*b*c*h*x*log(F) + 24*h)/(b**5*c**5*log(F)**5), Ne(b**5*c**5*log(F
)**5, 0)), (d*x + e*x**2/2 + f*x**3/3 + g*x**4/4 + h*x**5/5, True))
```

Giac [C] time = 1.51238, size = 10024, normalized size = 28.8

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*(h*x^4+g*x^3+f*x^2+e*x+d),x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(pi*b*c*x*sgn(
F) - pi*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))
^2)^2 + 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) + (pi
^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(b*c*x*log(abs(
F)) - 1)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*cos(-1/2*p
i*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) + ((pi^2*b^
2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)*(pi*b*c*x*sgn(F) - p
i*b*c*x)/((pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2
+ 4*(pi*b^2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2) - 4*(pi*b^2
*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))*(b*c*x*log(abs(F)) - 1)/(
(pi^2*b^2*c^2*sgn(F) - pi^2*b^2*c^2 + 2*b^2*c^2*log(abs(F))^2)^2 + 4*(pi*b^
2*c^2*log(abs(F))*sgn(F) - pi*b^2*c^2*log(abs(F)))^2))*sin(-1/2*pi*b*c*x*sg
n(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F))
 + a*c*log(abs(F)) + 1) - 1/2*I*((2*pi*b*c*x*sgn(F) - 2*pi*b*c*x - 4*I*b*c*
x*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a
*c*sgn(F) - 1/2*I*pi*a*c)/(2*pi^2*b^2*c^2*sgn(F) + 4*I*pi*b^2*c^2*log(abs(F
))*sgn(F) - 2*pi^2*b^2*c^2 - 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs
(F))^2) + (2*pi*b*c*x*sgn(F) - 2*pi*b*c*x + 4*I*b*c*x*log(abs(F)) - 4*I)*e^
(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a
*c)/(2*pi^2*b^2*c^2*sgn(F) - 4*I*pi*b^2*c^2*log(abs(F))*sgn(F) - 2*pi^2*b^2
*c^2 + 4*I*pi*b^2*c^2*log(abs(F)) + 4*b^2*c^2*log(abs(F))^2))*e^(b*c*x*log(
abs(F)) + a*c*log(abs(F)) + 1) - (((4*pi^3*b^4*c^4*h*x^4*log(abs(F))*sgn(F)
 - 4*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*h*x^4*log(abs(F
)) + 4*pi*b^4*c^4*h*x^4*log(abs(F))^3 + 4*pi^3*b^4*c^4*g*x^3*log(abs(F))*sg
n(F) - 4*pi*b^4*c^4*g*x^3*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*g*x^3*log(a
bs(F)) + 4*pi*b^4*c^4*g*x^3*log(abs(F))^3 + 4*pi^3*b^4*c^4*f*x^2*log(abs(F)
)*sgn(F) - 4*pi*b^4*c^4*f*x^2*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*f*x^2*l
og(abs(F)) + 4*pi*b^4*c^4*f*x^2*log(abs(F))^3 - 4*pi^3*b^3*c^3*h*x^3*sgn(F)
 + 4*pi^3*b^4*c^4*d*log(abs(F))*sgn(F) + 12*pi*b^3*c^3*h*x^3*log(abs(F))^2*
sgn(F) - 4*pi*b^4*c^4*d*log(abs(F))^3*sgn(F) + 4*pi^3*b^3*c^3*h*x^3 - 4*pi^
3*b^4*c^4*d*log(abs(F)) - 12*pi*b^3*c^3*h*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*
d*log(abs(F))^3 - 3*pi^3*b^3*c^3*g*x^2*sgn(F) + 9*pi*b^3*c^3*g*x^2*log(abs(
F))^2*sgn(F) + 3*pi^3*b^3*c^3*g*x^2 - 9*pi*b^3*c^3*g*x^2*log(abs(F))^2 - 2*
pi^3*b^3*c^3*f*x*sgn(F) + 6*pi*b^3*c^3*f*x*log(abs(F))^2*sgn(F) + 2*pi^3*b^
3*c^3*f*x - 6*pi*b^3*c^3*f*x*log(abs(F))^2 - 24*pi*b^2*c^2*h*x^2*log(abs(F)
)*sgn(F) + 24*pi*b^2*c^2*h*x^2*log(abs(F)) - 12*pi*b^2*c^2*g*x*log(abs(F))*
sgn(F) + 12*pi*b^2*c^2*g*x*log(abs(F)) - 4*pi*b^2*c^2*f*log(abs(F))*sgn(F)
+ 4*pi*b^2*c^2*f*log(abs(F)) + 24*pi*b*c*h*x*sgn(F) - 24*pi*b*c*h*x + 6*pi*
b*c*g*sgn(F) - 6*pi*b*c*g)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F
))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^
5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 1
0*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - p
i^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2
 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F
) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*
log(abs(F))^5)^2) - (pi^4*b^4*c^4*h*x^4*sgn(F) - 6*pi^2*b^4*c^4*h*x^4*log(a
bs(F))^2*sgn(F) - pi^4*b^4*c^4*h*x^4 + 6*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 -
 2*b^4*c^4*h*x^4*log(abs(F))^4 + pi^4*b^4*c^4*g*x^3*sgn(F) - 6*pi^2*b^4*c^4
*g*x^3*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*g*x^3 + 6*pi^2*b^4*c^4*g*x^3*log
(abs(F))^2 - 2*b^4*c^4*g*x^3*log(abs(F))^4 + pi^4*b^4*c^4*f*x^2*sgn(F) - 6*
pi^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*f*x^2 + 6*pi^2*b^4*c
^4*f*x^2*log(abs(F))^2 - 2*b^4*c^4*f*x^2*log(abs(F))^4 + pi^4*b^4*c^4*d*sgn
(F) + 12*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*d*log(abs(F
))^2*sgn(F) - pi^4*b^4*c^4*d - 12*pi^2*b^3*c^3*h*x^3*log(abs(F)) + 6*pi^2*b
^4*c^4*d*log(abs(F))^2 + 8*b^3*c^3*h*x^3*log(abs(F))^3 - 2*b^4*c^4*d*log(ab
s(F))^4 + 9*pi^2*b^3*c^3*g*x^2*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*g*x^2*lo
g(abs(F)) + 6*b^3*c^3*g*x^2*log(abs(F))^3 + 6*pi^2*b^3*c^3*f*x*log(abs(F))*
sgn(F) - 6*pi^2*b^3*c^3*f*x*log(abs(F)) + 4*b^3*c^3*f*x*log(abs(F))^3 - 12*
```

```
pi^2*b^2*c^2*h*x^2*sgn(F) + 12*pi^2*b^2*c^2*h*x^2 - 24*b^2*c^2*h*x^2*log(ab
s(F))^2 - 6*pi^2*b^2*c^2*g*x*sgn(F) + 6*pi^2*b^2*c^2*g*x - 12*b^2*c^2*g*x*l
og(abs(F))^2 - 2*pi^2*b^2*c^2*f*sgn(F) + 2*pi^2*b^2*c^2*f - 4*b^2*c^2*f*log
(abs(F))^2 + 48*b*c*h*x*log(abs(F)) + 12*b*c*g*log(abs(F)) - 48*h)*(5*pi^4*
b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*
b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))
^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5
*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 -
5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^
2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c
^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*c*x*sgn(F) +
1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^4*b^4*c^4*h*x^4*sgn(F
) - 6*pi^2*b^4*c^4*h*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*h*x^4 + 6*pi^2
*b^4*c^4*h*x^4*log(abs(F))^2 - 2*b^4*c^4*h*x^4*log(abs(F))^4 + pi^4*b^4*c^4
*g*x^3*sgn(F) - 6*pi^2*b^4*c^4*g*x^3*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*g*
x^3 + 6*pi^2*b^4*c^4*g*x^3*log(abs(F))^2 - 2*b^4*c^4*g*x^3*log(abs(F))^4 +
pi^4*b^4*c^4*f*x^2*sgn(F) - 6*pi^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn(F) - pi^
4*b^4*c^4*f*x^2 + 6*pi^2*b^4*c^4*f*x^2*log(abs(F))^2 - 2*b^4*c^4*f*x^2*log(
abs(F))^4 + pi^4*b^4*c^4*d*sgn(F) + 12*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F
) - 6*pi^2*b^4*c^4*d*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*d - 12*pi^2*b^3*c^
3*h*x^3*log(abs(F)) + 6*pi^2*b^4*c^4*d*log(abs(F))^2 + 8*b^3*c^3*h*x^3*log(
abs(F))^3 - 2*b^4*c^4*d*log(abs(F))^4 + 9*pi^2*b^3*c^3*g*x^2*log(abs(F))*sg
n(F) - 9*pi^2*b^3*c^3*g*x^2*log(abs(F)) + 6*b^3*c^3*g*x^2*log(abs(F))^3 + 6
*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F) - 6*pi^2*b^3*c^3*f*x*log(abs(F)) + 4*b
^3*c^3*f*x*log(abs(F))^3 - 12*pi^2*b^2*c^2*h*x^2*sgn(F) + 12*pi^2*b^2*c^2*h
*x^2 - 24*b^2*c^2*h*x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*g*x*sgn(F) + 6*pi^2*
b^2*c^2*g*x - 12*b^2*c^2*g*x*log(abs(F))^2 - 2*pi^2*b^2*c^2*f*sgn(F) + 2*pi
^2*b^2*c^2*f - 4*b^2*c^2*f*log(abs(F))^2 + 48*b*c*h*x*log(abs(F)) + 12*b*c*
g*log(abs(F)) - 48*h)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*
sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5
*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi^
3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b
^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5
*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5
*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(a
bs(F))^5)^2) + (4*pi^3*b^4*c^4*h*x^4*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*h*x^
4*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*h*x^4*log(abs(F)) + 4*pi*b^4*c^4*h*
x^4*log(abs(F))^3 + 4*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*
g*x^3*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*g*x^3*log(abs(F)) + 4*pi*b^4*c^
4*g*x^3*log(abs(F))^3 + 4*pi^3*b^4*c^4*f*x^2*log(abs(F))*sgn(F) - 4*pi*b^4*
c^4*f*x^2*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*f*x^2*log(abs(F)) + 4*pi*b^
4*c^4*f*x^2*log(abs(F))^3 - 4*pi^3*b^3*c^3*h*x^3*sgn(F) + 4*pi^3*b^4*c^4*d*
log(abs(F))*sgn(F) + 12*pi*b^3*c^3*h*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^
4*d*log(abs(F))^3*sgn(F) + 4*pi^3*b^3*c^3*h*x^3 - 4*pi^3*b^4*c^4*d*log(abs(
F)) - 12*pi*b^3*c^3*h*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*d*log(abs(F))^3 - 3*
pi^3*b^3*c^3*g*x^2*sgn(F) + 9*pi*b^3*c^3*g*x^2*log(abs(F))^2*sgn(F) + 3*pi^
3*b^3*c^3*g*x^2 - 9*pi*b^3*c^3*g*x^2*log(abs(F))^2 - 2*pi^3*b^3*c^3*f*x*sgn
(F) + 6*pi*b^3*c^3*f*x*log(abs(F))^2*sgn(F) + 2*pi^3*b^3*c^3*f*x - 6*pi*b^3
*c^3*f*x*log(abs(F))^2 - 24*pi*b^2*c^2*h*x^2*log(abs(F))*sgn(F) + 24*pi*b^2
*c^2*h*x^2*log(abs(F)) - 12*pi*b^2*c^2*g*x*log(abs(F))*sgn(F) + 12*pi*b^2*c
^2*g*x*log(abs(F)) - 4*pi*b^2*c^2*f*log(abs(F))*sgn(F) + 4*pi*b^2*c^2*f*log
(abs(F)) + 24*pi*b*c*h*x*sgn(F) - 24*pi*b*c*h*x + 6*pi*b*c*g*sgn(F) - 6*pi*
b*c*g)*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*s
gn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*
c^5*log(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sg
n(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*l
og(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*
sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F))
+ 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*pi*
```

```
b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log
(abs(F)) + a*c*log(abs(F))) + 1/2*I*((-16*I*pi^4*b^4*c^4*h*x^4*sgn(F) + 64*
pi^3*b^4*c^4*h*x^4*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*h*x^4*log(abs(F))
^2*sgn(F) - 64*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*h*
x^4 - 64*pi^3*b^4*c^4*h*x^4*log(abs(F)) - 96*I*pi^2*b^4*c^4*h*x^4*log(abs(F
))^2 + 64*pi*b^4*c^4*h*x^4*log(abs(F))^3 + 32*I*b^4*c^4*h*x^4*log(abs(F))^4
 - 16*I*pi^4*b^4*c^4*g*x^3*sgn(F) + 64*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F
) + 96*I*pi^2*b^4*c^4*g*x^3*log(abs(F))^2*sgn(F) - 64*pi*b^4*c^4*g*x^3*log(
abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*g*x^3 - 64*pi^3*b^4*c^4*g*x^3*log(abs(
F)) - 96*I*pi^2*b^4*c^4*g*x^3*log(abs(F))^2 + 64*pi*b^4*c^4*g*x^3*log(abs(F
))^3 + 32*I*b^4*c^4*g*x^3*log(abs(F))^4 - 16*I*pi^4*b^4*c^4*f*x^2*sgn(F) +
64*pi^3*b^4*c^4*f*x^2*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*f*x^2*log(abs(
F))^2*sgn(F) - 64*pi*b^4*c^4*f*x^2*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4
*f*x^2 - 64*pi^3*b^4*c^4*f*x^2*log(abs(F)) - 96*I*pi^2*b^4*c^4*f*x^2*log(ab
s(F))^2 + 64*pi*b^4*c^4*f*x^2*log(abs(F))^3 + 32*I*b^4*c^4*f*x^2*log(abs(F)
)^4 - 16*I*pi^4*b^4*c^4*d*sgn(F) - 64*pi^3*b^3*c^3*h*x^3*sgn(F) + 64*pi^3*b
^4*c^4*d*log(abs(F))*sgn(F) - 192*I*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) +
 96*I*pi^2*b^4*c^4*d*log(abs(F))^2*sgn(F) + 192*pi*b^3*c^3*h*x^3*log(abs(F)
)^2*sgn(F) - 64*pi*b^4*c^4*d*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*d + 6
4*pi^3*b^3*c^3*h*x^3 - 64*pi^3*b^4*c^4*d*log(abs(F)) + 192*I*pi^2*b^3*c^3*h
*x^3*log(abs(F)) - 96*I*pi^2*b^4*c^4*d*log(abs(F))^2 - 192*pi*b^3*c^3*h*x^3
*log(abs(F))^2 + 64*pi*b^4*c^4*d*log(abs(F))^3 - 128*I*b^3*c^3*h*x^3*log(ab
s(F))^3 + 32*I*b^4*c^4*d*log(abs(F))^4 - 48*pi^3*b^3*c^3*g*x^2*sgn(F) - 144
*I*pi^2*b^3*c^3*g*x^2*log(abs(F))*sgn(F) + 144*pi*b^3*c^3*g*x^2*log(abs(F))
^2*sgn(F) + 48*pi^3*b^3*c^3*g*x^2 + 144*I*pi^2*b^3*c^3*g*x^2*log(abs(F)) -
144*pi*b^3*c^3*g*x^2*log(abs(F))^2 - 96*I*b^3*c^3*g*x^2*log(abs(F))^3 - 32*
pi^3*b^3*c^3*f*x*sgn(F) - 96*I*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F) + 96*pi*
b^3*c^3*f*x*log(abs(F))^2*sgn(F) + 32*pi^3*b^3*c^3*f*x + 96*I*pi^2*b^3*c^3*
f*x*log(abs(F)) - 96*pi*b^3*c^3*f*x*log(abs(F))^2 - 64*I*b^3*c^3*f*x*log(ab
s(F))^3 + 192*I*pi^2*b^2*c^2*h*x^2*sgn(F) - 384*pi*b^2*c^2*h*x^2*log(abs(F)
)*sgn(F) - 192*I*pi^2*b^2*c^2*h*x^2 + 384*pi*b^2*c^2*h*x^2*log(abs(F)) + 38
4*I*b^2*c^2*h*x^2*log(abs(F))^2 + 96*I*pi^2*b^2*c^2*g*x*sgn(F) - 192*pi*b^2
*c^2*g*x*log(abs(F))*sgn(F) - 96*I*pi^2*b^2*c^2*g*x + 192*pi*b^2*c^2*g*x*lo
g(abs(F)) + 192*I*b^2*c^2*g*x*log(abs(F))^2 + 32*I*pi^2*b^2*c^2*f*sgn(F) -
64*pi*b^2*c^2*f*log(abs(F))*sgn(F) - 32*I*pi^2*b^2*c^2*f + 64*pi*b^2*c^2*f*
log(abs(F)) + 64*I*b^2*c^2*f*log(abs(F))^2 + 384*pi*b*c*h*x*sgn(F) - 384*pi
*b*c*h*x - 768*I*b*c*h*x*log(abs(F)) + 96*pi*b*c*g*sgn(F) - 96*pi*b*c*g - 1
92*I*b*c*g*log(abs(F)) + 768*I*h)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x
 + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*
b^5*c^5*log(abs(F))*sgn(F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*
pi^2*b^5*c^5*log(abs(F))^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) -
16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(ab
s(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 +
32*b^5*c^5*log(abs(F))^5) - (-16*I*pi^4*b^4*c^4*h*x^4*sgn(F) - 64*pi^3*b^4*
c^4*h*x^4*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2*sgn(F)
 + 64*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*h*x^4 + 64*
pi^3*b^4*c^4*h*x^4*log(abs(F)) - 96*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 - 64
*pi*b^4*c^4*h*x^4*log(abs(F))^3 + 32*I*b^4*c^4*h*x^4*log(abs(F))^4 - 16*I*p
i^4*b^4*c^4*g*x^3*sgn(F) - 64*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F) + 96*I*
pi^2*b^4*c^4*g*x^3*log(abs(F))^2*sgn(F) + 64*pi*b^4*c^4*g*x^3*log(abs(F))^3
*sgn(F) + 16*I*pi^4*b^4*c^4*g*x^3 + 64*pi^3*b^4*c^4*g*x^3*log(abs(F)) - 96*
I*pi^2*b^4*c^4*g*x^3*log(abs(F))^2 - 64*pi*b^4*c^4*g*x^3*log(abs(F))^3 + 32
*I*b^4*c^4*g*x^3*log(abs(F))^4 - 16*I*pi^4*b^4*c^4*f*x^2*sgn(F) - 64*pi^3*b
^4*c^4*f*x^2*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn
(F) + 64*pi*b^4*c^4*f*x^2*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*f*x^2 +
64*pi^3*b^4*c^4*f*x^2*log(abs(F)) - 96*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2 -
 64*pi*b^4*c^4*f*x^2*log(abs(F))^3 + 32*I*b^4*c^4*f*x^2*log(abs(F))^4 - 16*
I*pi^4*b^4*c^4*d*sgn(F) + 64*pi^3*b^3*c^3*h*x^3*sgn(F) - 64*pi^3*b^4*c^4*d*
log(abs(F))*sgn(F) - 192*I*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) + 96*I*pi^
```

```
2*b^4*c^4*d*log(abs(F))^2*sgn(F) - 192*pi*b^3*c^3*h*x^3*log(abs(F))^2*sgn(F
) + 64*pi*b^4*c^4*d*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*c^4*d - 64*pi^3*b^
3*c^3*h*x^3 + 64*pi^3*b^4*c^4*d*log(abs(F)) + 192*I*pi^2*b^3*c^3*h*x^3*log(
abs(F)) - 96*I*pi^2*b^4*c^4*d*log(abs(F))^2 + 192*pi*b^3*c^3*h*x^3*log(abs(
F))^2 - 64*pi*b^4*c^4*d*log(abs(F))^3 - 128*I*b^3*c^3*h*x^3*log(abs(F))^3 +
 32*I*b^4*c^4*d*log(abs(F))^4 + 48*pi^3*b^3*c^3*g*x^2*sgn(F) - 144*I*pi^2*b
^3*c^3*g*x^2*log(abs(F))*sgn(F) - 144*pi*b^3*c^3*g*x^2*log(abs(F))^2*sgn(F)
 - 48*pi^3*b^3*c^3*g*x^2 + 144*I*pi^2*b^3*c^3*g*x^2*log(abs(F)) + 144*pi*b^
3*c^3*g*x^2*log(abs(F))^2 - 96*I*b^3*c^3*g*x^2*log(abs(F))^3 + 32*pi^3*b^3*
c^3*f*x*sgn(F) - 96*I*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F) - 96*pi*b^3*c^3*f
*x*log(abs(F))^2*sgn(F) - 32*pi^3*b^3*c^3*f*x + 96*I*pi^2*b^3*c^3*f*x*log(a
bs(F)) + 96*pi*b^3*c^3*f*x*log(abs(F))^2 - 64*I*b^3*c^3*f*x*log(abs(F))^3 +
 192*I*pi^2*b^2*c^2*h*x^2*sgn(F) + 384*pi*b^2*c^2*h*x^2*log(abs(F))*sgn(F)
- 192*I*pi^2*b^2*c^2*h*x^2 - 384*pi*b^2*c^2*h*x^2*log(abs(F)) + 384*I*b^2*c
^2*h*x^2*log(abs(F))^2 + 96*I*pi^2*b^2*c^2*g*x*sgn(F) + 192*pi*b^2*c^2*g*x*
log(abs(F))*sgn(F) - 96*I*pi^2*b^2*c^2*g*x - 192*pi*b^2*c^2*g*x*log(abs(F))
 + 192*I*b^2*c^2*g*x*log(abs(F))^2 + 32*I*pi^2*b^2*c^2*f*sgn(F) + 64*pi*b^2
*c^2*f*log(abs(F))*sgn(F) - 32*I*pi^2*b^2*c^2*f - 64*pi*b^2*c^2*f*log(abs(F
)) + 64*I*b^2*c^2*f*log(abs(F))^2 - 384*pi*b*c*h*x*sgn(F) + 384*pi*b*c*h*x
- 768*I*b*c*h*x*log(abs(F)) - 96*pi*b*c*g*sgn(F) + 96*pi*b*c*g - 192*I*b*c*
g*log(abs(F)) + 768*I*h)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I
*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5
*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^
5*c^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) + 16*I*pi
^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160*I*pi^3*b^5*c^5*log(abs(F))^2
 - 160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*
c^5*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

3.55 $\int e^{-a-bx} x^m (a+bx)^3 \, dx$

Optimal. Leaf size=116

$$-\frac{a^3e^{-a}x^m(bx)^{-m}\text{Gamma}(m+1,bx)}{b}-\frac{3a^2e^{-a}x^m(bx)^{-m}\text{Gamma}(m+2,bx)}{b}-\frac{3ae^{-a}x^m(bx)^{-m}\text{Gamma}(m+3,bx)}{b}-e$$

```
[Out] -((a^3*x^m*Gamma[1 + m, b*x])/(b*E^a*(b*x)^m)) - (3*a^2*x^m*Gamma[2 + m, b*
x])/(b*E^a*(b*x)^m) - (3*a*x^m*Gamma[3 + m, b*x])/(b*E^a*(b*x)^m) - (x^m*Ga
mma[4 + m, b*x])/(b*E^a*(b*x)^m)
```

Rubi [A] time = 0.174801, antiderivative size = 116, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 2, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.095, Rules used = {2199, 2181}

$$-\frac{a^3e^{-a}x^m(bx)^{-m}\text{Gamma}(m+1,bx)}{b}-\frac{3a^2e^{-a}x^m(bx)^{-m}\text{Gamma}(m+2,bx)}{b}-\frac{3ae^{-a}x^m(bx)^{-m}\text{Gamma}(m+3,bx)}{b}-e$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*x^m*(a + b*x)^3,x]
```

```
[Out] -((a^3*x^m*Gamma[1 + m, b*x])/(b*E^a*(b*x)^m)) - (3*a^2*x^m*Gamma[2 + m, b*
x])/(b*E^a*(b*x)^m) - (3*a*x^m*Gamma[3 + m, b*x])/(b*E^a*(b*x)^m) - (x^m*Ga
mma[4 + m, b*x])/(b*E^a*(b*x)^m)
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int e^{-a-bx}x^m(a+bx)^3\,dx &= \int \left(a^3e^{-a-bx}x^m+3a^2be^{-a-bx}x^{1+m}+3ab^2e^{-a-bx}x^{2+m}+b^3e^{-a-bx}x^{3+m}\right)dx\\ &= a^3\int e^{-a-bx}x^m\,dx+\left(3a^2b\right)\int e^{-a-bx}x^{1+m}\,dx+\left(3ab^2\right)\int e^{-a-bx}x^{2+m}\,dx+b^3\int e^{-a-bx}x^{3+m}\,dx\\ &= -\frac{a^3e^{-a}x^m(bx)^{-m}\Gamma(1+m,bx)}{b}-\frac{3a^2e^{-a}x^m(bx)^{-m}\Gamma(2+m,bx)}{b}-\frac{3ae^{-a}x^m(bx)^{-m}\Gamma(3+m,bx)}{b}\end{aligned}$$

Mathematica [A] time = 0.0568417, size = 61, normalized size = 0.53

$$-\frac{e^{-a}x^m(bx)^{-m}\left(a^3\text{Gamma}(m+1,bx)+3a^2\text{Gamma}(m+2,bx)+3a\text{Gamma}(m+3,bx)+\text{Gamma}(m+4,bx)\right)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*x^m*(a + b*x)^3,x]
```

```
[Out] -((x^m*(a^3*Gamma[1 + m, b*x] + 3*a^2*Gamma[2 + m, b*x] + 3*a*Gamma[3 + m,
b*x] + Gamma[4 + m, b*x]))/(b*E^a*(b*x)^m))
```

Maple [C] time = 0.08, size = 334, normalized size = 2.9

$$b^{-m-1}\mathrm{e}^{-a}\left(x^m b^m\left(m^2+5m+6\right)(bx)^{-\frac{m}{2}}\mathrm{e}^{-\frac{bx}{2}}M_{\frac{m}{2},\frac{m}{2}+\frac{1}{2}}(bx)-x^m b^m\left(b^2x^2+bmx+3bx+m^2+5m+6\right)(bx)^{-\frac{m}{2}}\mathrm{e}^{-\frac{bx}{2}}M_{\frac{m}{2}+1,}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*x^m*(b*x+a)^3,x)
```

```
[Out] b^(-m-1)*exp(-a)*(x^m*b^m*(m^2+5*m+6)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*Whittake
rM(1/2*m,1/2*m+1/2,b*x)-x^m*b^m*(b^2*x^2+b*m*x+3*b*x+m^2+5*m+6)*(b*x)^(-1/2
*m)*exp(-1/2*b*x)*WhittakerM(1/2*m+1,1/2*m+1/2,b*x))+3*b^(-m-1)*exp(-a)*a*(
x^m*b^m*(2+m)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m,1/2*m+1/2,b*x)-
x^m*b^m*(b*x+m+2)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m+1,1/2*m+1/2
,b*x))+3*b^(-m-1)*exp(-a)*a^2*(x^m*b^m*(b*x)^(-1/2*m)*exp(-1/2*b*x)*Whittak
erM(1/2*m,1/2*m+1/2,b*x)+1/(2+m)*x^m*b^m*(-2-m)*(b*x)^(-1/2*m)*exp(-1/2*b*x
)*WhittakerM(1/2*m+1,1/2*m+1/2,b*x))+exp(-a-1/2*b*x)/b*a^3/(1+m)*x^m*(b*x)^
(-1/2*m)*WhittakerM(1/2*m,1/2*m+1/2,b*x)
```

Maxima [A] time = 1.23557, size = 166, normalized size = 1.43

$$-(bx)^{-m-4}b^3x^{m+4}e^{(-a)}\Gamma(m+4,bx)-3(bx)^{-m-3}ab^2x^{m+3}e^{(-a)}\Gamma(m+3,bx)-3(bx)^{-m-2}a^2bx^{m+2}e^{(-a)}\Gamma(m+2,bx)-(bx)^{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b*x)^(-m - 4)*b^3*x^(m + 4)*e^(-a)*gamma(m + 4, b*x) - 3*(b*x)^(-m - 3)*a
*b^2*x^(m + 3)*e^(-a)*gamma(m + 3, b*x) - 3*(b*x)^(-m - 2)*a^2*b*x^(m + 2)*
e^(-a)*gamma(m + 2, b*x) - (b*x)^(-m - 1)*a^3*x^(m + 1)*e^(-a)*gamma(m + 1,
 b*x)
```

Fricas [A] time = 1.56245, size = 297, normalized size = 2.56

$$-\frac{\left(b^3x^3+\left(3(a+1)b^2+b^2m\right)x^2+\left((3a+5)bm+bm^2+3\left(a^2+2a+2\right)b\right)x\right)x^m e^{(-bx-a)}+\left(a^3+3(a+2)m^2+m^3+3a^2+\right.}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -((b^3*x^3 + (3*(a + 1)*b^2 + b^2*m)*x^2 + ((3*a + 5)*b*m + b*m^2 + 3*(a^2
+ 2*a + 2)*b)*x)*x^m*e^(-b*x - a) + (a^3 + 3*(a + 2)*m^2 + m^3 + 3*a^2 + (3
```

```
*a^2 + 9*a + 11)*m + 6*a + 6)*e^(-m*log(b) - a)*gamma(m + 1, b*x))/b
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x**m*(b*x+a)**3,x)
```

```
[Out] Timed out
```

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

$$\int (bx + a)^3 x^m e^{(-bx-a)}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] integrate((b*x + a)^3*x^m*e^(-b*x - a), x)
```

3.56 $\int e^{-a-bx}x^3(a+bx)^3\,dx$

Optimal. Leaf size=397

$$-\frac{3a^3x^2e^{-a-bx}}{b^2}-\frac{36a^2x^2e^{-a-bx}}{b^2}-\frac{6a^3xe^{-a-bx}}{b^3}-\frac{72a^2xe^{-a-bx}}{b^3}-\frac{6a^3e^{-a-bx}}{b^4}-\frac{72a^2e^{-a-bx}}{b^4}-3a^2x^4e^{-a-bx}-\frac{a^3x^3e^{-a-bx}}{b}-\frac{12a^2x}{}$$

```
[Out] (-720*E^(-a - b*x))/b^4 - (360*a*E^(-a - b*x))/b^4 - (72*a^2*E^(-a - b*x))/
b^4 - (6*a^3*E^(-a - b*x))/b^4 - (720*E^(-a - b*x)*x)/b^3 - (360*a*E^(-a -
b*x)*x)/b^3 - (72*a^2*E^(-a - b*x)*x)/b^3 - (6*a^3*E^(-a - b*x)*x)/b^3 - (3
60*E^(-a - b*x)*x^2)/b^2 - (180*a*E^(-a - b*x)*x^2)/b^2 - (36*a^2*E^(-a - b
*x)*x^2)/b^2 - (3*a^3*E^(-a - b*x)*x^2)/b^2 - (120*E^(-a - b*x)*x^3)/b - (6
0*a*E^(-a - b*x)*x^3)/b - (12*a^2*E^(-a - b*x)*x^3)/b - (a^3*E^(-a - b*x)*x
^3)/b - 30*E^(-a - b*x)*x^4 - 15*a*E^(-a - b*x)*x^4 - 3*a^2*E^(-a - b*x)*x^
4 - 6*b*E^(-a - b*x)*x^5 - 3*a*b*E^(-a - b*x)*x^5 - b^2*E^(-a - b*x)*x^6
```

Rubi [A] time = 0.516056, antiderivative size = 397, normalized size of antiderivative = 1., number of steps used = 24, number of rules used = 3, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2196, 2176, 2194}

$$-\frac{3a^3x^2e^{-a-bx}}{b^2}-\frac{36a^2x^2e^{-a-bx}}{b^2}-\frac{6a^3xe^{-a-bx}}{b^3}-\frac{72a^2xe^{-a-bx}}{b^3}-\frac{6a^3e^{-a-bx}}{b^4}-\frac{72a^2e^{-a-bx}}{b^4}-3a^2x^4e^{-a-bx}-\frac{a^3x^3e^{-a-bx}}{b}-\frac{12a^2x}{}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*x^3*(a + b*x)^3,x]
```


```
[Out] (-720*E^(-a - b*x))/b^4 - (360*a*E^(-a - b*x))/b^4 - (72*a^2*E^(-a - b*x))/
b^4 - (6*a^3*E^(-a - b*x))/b^4 - (720*E^(-a - b*x)*x)/b^3 - (360*a*E^(-a -
b*x)*x)/b^3 - (72*a^2*E^(-a - b*x)*x)/b^3 - (6*a^3*E^(-a - b*x)*x)/b^3 - (3
60*E^(-a - b*x)*x^2)/b^2 - (180*a*E^(-a - b*x)*x^2)/b^2 - (36*a^2*E^(-a - b
*x)*x^2)/b^2 - (3*a^3*E^(-a - b*x)*x^2)/b^2 - (120*E^(-a - b*x)*x^3)/b - (6
0*a*E^(-a - b*x)*x^3)/b - (12*a^2*E^(-a - b*x)*x^3)/b - (a^3*E^(-a - b*x)*x
^3)/b - 30*E^(-a - b*x)*x^4 - 15*a*E^(-a - b*x)*x^4 - 3*a^2*E^(-a - b*x)*x^
4 - 6*b*E^(-a - b*x)*x^5 - 3*a*b*E^(-a - b*x)*x^5 - b^2*E^(-a - b*x)*x^6
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}x^3(a+bx)^3\,dx = \int \left(a^3e^{-a-bx}x^3 + 3a^2be^{-a-bx}x^4 + 3ab^2e^{-a-bx}x^5 + b^3e^{-a-bx}x^6\right)dx$$
$$= a^3\int e^{-a-bx}x^3\,dx + \left(3a^2b\right)\int e^{-a-bx}x^4\,dx + \left(3ab^2\right)\int e^{-a-bx}x^5\,dx + b^3\int e^{-a-bx}x^6\,dx$$
$$= -\frac{a^3e^{-a-bx}x^3}{b} - 3a^2e^{-a-bx}x^4 - 3abe^{-a-bx}x^5 - b^2e^{-a-bx}x^6 + \left(12a^2\right)\int e^{-a-bx}x^3\,dx + \frac{\left(3a^3\right)\int e^{-a}}{b}$$
$$= -\frac{3a^3e^{-a-bx}x^2}{b^2} - \frac{12a^2e^{-a-bx}x^3}{b} - \frac{a^3e^{-a-bx}x^3}{b} - 15ae^{-a-bx}x^4 - 3a^2e^{-a-bx}x^4 - 6be^{-a-bx}x^5 - 3abe$$
$$= -\frac{6a^3e^{-a-bx}x}{b^3} - \frac{36a^2e^{-a-bx}x^2}{b^2} - \frac{3a^3e^{-a-bx}x^2}{b^2} - \frac{60ae^{-a-bx}x^3}{b} - \frac{12a^2e^{-a-bx}x^3}{b} - \frac{a^3e^{-a-bx}x^3}{b} - 3$$
$$= -\frac{6a^3e^{-a-bx}}{b^4} - \frac{72a^2e^{-a-bx}x}{b^3} - \frac{6a^3e^{-a-bx}x}{b^3} - \frac{180ae^{-a-bx}x^2}{b^2} - \frac{36a^2e^{-a-bx}x^2}{b^2} - \frac{3a^3e^{-a-bx}x^2}{b^2} - 12$$
$$= -\frac{72a^2e^{-a-bx}}{b^4} - \frac{6a^3e^{-a-bx}}{b^4} - \frac{360ae^{-a-bx}x}{b^3} - \frac{72a^2e^{-a-bx}x}{b^3} - \frac{6a^3e^{-a-bx}x}{b^3} - \frac{360e^{-a-bx}x^2}{b^2} - 180a$$
$$= -\frac{360ae^{-a-bx}}{b^4} - \frac{72a^2e^{-a-bx}}{b^4} - \frac{6a^3e^{-a-bx}}{b^4} - \frac{720e^{-a-bx}x}{b^3} - \frac{360ae^{-a-bx}x}{b^3} - \frac{72a^2e^{-a-bx}x}{b^3} - \frac{6a^3e^{-}}{b}$$
$$= -\frac{720e^{-a-bx}}{b^4} - \frac{360ae^{-a-bx}}{b^4} - \frac{72a^2e^{-a-bx}}{b^4} - \frac{6a^3e^{-a-bx}}{b^4} - \frac{720e^{-a-bx}x}{b^3} - \frac{360ae^{-a-bx}x}{b^3} - \frac{72a^2e^{-a}}{b^3}$$

Mathematica [A] time = 0.323201, size = 121, normalized size = 0.3

$$e^{-a-bx}\left(-\frac{3\left(a^3+12a^2+60a+120\right)x^2}{b^2} - \frac{6\left(a^3+12a^2+60a+120\right)x}{b^3} - \frac{6\left(a^3+12a^2+60a+120\right)}{b^4} - \frac{\left(a^3+12a^2+60a\right.}{b}\right.$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*x^3*(a + b*x)^3,x]
```

```
[Out] E^(-a - b*x)*((-6*(120 + 60*a + 12*a^2 + a^3))/b^4 - (6*(120 + 60*a + 12*a^
2 + a^3)*x)/b^3 - (3*(120 + 60*a + 12*a^2 + a^3)*x^2)/b^2 - ((120 + 60*a +
12*a^2 + a^3)*x^3)/b - 3*(10 + 5*a + a^2)*x^4 - 3*(2 + a)*b*x^5 - b^2*x^6)
```

Maple [A] time = 0.004, size = 182, normalized size = 0.5

$$-\frac{\left(b^6x^6 + 3\,b^5x^5a + 3\,a^2b^4x^4 + 6\,b^5x^5 + a^3b^3x^3 + 15\,ab^4x^4 + 12\,a^2b^3x^3 + 30\,x^4b^4 + 3\,a^3b^2x^2 + 60\,ab^3x^3 + 36\,a^2b^2x^2 + \right.}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*x^3*(b*x+a)^3,x)
```

```
[Out] -(b^6*x^6+3*a*b^5*x^5+3*a^2*b^4*x^4+6*b^5*x^5+a^3*b^3*x^3+15*a*b^4*x^4+12*a
^2*b^3*x^3+30*b^4*x^4+3*a^3*b^2*x^2+60*a*b^3*x^3+36*a^2*b^2*x^2+120*b^3*x^3
+6*a^3*b*x+180*a*b^2*x^2+72*a^2*b*x+360*b^2*x^2+6*a^3+360*a*b*x+72*a^2+720*
b*x+360*a+720)*exp(-b*x-a)/b^4
```

Maxima [A] time = 1.06296, size = 265, normalized size = 0.67

$$-\frac{\left(b^3x^3+3\,b^2x^2+6\,bx+6\right)a^3e^{(-bx-a)}}{b^4} - \frac{3\left(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24\right)a^2e^{(-bx-a)}}{b^4} - \frac{3\left(b^5x^5+5\,b^4x^4+20\,b^3x\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*e^(-b*x - a)/b^4 - 3*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*e^(-b*x - a)/b^4 - 3*(b^5*x^5 + 5*b^4
*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*a*e^(-b*x - a)/b^4 - (b^6*x
^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b*x + 720)*e^
(-b*x - a)/b^4
```

Fricas [A] time = 1.47151, size = 301, normalized size = 0.76

$$-\frac{\left(b^6x^6 + 3\,(a+2)b^5x^5 + 3\left(a^2+5\,a+10\right)b^4x^4 + \left(a^3+12\,a^2+60\,a+120\right)b^3x^3 + 3\left(a^3+12\,a^2+60\,a+120\right)b^2x^2 + 6\,a^3 \cdots}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^6*x^6 + 3*(a + 2)*b^5*x^5 + 3*(a^2 + 5*a + 10)*b^4*x^4 + (a^3 + 12*a^2
+ 60*a + 120)*b^3*x^3 + 3*(a^3 + 12*a^2 + 60*a + 120)*b^2*x^2 + 6*a^3 + 6*(
a^3 + 12*a^2 + 60*a + 120)*b*x + 72*a^2 + 360*a + 720)*e^(-b*x - a)/b^4
```

Sympy [A] time = 0.192338, size = 236, normalized size = 0.59

$$\begin{cases} \frac{\left(-a^3b^3x^3-3a^3b^2x^2-6a^3bx-6a^3-3a^2b^4x^4-12a^2b^3x^3-36a^2b^2x^2-72a^2bx-72a^2-3ab^5x^5-15ab^4x^4-60ab^3x^3-180ab^2x^2-360abx-360a-b^6x^6-6b^5x^5-30b^4x^4-120b^3 \cdots}{b^4} \\ \frac{a^3x^4}{4}+\frac{3a^2bx^5}{5}+\frac{ab^2x^6}{2}+\frac{b^3x^7}{7} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x**3*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3*b**3*x**3 - 3*a**3*b**2*x**2 - 6*a**3*b*x - 6*a**3 - 3*a*
*2*b**4*x**4 - 12*a**2*b**3*x**3 - 36*a**2*b**2*x**2 - 72*a**2*b*x - 72*a**
2 - 3*a*b**5*x**5 - 15*a*b**4*x**4 - 60*a*b**3*x**3 - 180*a*b**2*x**2 - 360
*a*b*x - 360*a - b**6*x**6 - 6*b**5*x**5 - 30*b**4*x**4 - 120*b**3*x**3 - 3
60*b**2*x**2 - 720*b*x - 720)*exp(-a - b*x)/b**4, Ne(b**4, 0)), (a**3*x**4/
4 + 3*a**2*b*x**5/5 + a*b**2*x**6/2 + b**3*x**7/7, True))
```

Giac [A] time = 1.25142, size = 273, normalized size = 0.69

$$-\frac{\left(b^9x^6 + 3\,ab^8x^5 + 3\,a^2b^7x^4 + 6\,b^8x^5 + a^3b^6x^3 + 15\,ab^7x^4 + 12\,a^2b^6x^3 + 30\,b^7x^4 + 3\,a^3b^5x^2 + 60\,ab^6x^3 + 36\,a^2b^5x^2 + 120 \cdots}{b \cdots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^9*x^6 + 3*a*b^8*x^5 + 3*a^2*b^7*x^4 + 6*b^8*x^5 + a^3*b^6*x^3 + 15*a*b^
7*x^4 + 12*a^2*b^6*x^3 + 30*b^7*x^4 + 3*a^3*b^5*x^2 + 60*a*b^6*x^3 + 36*a^2
```

```
*b^5*x^2 + 120*b^6*x^3 + 6*a^3*b^4*x + 180*a*b^5*x^2 + 72*a^2*b^4*x + 360*b
^5*x^2 + 6*a^3*b^3 + 360*a*b^4*x + 72*a^2*b^3 + 720*b^4*x + 360*a*b^3 + 720
*b^3)*e^(-b*x - a)/b^7
```

3.57 $\int e^{-a-bx}x^2(a+bx)^3\,dx$

Optimal. Leaf size=318

$$-\frac{2a^3xe^{-a-bx}}{b^2}-\frac{18a^2xe^{-a-bx}}{b^2}-\frac{2a^3e^{-a-bx}}{b^3}-\frac{18a^2e^{-a-bx}}{b^3}-3a^2x^3e^{-a-bx}-\frac{a^3x^2e^{-a-bx}}{b}-\frac{9a^2x^2e^{-a-bx}}{b}-b^2x^5e^{-a-bx}-\frac{72axe^{-a-}}{b^2}$$

```
[Out] (-120*E^(-a - b*x))/b^3 - (72*a*E^(-a - b*x))/b^3 - (18*a^2*E^(-a - b*x))/b
^3 - (2*a^3*E^(-a - b*x))/b^3 - (120*E^(-a - b*x)*x)/b^2 - (72*a*E^(-a - b*
x)*x)/b^2 - (18*a^2*E^(-a - b*x)*x)/b^2 - (2*a^3*E^(-a - b*x)*x)/b^2 - (60*
E^(-a - b*x)*x^2)/b - (36*a*E^(-a - b*x)*x^2)/b - (9*a^2*E^(-a - b*x)*x^2)/
b - (a^3*E^(-a - b*x)*x^2)/b - 20*E^(-a - b*x)*x^3 - 12*a*E^(-a - b*x)*x^3
- 3*a^2*E^(-a - b*x)*x^3 - 5*b*E^(-a - b*x)*x^4 - 3*a*b*E^(-a - b*x)*x^4 -
b^2*E^(-a - b*x)*x^5
```

Rubi [A] time = 0.412468, antiderivative size = 318, normalized size of antiderivative = 1., number of steps used = 20, number of rules used = 3, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2196, 2176, 2194}

$$-\frac{2a^3xe^{-a-bx}}{b^2}-\frac{18a^2xe^{-a-bx}}{b^2}-\frac{2a^3e^{-a-bx}}{b^3}-\frac{18a^2e^{-a-bx}}{b^3}-3a^2x^3e^{-a-bx}-\frac{a^3x^2e^{-a-bx}}{b}-\frac{9a^2x^2e^{-a-bx}}{b}-b^2x^5e^{-a-bx}-\frac{72axe^{-a-}}{b^2}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*x^2*(a + b*x)^3,x]
```


```
[Out] (-120*E^(-a - b*x))/b^3 - (72*a*E^(-a - b*x))/b^3 - (18*a^2*E^(-a - b*x))/b
^3 - (2*a^3*E^(-a - b*x))/b^3 - (120*E^(-a - b*x)*x)/b^2 - (72*a*E^(-a - b*
x)*x)/b^2 - (18*a^2*E^(-a - b*x)*x)/b^2 - (2*a^3*E^(-a - b*x)*x)/b^2 - (60*
E^(-a - b*x)*x^2)/b - (36*a*E^(-a - b*x)*x^2)/b - (9*a^2*E^(-a - b*x)*x^2)/
b - (a^3*E^(-a - b*x)*x^2)/b - 20*E^(-a - b*x)*x^3 - 12*a*E^(-a - b*x)*x^3
- 3*a^2*E^(-a - b*x)*x^3 - 5*b*E^(-a - b*x)*x^4 - 3*a*b*E^(-a - b*x)*x^4 -
b^2*E^(-a - b*x)*x^5
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = \int \left(a^3e^{-a-bx}x^2 + 3a^2be^{-a-bx}x^3 + 3ab^2e^{-a-bx}x^4 + b^3e^{-a-bx}x^5\right)dx$$
$$= a^3\int e^{-a-bx}x^2\,dx + \left(3a^2b\right)\int e^{-a-bx}x^3\,dx + \left(3ab^2\right)\int e^{-a-bx}x^4\,dx + b^3\int e^{-a-bx}x^5\,dx$$
$$= -\frac{a^3e^{-a-bx}x^2}{b} - 3a^2e^{-a-bx}x^3 - 3abe^{-a-bx}x^4 - b^2e^{-a-bx}x^5 + \left(9a^2\right)\int e^{-a-bx}x^2\,dx + \frac{\left(2a^3\right)\int e^{-a-}}{b}$$
$$= -\frac{2a^3e^{-a-bx}x}{b^2} - \frac{9a^2e^{-a-bx}x^2}{b} - \frac{a^3e^{-a-bx}x^2}{b} - 12ae^{-a-bx}x^3 - 3a^2e^{-a-bx}x^3 - 5be^{-a-bx}x^4 - 3abe^{-a}$$
$$= -\frac{2a^3e^{-a-bx}}{b^3} - \frac{18a^2e^{-a-bx}x}{b^2} - \frac{2a^3e^{-a-bx}x}{b^2} - \frac{36ae^{-a-bx}x^2}{b} - \frac{9a^2e^{-a-bx}x^2}{b} - \frac{a^3e^{-a-bx}x^2}{b} - 20e^{-a}$$
$$= -\frac{18a^2e^{-a-bx}}{b^3} - \frac{2a^3e^{-a-bx}}{b^3} - \frac{72ae^{-a-bx}x}{b^2} - \frac{18a^2e^{-a-bx}x}{b^2} - \frac{2a^3e^{-a-bx}x}{b^2} - \frac{60e^{-a-bx}x^2}{b} - \frac{36ae^{-a-}}{b}$$
$$= -\frac{72ae^{-a-bx}}{b^3} - \frac{18a^2e^{-a-bx}}{b^3} - \frac{2a^3e^{-a-bx}}{b^3} - \frac{120e^{-a-bx}x}{b^2} - \frac{72ae^{-a-bx}x}{b^2} - \frac{18a^2e^{-a-bx}x}{b^2} - \frac{2a^3e^{-a-b}}{b^2}$$
$$= -\frac{120e^{-a-bx}}{b^3} - \frac{72ae^{-a-bx}}{b^3} - \frac{18a^2e^{-a-bx}}{b^3} - \frac{2a^3e^{-a-bx}}{b^3} - \frac{120e^{-a-bx}x}{b^2} - \frac{72ae^{-a-bx}x}{b^2} - \frac{18a^2e^{-a-bx}}{b^2}$$

Mathematica [A] time = 0.198432, size = 130, normalized size = 0.41

$$e^{-bx}\left(-\frac{2\left(a^3+9a^2+36a+60\right)e^{-a}x}{b^2} - \frac{2\left(a^3+9a^2+36a+60\right)e^{-a}}{b^3} - \frac{\left(a^3+9a^2+36a+60\right)e^{-a}x^2}{b} - \left(3a^2+12a+20\right)\right.$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*x^2*(a + b*x)^3,x]
```

```
[Out] ((-2*(60 + 36*a + 9*a^2 + a^3))/(b^3*E^a) - (2*(60 + 36*a + 9*a^2 + a^3)*x)
/(b^2*E^a) - ((60 + 36*a + 9*a^2 + a^3)*x^2)/(b*E^a) - ((20 + 12*a + 3*a^2)
*x^3)/E^a - ((5 + 3*a)*b*x^4)/E^a - (b^2*x^5)/E^a)/E^(b*x)
```

Maple [A] time = 0.005, size = 143, normalized size = 0.5

$$-\frac{\left(b^5x^5 + 3\,b^4x^4a + 3\,a^2b^3x^3 + 5\,b^4x^4 + a^3b^2x^2 + 12\,ab^3x^3 + 9\,a^2b^2x^2 + 20\,x^3b^3 + 2\,a^3bx + 36\,ab^2x^2 + 18\,a^2bx + 60\,b^2\right.}{b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*x^2*(b*x+a)^3,x)
```

```
[Out] -(b^5*x^5+3*a*b^4*x^4+3*a^2*b^3*x^3+5*b^4*x^4+a^3*b^2*x^2+12*a*b^3*x^3+9*a^
2*b^2*x^2+20*b^3*x^3+2*a^3*b*x+36*a*b^2*x^2+18*a^2*b*x+60*b^2*x^2+2*a^3+72*
a*b*x+18*a^2+120*b*x+72*a+120)*exp(-b*x-a)/b^3
```

Maxima [A] time = 1.05629, size = 221, normalized size = 0.69

$$-\frac{\left(b^2x^2+2\,bx+2\right)a^3e^{(-bx-a)}}{b^3} - \frac{3\left(b^3x^3+3\,b^2x^2+6\,bx+6\right)a^2e^{(-bx-a)}}{b^3} - \frac{3\left(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24\right)ae^{(-bx}}{b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b^2*x^2 + 2*b*x + 2)*a^3*e^(-b*x - a)/b^3 - 3*(b^3*x^3 + 3*b^2*x^2 + 6*b*
x + 6)*a^2*e^(-b*x - a)/b^3 - 3*(b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x
+ 24)*a*e^(-b*x - a)/b^3 - (b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 +
 120*b*x + 120)*e^(-b*x - a)/b^3
```

Fricas [A] time = 1.52069, size = 242, normalized size = 0.76

$$-\frac{\left(b^5x^5 + (3\,a+5)b^4x^4 + \left(3\,a^2+12\,a+20\right)b^3x^3 + \left(a^3+9\,a^2+36\,a+60\right)b^2x^2 + 2\,a^3 + 2\left(a^3+9\,a^2+36\,a+60\right)bx + 18\,a\cdots}{b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^5*x^5 + (3*a + 5)*b^4*x^4 + (3*a^2 + 12*a + 20)*b^3*x^3 + (a^3 + 9*a^2
+ 36*a + 60)*b^2*x^2 + 2*a^3 + 2*(a^3 + 9*a^2 + 36*a + 60)*b*x + 18*a^2 + 7
2*a + 120)*e^(-b*x - a)/b^3
```

Sympy [A] time = 0.175937, size = 196, normalized size = 0.62

$$\begin{cases} \frac{\left(-a^3b^2x^2-2a^3bx-2a^3-3a^2b^3x^3-9a^2b^2x^2-18a^2bx-18a^2-3ab^4x^4-12ab^3x^3-36ab^2x^2-72abx-72a-b^5x^5-5b^4x^4-20b^3x^3-60b^2x^2-120bx-120\right)e^{-a-bx}}{b^3} & \text{for } b^3 \neq \cdots \\ \frac{a^3x^3}{3} + \frac{3a^2bx^4}{4} + \frac{3ab^2x^5}{5} + \frac{b^3x^6}{6} & \text{otherw}\cdots \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x**2*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3*b**2*x**2 - 2*a**3*b*x - 2*a**3 - 3*a**2*b**3*x**3 - 9*a*
*2*b**2*x**2 - 18*a**2*b*x - 18*a**2 - 3*a*b**4*x**4 - 12*a*b**3*x**3 - 36*
a*b**2*x**2 - 72*a*b*x - 72*a - b**5*x**5 - 5*b**4*x**4 - 20*b**3*x**3 - 60
*b**2*x**2 - 120*b*x - 120)*exp(-a - b*x)/b**3, Ne(b**3, 0)), (a**3*x**3/3
+ 3*a**2*b*x**4/4 + 3*a*b**2*x**5/5 + b**3*x**6/6, True))
```

Giac [A] time = 1.36125, size = 220, normalized size = 0.69

$$-\frac{\left(b^8x^5 + 3\,ab^7x^4 + 3\,a^2b^6x^3 + 5\,b^7x^4 + a^3b^5x^2 + 12\,ab^6x^3 + 9\,a^2b^5x^2 + 20\,b^6x^3 + 2\,a^3b^4x + 36\,ab^5x^2 + 18\,a^2b^4x + 60\,b^5x^2\cdots}{b^6}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^8*x^5 + 3*a*b^7*x^4 + 3*a^2*b^6*x^3 + 5*b^7*x^4 + a^3*b^5*x^2 + 12*a*b^
6*x^3 + 9*a^2*b^5*x^2 + 20*b^6*x^3 + 2*a^3*b^4*x + 36*a*b^5*x^2 + 18*a^2*b^
4*x + 60*b^5*x^2 + 2*a^3*b^3 + 72*a*b^4*x + 18*a^2*b^3 + 120*b^4*x + 72*a*b
^3 + 120*b^3)*e^(-b*x - a)/b^6
```

3.58 $\int e^{-a-bx}x(a+bx)^3\,dx$

Optimal. Leaf size=184

$$-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{6ae^{-a-bx}(a+bx)}{b^2}$$

```
[Out] (-24*E^(-a - b*x))/b^2 + (6*a*E^(-a - b*x))/b^2 - (24*E^(-a - b*x)*(a + b*x
))/b^2 + (6*a*E^(-a - b*x)*(a + b*x))/b^2 - (12*E^(-a - b*x)*(a + b*x)^2)/b
^2 + (3*a*E^(-a - b*x)*(a + b*x)^2)/b^2 - (4*E^(-a - b*x)*(a + b*x)^3)/b^2
+ (a*E^(-a - b*x)*(a + b*x)^3)/b^2 - (E^(-a - b*x)*(a + b*x)^4)/b^2
```

Rubi [A] time = 0.241916, antiderivative size = 184, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2196, 2176, 2194}

$$-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{6ae^{-a-bx}(a+bx)}{b^2}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*x*(a + b*x)^3,x]
```

```
[Out] (-24*E^(-a - b*x))/b^2 + (6*a*E^(-a - b*x))/b^2 - (24*E^(-a - b*x)*(a + b*x
))/b^2 + (6*a*E^(-a - b*x)*(a + b*x))/b^2 - (12*E^(-a - b*x)*(a + b*x)^2)/b
^2 + (3*a*E^(-a - b*x)*(a + b*x)^2)/b^2 - (4*E^(-a - b*x)*(a + b*x)^3)/b^2
+ (a*E^(-a - b*x)*(a + b*x)^3)/b^2 - (E^(-a - b*x)*(a + b*x)^4)/b^2
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] && !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}x(a+bx)^3\,dx = \int\left(-\frac{ae^{-a-bx}(a+bx)^3}{b}+\frac{e^{-a-bx}(a+bx)^4}{b}\right)dx$$
$$= \frac{\int e^{-a-bx}(a+bx)^4\,dx}{b}-\frac{a\int e^{-a-bx}(a+bx)^3\,dx}{b}$$
$$= \frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{4\int e^{-a-bx}(a+bx)^3\,dx}{b}-\frac{(3a)\int e^{-a-bx}(a+bx)^2\,dx}{b}$$
$$= \frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{12\int e^{-a-bx}(a+bx}{b}$$
$$= \frac{6ae^{-a-bx}(a+bx)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{ae^{-a-bx}(a+bx)}{b^2}$$
$$= \frac{6ae^{-a-bx}}{b^2}-\frac{24e^{-a-bx}(a+bx)}{b^2}+\frac{6ae^{-a-bx}(a+bx)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-4e^{-}$$
$$= -\frac{24e^{-a-bx}}{b^2}+\frac{6ae^{-a-bx}}{b^2}-\frac{24e^{-a-bx}(a+bx)}{b^2}+\frac{6ae^{-a-bx}(a+bx)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{3ae^{-a-bx}(a}{b^2}$$

Mathematica [A] time = 0.121952, size = 96, normalized size = 0.52

$$\frac{e^{-a-bx}\left(-3a^2\left(b^2x^2+2bx+2\right)-a^3(bx+1)-3a\left(b^3x^3+3b^2x^2+6bx+6\right)-b^4x^4-4b^3x^3-12b^2x^2-24bx-24\right)}{b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*x*(a + b*x)^3,x]
```

```
[Out] (E^(-a - b*x)*(-24 - 24*b*x - 12*b^2*x^2 - 4*b^3*x^3 - b^4*x^4 - a^3*(1 + b
*x) - 3*a^2*(2 + 2*b*x + b^2*x^2) - 3*a*(6 + 6*b*x + 3*b^2*x^2 + b^3*x^3)))
/b^2
```

Maple [A] time = 0.004, size = 102, normalized size = 0.6

$$-\frac{\left(b^4x^4+3\,b^3x^3a+3\,a^2b^2x^2+4\,b^3x^3+a^3bx+9\,ab^2x^2+6\,a^2bx+12\,b^2x^2+a^3+18\,abx+6\,a^2+24\,bx+18\,a+24\right)e^{-bx-}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*x*(b*x+a)^3,x)
```

```
[Out] -(b^4*x^4+3*a*b^3*x^3+3*a^2*b^2*x^2+4*b^3*x^3+a^3*b*x+9*a*b^2*x^2+6*a^2*b*x
+12*b^2*x^2+a^3+18*a*b*x+6*a^2+24*b*x+18*a+24)*exp(-b*x-a)/b^2
```

Maxima [A] time = 1.09198, size = 178, normalized size = 0.97

$$-\frac{(bx+1)a^3e^{(-bx-a)}}{b^2}-\frac{3\left(b^2x^2+2\,bx+2\right)a^2e^{(-bx-a)}}{b^2}-\frac{3\left(b^3x^3+3\,b^2x^2+6\,bx+6\right)ae^{(-bx-a)}}{b^2}-\frac{\left(b^4x^4+4\,b^3x^3+12\,b^2x^2+2\right.}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b*x + 1)*a^3*e^(-b*x - a)/b^2 - 3*(b^2*x^2 + 2*b*x + 2)*a^2*e^(-b*x - a)/
b^2 - 3*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*e^(-b*x - a)/b^2 - (b^4*x^4 + 4
*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*e^(-b*x - a)/b^2
```

Fricas [A] time = 1.50241, size = 182, normalized size = 0.99

$$-\frac{\left(b^4x^4 + (3\,a + 4)b^3x^3 + 3\,\left(a^2 + 3\,a + 4\right)b^2x^2 + a^3 + \left(a^3 + 6\,a^2 + 18\,a + 24\right)bx + 6\,a^2 + 18\,a + 24\right)e^{(-bx-a)}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^4*x^4 + (3*a + 4)*b^3*x^3 + 3*(a^2 + 3*a + 4)*b^2*x^2 + a^3 + (a^3 + 6*
a^2 + 18*a + 24)*b*x + 6*a^2 + 18*a + 24)*e^(-b*x - a)/b^2
```

Sympy [A] time = 0.163471, size = 148, normalized size = 0.8

$$\begin{cases} \frac{\left(-a^3bx-a^3-3a^2b^2x^2-6a^2bx-6a^2-3ab^3x^3-9ab^2x^2-18abx-18a-b^4x^4-4b^3x^3-12b^2x^2-24bx-24\right)e^{-a-bx}}{b^2} & \text{for}\ b^2 \neq 0 \\ \frac{a^3x^2}{2} + a^2bx^3 + \frac{3ab^2x^4}{4} + \frac{b^3x^5}{5} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3*b*x - a**3 - 3*a**2*b**2*x**2 - 6*a**2*b*x - 6*a**2 - 3*a
*b**3*x**3 - 9*a*b**2*x**2 - 18*a*b*x - 18*a - b**4*x**4 - 4*b**3*x**3 - 12
*b**2*x**2 - 24*b*x - 24)*exp(-a - b*x)/b**2, Ne(b**2, 0)), (a**3*x**2/2 +
a**2*b*x**3 + 3*a*b**2*x**4/4 + b**3*x**5/5, True))
```

Giac [A] time = 1.35255, size = 166, normalized size = 0.9

$$-\frac{\left(b^7x^4 + 3\,ab^6x^3 + 3\,a^2b^5x^2 + 4\,b^6x^3 + a^3b^4x + 9\,ab^5x^2 + 6\,a^2b^4x + 12\,b^5x^2 + a^3b^3 + 18\,ab^4x + 6\,a^2b^3 + 24\,b^4x + 18\,a\right.}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^7*x^4 + 3*a*b^6*x^3 + 3*a^2*b^5*x^2 + 4*b^6*x^3 + a^3*b^4*x + 9*a*b^5*x
^2 + 6*a^2*b^4*x + 12*b^5*x^2 + a^3*b^3 + 18*a*b^4*x + 6*a^2*b^3 + 24*b^4*x
 + 18*a*b^3 + 24*b^3)*e^(-b*x - a)/b^5
```

3.59 $\int e^{-a-bx}(a+bx)^3\,dx$

Optimal. Leaf size=80

$$-\frac{e^{-a-bx}(a+bx)^3}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{6e^{-a-bx}(a+bx)}{b}-\frac{6e^{-a-bx}}{b}$$

```
[Out] (-6*E^(-a - b*x))/b - (6*E^(-a - b*x)*(a + b*x))/b - (3*E^(-a - b*x)*(a + b
*x)^2)/b - (E^(-a - b*x)*(a + b*x)^3)/b
```

Rubi [A] time = 0.0683236, antiderivative size = 80, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 18, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2176, 2194}

$$-\frac{e^{-a-bx}(a+bx)^3}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{6e^{-a-bx}(a+bx)}{b}-\frac{6e^{-a-bx}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*(a + b*x)^3,x]
```

```
[Out] (-6*E^(-a - b*x))/b - (6*E^(-a - b*x)*(a + b*x))/b - (3*E^(-a - b*x)*(a + b
*x)^2)/b - (E^(-a - b*x)*(a + b*x)^3)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\int e^{-a-bx}(a+bx)^3\,dx &= -\frac{e^{-a-bx}(a+bx)^3}{b}+3\int e^{-a-bx}(a+bx)^2\,dx\\
&= -\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{e^{-a-bx}(a+bx)^3}{b}+6\int e^{-a-bx}(a+bx)\,dx\\
&= -\frac{6e^{-a-bx}(a+bx)}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{e^{-a-bx}(a+bx)^3}{b}+6\int e^{-a-bx}\,dx\\
&= -\frac{6e^{-a-bx}}{b}-\frac{6e^{-a-bx}(a+bx)}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{e^{-a-bx}(a+bx)^3}{b}
\end{aligned}$$

Mathematica [A] time = 0.046695, size = 41, normalized size = 0.51

$$\frac{e^{-a-bx}\left(-(a+bx)^3-3(a+bx)^2-6(a+bx)-6\right)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^3,x]

[Out] (E^(-a - b*x)*(-6 - 6*(a + b*x) - 3*(a + b*x)^2 - (a + b*x)^3))/b
```

Maple [A] time = 0.003, size = 68, normalized size = 0.9

$$-\frac{\left(b^3x^3+3\,b^2x^2a+3\,a^2bx+3\,b^2x^2+a^3+6\,abx+3\,a^2+6\,bx+6\,a+6\right)\mathrm{e}^{-bx-a}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^3,x)

[Out] -(b^3*x^3+3*a*b^2*x^2+3*a^2*b*x+3*b^2*x^2+a^3+6*a*b*x+3*a^2+6*b*x+6*a+6)*ex
p(-b*x-a)/b
```

Maxima [A] time = 1.06245, size = 139, normalized size = 1.74

$$-\frac{3\,(bx+1)a^2e^{(-bx-a)}}{b}-\frac{a^3e^{(-bx-a)}}{b}-\frac{3\left(b^2x^2+2\,bx+2\right)ae^{(-bx-a)}}{b}-\frac{\left(b^3x^3+3\,b^2x^2+6\,bx+6\right)e^{(-bx-a)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="maxima")

[Out] -3*(b*x + 1)*a^2*e^(-b*x - a)/b - a^3*e^(-b*x - a)/b - 3*(b^2*x^2 + 2*b*x +
 2)*a*e^(-b*x - a)/b - (b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*e^(-b*x - a)/b
```

Fricas [A] time = 1.47203, size = 128, normalized size = 1.6

$$-\frac{\left(b^3x^3+3\,(a+1)b^2x^2+a^3+3\left(a^2+2\,a+2\right)bx+3\,a^2+6\,a+6\right)e^{(-bx-a)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="fricas")

[Out] -(b^3*x^3 + 3*(a + 1)*b^2*x^2 + a^3 + 3*(a^2 + 2*a + 2)*b*x + 3*a^2 + 6*a +
 6)*e^(-b*x - a)/b
```

Sympy [A] time = 0.145624, size = 104, normalized size = 1.3

$$\begin{cases} \frac{\left(-a^3-3a^2bx-3a^2-3ab^2x^2-6abx-6a-b^3x^3-3b^2x^2-6bx-6\right)e^{-a-bx}}{b} & \text{for } b\neq 0 \\ a^3x+\frac{3a^2bx^2}{2}+ab^2x^3+\frac{b^3x^4}{4} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3 - 3*a**2*b*x - 3*a**2 - 3*a*b**2*x**2 - 6*a*b*x - 6*a - b
**3*x**3 - 3*b**2*x**2 - 6*b*x - 6)*exp(-a - b*x)/b, Ne(b, 0)), (a**3*x + 3
*a**2*b*x**2/2 + a*b**2*x**3 + b**3*x**4/4, True))
```

Giac [A] time = 1.31471, size = 117, normalized size = 1.46

$$-\frac{\left(b^6x^3 + 3\,ab^5x^2 + 3\,a^2b^4x + 3\,b^5x^2 + a^3b^3 + 6\,ab^4x + 3\,a^2b^3 + 6\,b^4x + 6\,ab^3 + 6\,b^3\right)e^{(-bx-a)}}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^6*x^3 + 3*a*b^5*x^2 + 3*a^2*b^4*x + 3*b^5*x^2 + a^3*b^3 + 6*a*b^4*x + 3
*a^2*b^3 + 6*b^4*x + 6*a*b^3 + 6*b^3)*e^(-b*x - a)/b^4
```

3.60 $\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx$

Optimal. Leaf size=102

$$e^{-a}a^3\mathrm{Ei}(-bx) - 3a^2e^{-a-bx} - b^2x^2e^{-a-bx} - 3ae^{-a-bx} - 3abxe^{-a-bx} - 2e^{-a-bx} - 2bxe^{-a-bx}$$

```
[Out] -2*E^(-a - b*x) - 3*a*E^(-a - b*x) - 3*a^2*E^(-a - b*x) - 2*b*E^(-a - b*x)*
x - 3*a*b*E^(-a - b*x)*x - b^2*E^(-a - b*x)*x^2 + (a^3*ExpIntegralEi[-(b*x)
])/E^a
```

Rubi [A] time = 0.155647, antiderivative size = 102, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 4, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.19, Rules used = {2199, 2194, 2178, 2176}

$$e^{-a}a^3\mathrm{Ei}(-bx) - 3a^2e^{-a-bx} - b^2x^2e^{-a-bx} - 3ae^{-a-bx} - 3abxe^{-a-bx} - 2e^{-a-bx} - 2bxe^{-a-bx}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x,x]
```

```
[Out] -2*E^(-a - b*x) - 3*a*E^(-a - b*x) - 3*a^2*E^(-a - b*x) - 2*b*E^(-a - b*x)*
x - 3*a*b*E^(-a - b*x)*x - b^2*E^(-a - b*x)*x^2 + (a^3*ExpIntegralEi[-(b*x)
])/E^a
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx &= \int \left(3a^2be^{-a-bx} + \frac{a^3e^{-a-bx}}{x} + 3ab^2e^{-a-bx}x + b^3e^{-a-bx}x^2\right)dx\\ &= a^3\int \frac{e^{-a-bx}}{x}\,dx + \left(3a^2b\right)\int e^{-a-bx}\,dx + \left(3ab^2\right)\int e^{-a-bx}x\,dx + b^3\int e^{-a-bx}x^2\,dx\\ &= -3a^2e^{-a-bx} - 3abe^{-a-bx}x - b^2e^{-a-bx}x^2 + a^3e^{-a}\mathrm{Ei}(-bx) + (3ab)\int e^{-a-bx}\,dx + \left(2b^2\right)\int e^{-a-bx}x\,dx\\ &= -3ae^{-a-bx} - 3a^2e^{-a-bx} - 2be^{-a-bx}x - 3abe^{-a-bx}x - b^2e^{-a-bx}x^2 + a^3e^{-a}\mathrm{Ei}(-bx) + (2b)\int e^{-a-bx}\,dx\\ &= -2e^{-a-bx} - 3ae^{-a-bx} - 3a^2e^{-a-bx} - 2be^{-a-bx}x - 3abe^{-a-bx}x - b^2e^{-a-bx}x^2 + a^3e^{-a}\mathrm{Ei}(-bx)\end{aligned}$$

Mathematica [A] time = 0.0502071, size = 52, normalized size = 0.51

$$e^{-a-bx}\left(a^3e^{bx}\mathrm{Ei}(-bx) - 3a^2 - 3a(bx+1) - b^2x^2 - 2bx - 2\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x,x]
```

```
[Out] E^(-a - b*x)*(-2 - 3*a^2 - 2*b*x - b^2*x^2 - 3*a*(1 + b*x) + a^3*E^(b*x)*Ex
pIntegralEi[-(b*x)])
```

Maple [A] time = 0.008, size = 113, normalized size = 1.1

$$-\left(-bx-a\right)^2 e^{-bx-a} + 2\left(-bx-a\right)e^{-bx-a} - 2e^{-bx-a} + a\left(\left(-bx-a\right)e^{-bx-a} - e^{-bx-a}\right) - a^2e^{-bx-a} - a^3e^{-a}\mathrm{Ei}\left(1, bx\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x,x)
```

```
[Out] -(-b*x-a)^2*exp(-b*x-a)+2*(-b*x-a)*exp(-b*x-a)-2*exp(-b*x-a)+a*((-b*x-a)*ex
p(-b*x-a)-exp(-b*x-a))-a^2*exp(-b*x-a)-a^3*exp(-a)*Ei(1,b*x)
```

Maxima [A] time = 1.15238, size = 93, normalized size = 0.91

$$a^3\mathrm{Ei}\left(-bx\right)e^{(-a)} - 3\left(bx+1\right)ae^{(-bx-a)} - 3\,a^2e^{(-bx-a)} - \left(b^2x^2 + 2\,bx + 2\right)e^{(-bx-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="maxima")
```

```
[Out] a^3*Ei(-b*x)*e^(-a) - 3*(b*x + 1)*a*e^(-b*x - a) - 3*a^2*e^(-b*x - a) - (b^
2*x^2 + 2*b*x + 2)*e^(-b*x - a)
```

Fricas [A] time = 1.46542, size = 108, normalized size = 1.06

$$a^3\mathrm{Ei}\left(-bx\right)e^{(-a)} - \left(b^2x^2 + (3\,a+2)bx + 3\,a^2 + 3\,a + 2\right)e^{(-bx-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="fricas")
```

```
[Out] a^3*Ei(-b*x)*e^(-a) - (b^2*x^2 + (3*a + 2)*b*x + 3*a^2 + 3*a + 2)*e^(-b*x -
 a)
```

Sympy [A] time = 15.072, size = 70, normalized size = 0.69

$$\left(a^3 \operatorname{Ei}\left(-bx\right) - 3a^2e^{-bx} - 3a\left(bxe^{-bx} + e^{-bx}\right) - b^2x^2e^{-bx} - 2bxe^{-bx} - 2e^{-bx}\right)e^{-a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x,x)
```

```
[Out] (a**3*Ei(-b*x) - 3*a**2*exp(-b*x) - 3*a*(b*x*exp(-b*x) + exp(-b*x)) - b**2*
x**2*exp(-b*x) - 2*b*x*exp(-b*x) - 2*exp(-b*x))*exp(-a)
```

Giac [A] time = 1.31972, size = 128, normalized size = 1.25

$$-b^2x^2e^{(-bx-a)} + a^3\operatorname{Ei}\left(-bx\right)e^{(-a)} - 3\,abxe^{(-bx-a)} - 3\,a^2e^{(-bx-a)} - 2\,bxe^{(-bx-a)} - 3\,ae^{(-bx-a)} - 2\,e^{(-bx-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="giac")
```

```
[Out] -b^2*x^2*e^(-b*x - a) + a^3*Ei(-b*x)*e^(-a) - 3*a*b*x*e^(-b*x - a) - 3*a^2*
e^(-b*x - a) - 2*b*x*e^(-b*x - a) - 3*a*e^(-b*x - a) - 2*e^(-b*x - a)
```

3.61 $\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx$

Optimal. Leaf size=94

$$e^{-a}a^3(-b)\text{Ei}(-bx)+3e^{-a}a^2b\text{Ei}(-bx)-\frac{a^3e^{-a-bx}}{x}-b^2xe^{-a-bx}-3abe^{-a-bx}-be^{-a-bx}$$

```
[Out] -(b*E^(-a - b*x)) - 3*a*b*E^(-a - b*x) - (a^3*E^(-a - b*x))/x - b^2*E^(-a -
 b*x)*x + (3*a^2*b*ExpIntegralEi[-(b*x)])/E^a - (a^3*b*ExpIntegralEi[-(b*x)
])/E^a
```

Rubi [A] time = 0.160883, antiderivative size = 94, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 5, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.238, Rules used = {2199, 2194, 2177, 2178, 2176}

$$e^{-a}a^3(-b)\text{Ei}(-bx)+3e^{-a}a^2b\text{Ei}(-bx)-\frac{a^3e^{-a-bx}}{x}-b^2xe^{-a-bx}-3abe^{-a-bx}-be^{-a-bx}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^2,x]
```

```
[Out] -(b*E^(-a - b*x)) - 3*a*b*E^(-a - b*x) - (a^3*E^(-a - b*x))/x - b^2*E^(-a -
 b*x)*x + (3*a^2*b*ExpIntegralEi[-(b*x)])/E^a - (a^3*b*ExpIntegralEi[-(b*x)
])/E^a
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
```

```
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx &= \int \left(3ab^2e^{-a-bx}+\frac{a^3e^{-a-bx}}{x^2}+\frac{3a^2be^{-a-bx}}{x}+b^3e^{-a-bx}x\right)dx\\ &= a^3\int \frac{e^{-a-bx}}{x^2}\,dx+\left(3a^2b\right)\int \frac{e^{-a-bx}}{x}\,dx+\left(3ab^2\right)\int e^{-a-bx}\,dx+b^3\int e^{-a-bx}x\,dx\\ &= -3abe^{-a-bx}-\frac{a^3e^{-a-bx}}{x}-b^2e^{-a-bx}x+3a^2be^{-a}\text{Ei}(-bx)-\left(a^3b\right)\int \frac{e^{-a-bx}}{x}\,dx+b^2\int e^{-a-bx}\,dx\\ &= -be^{-a-bx}-3abe^{-a-bx}-\frac{a^3e^{-a-bx}}{x}-b^2e^{-a-bx}x+3a^2be^{-a}\text{Ei}(-bx)-a^3be^{-a}\text{Ei}(-bx)\end{aligned}$$

Mathematica [A] time = 0.0650001, size = 54, normalized size = 0.57

$$\frac{e^{-a-bx}\left(-(a-3)a^2bxe^{bx}\text{Ei}(-bx)-a^3-3abx-bx(bx+1)\right)}{x}$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^2,x]
```

```
[Out] (E^(-a - b*x)*(-a^3 - 3*a*b*x - b*x*(1 + b*x) - (-3 + a)*a^2*b*E^(b*x)*x*Ex
pIntegralEi[-(b*x)]))/x
```

Maple [A] time = 0.008, size = 92, normalized size = 1.

$$b\left((-bx-a)\,\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}-2\,a\mathrm{e}^{-bx-a}-3\,a^2\mathrm{e}^{-a}\text{Ei}\,(1,bx)-a^3\left(\frac{\mathrm{e}^{-bx-a}}{bx}-\mathrm{e}^{-a}\text{Ei}\,(1,bx)\right)\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^2,x)
```

```
[Out] b*((-b*x-a)*exp(-b*x-a)-exp(-b*x-a)-2*a*exp(-b*x-a)-3*a^2*exp(-a)*Ei(1,b*x)
-a^3*(exp(-b*x-a)/b/x-exp(-a)*Ei(1,b*x)))
```

Maxima [A] time = 1.1616, size = 82, normalized size = 0.87

$$-a^3be^{(-a)}\Gamma\left(-1,bx\right)+3\,a^2b\text{Ei}\left(-bx\right)e^{(-a)}-(bx+1)be^{(-bx-a)}-3\,abe^{(-bx-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="maxima")
```

```
[Out] -a^3*b*e^(-a)*gamma(-1, b*x) + 3*a^2*b*Ei(-b*x)*e^(-a) - (b*x + 1)*b*e^(-b*
x - a) - 3*a*b*e^(-b*x - a)
```

Fricas [A] time = 1.4683, size = 117, normalized size = 1.24

$$-\frac{\left(a^{3}-3\,a^{2}\right)bx\mathrm{Ei}\left(-bx\right)e^{(-a)}+\left(b^{2}x^{2}+a^{3}+(3\,a+1)bx\right)e^{(-bx-a)}}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="fricas")
```

```
[Out] -((a^3 - 3*a^2)*b*x*Ei(-b*x)*e^(-a) + (b^2*x^2 + a^3 + (3*a + 1)*b*x)*e^(-b
*x - a))/x
```

Sympy [A] time = 6.47635, size = 99, normalized size = 1.05

$$-\frac{a^{3}e^{-a}\operatorname{E}_{2}\left(bx\right)}{x}+3a^{2}be^{-a}\operatorname{Ei}\left(-bx\right)+3ab^{2}\left(\begin{cases}x & \text{for}\: b=0\\-\frac{e^{-bx}}{b} & \text{otherwise}\end{cases}\right)e^{-a}+b^{3}x\left(\begin{cases}x & \text{for}\: b=0\\-\frac{e^{-bx}}{b} & \text{otherwise}\end{cases}\right)e^{-a}-b^{3}\left(\begin{cases}\frac{x^{2}}{2} & \\-\frac{\begin{cases}-\frac{e^{-bx}}{b} & \text{fo}\\x & \text{o}\end{cases}}{b} & \end{cases}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**2,x)
```

```
[Out] -a**3*exp(-a)*expint(2, b*x)/x + 3*a**2*b*exp(-a)*Ei(-b*x) + 3*a*b**2*Piece
wise((x, Eq(b, 0)), (-exp(-b*x)/b, True))*exp(-a) + b**3*x*Piecewise((x, Eq
(b, 0)), (-exp(-b*x)/b, True))*exp(-a) - b**3*Piecewise((x**2/2, Eq(b, 0)),
 (-Piecewise((-exp(-b*x)/b, Ne(b, 0)), (x, True))/b, True))*exp(-a)
```

Giac [A] time = 1.383, size = 124, normalized size = 1.32

$$-\frac{a^{3}bx\mathrm{Ei}\left(-bx\right)e^{(-a)}-3\,a^{2}bx\mathrm{Ei}\left(-bx\right)e^{(-a)}+b^{2}x^{2}e^{(-bx-a)}+a^{3}e^{(-bx-a)}+3\,abxe^{(-bx-a)}+bxe^{(-bx-a)}}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="giac")
```

```
[Out] -(a^3*b*x*Ei(-b*x)*e^(-a) - 3*a^2*b*x*Ei(-b*x)*e^(-a) + b^2*x^2*e^(-b*x - a
) + a^3*e^(-b*x - a) + 3*a*b*x*e^(-b*x - a) + b*x*e^(-b*x - a))/x
```

3.62 $\int \frac{e^{-a-bx}(a+bx)^3}{x^3} dx$

Optimal. Leaf size=130

$$\frac{1}{2}e^{-a}a^3b^2\text{Ei}(-bx) - 3e^{-a}a^2b^2\text{Ei}(-bx) - \frac{a^3e^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{2x} - \frac{3a^2be^{-a-bx}}{x} + 3e^{-a}ab^2\text{Ei}(-bx) - b^2e^{-a-bx}$$

```
[Out] -(b^2*E^(-a - b*x)) - (a^3*E^(-a - b*x))/(2*x^2) - (3*a^2*b*E^(-a - b*x))/x
 + (a^3*b*E^(-a - b*x))/(2*x) + (3*a*b^2*ExpIntegralEi[-(b*x)])/E^a - (3*a^
2*b^2*ExpIntegralEi[-(b*x)])/E^a + (a^3*b^2*ExpIntegralEi[-(b*x)])/(2*E^a)
```

Rubi [A] time = 0.213394, antiderivative size = 130, normalized size of antiderivative = 1., number of steps used = 9, number of rules used = 4, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.19, Rules used = {2199, 2194, 2177, 2178}

$$\frac{1}{2}e^{-a}a^3b^2\text{Ei}(-bx) - 3e^{-a}a^2b^2\text{Ei}(-bx) - \frac{a^3e^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{2x} - \frac{3a^2be^{-a-bx}}{x} + 3e^{-a}ab^2\text{Ei}(-bx) - b^2e^{-a-bx}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^3,x]
```

```
[Out] -(b^2*E^(-a - b*x)) - (a^3*E^(-a - b*x))/(2*x^2) - (3*a^2*b*E^(-a - b*x))/x
 + (a^3*b*E^(-a - b*x))/(2*x) + (3*a*b^2*ExpIntegralEi[-(b*x)])/E^a - (3*a^
2*b^2*ExpIntegralEi[-(b*x)])/E^a + (a^3*b^2*ExpIntegralEi[-(b*x)])/(2*E^a)
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \int \left(b^3e^{-a-bx} + \frac{a^3e^{-a-bx}}{x^3} + \frac{3a^2be^{-a-bx}}{x^2} + \frac{3ab^2e^{-a-bx}}{x}\right) dx$$
$$= a^3\int \frac{e^{-a-bx}}{x^3}\,dx + \left(3a^2b\right)\int \frac{e^{-a-bx}}{x^2}\,dx + \left(3ab^2\right)\int \frac{e^{-a-bx}}{x}\,dx + b^3\int e^{-a-bx}\,dx$$
$$= -b^2e^{-a-bx} - \frac{a^3e^{-a-bx}}{2x^2} - \frac{3a^2be^{-a-bx}}{x} + 3ab^2e^{-a}\text{Ei}(-bx) - \frac{1}{2}\left(a^3b\right)\int \frac{e^{-a-bx}}{x^2}\,dx - \left(3a^2b^2\right)\int \frac{e^{-a-bx}}{x}$$
$$= -b^2e^{-a-bx} - \frac{a^3e^{-a-bx}}{2x^2} - \frac{3a^2be^{-a-bx}}{x} + \frac{a^3be^{-a-bx}}{2x} + 3ab^2e^{-a}\text{Ei}(-bx) - 3a^2b^2e^{-a}\text{Ei}(-bx) + \frac{1}{2}\left(a^3b^2\right)$$
$$= -b^2e^{-a-bx} - \frac{a^3e^{-a-bx}}{2x^2} - \frac{3a^2be^{-a-bx}}{x} + \frac{a^3be^{-a-bx}}{2x} + 3ab^2e^{-a}\text{Ei}(-bx) - 3a^2b^2e^{-a}\text{Ei}(-bx) + \frac{1}{2}a^3b^2e^{-a}$$

Mathematica [A] time = 0.0724097, size = 68, normalized size = 0.52

$$\frac{e^{-a-bx}\left(\left(a^2-6a+6\right)ab^2x^2e^{bx}\text{Ei}(-bx)+a^3(bx-1)-6a^2bx-2b^2x^2\right)}{2x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^3,x]
```

```
[Out] (E^(-a - b*x)*(-6*a^2*b*x - 2*b^2*x^2 + a^3*(-1 + b*x) + a*(6 - 6*a + a^2)*
b^2*E^(b*x)*x^2*ExpIntegralEi[-(b*x)]))/(2*x^2)
```

Maple [A] time = 0.009, size = 112, normalized size = 0.9

$$-b^2\left(\mathrm{e}^{-bx-a} + 3\,a\mathrm{e}^{-a}\text{Ei}\,(1,bx) - a^3\left(-\frac{\mathrm{e}^{-bx-a}}{2\,b^2x^2} + \frac{\mathrm{e}^{-bx-a}}{2\,bx} - \frac{\mathrm{e}^{-a}\text{Ei}\,(1,bx)}{2}\right) + 3\,a^2\left(\frac{\mathrm{e}^{-bx-a}}{bx} - \mathrm{e}^{-a}\text{Ei}\,(1,bx)\right)\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^3,x)
```

```
[Out] -b^2*(exp(-b*x-a)+3*a*exp(-a)*Ei(1,b*x)-a^3*(-1/2*exp(-b*x-a)/b^2/x^2+1/2*e
xp(-b*x-a)/b/x-1/2*exp(-a)*Ei(1,b*x))+3*a^2*(exp(-b*x-a)/b/x-exp(-a)*Ei(1,b
*x)))
```

Maxima [A] time = 1.2718, size = 86, normalized size = 0.66

$$-a^3b^2e^{(-a)}\Gamma\left(-2,bx\right) - 3\,a^2b^2e^{(-a)}\Gamma\left(-1,bx\right) + 3\,ab^2\text{Ei}\left(-bx\right)e^{(-a)} - b^2e^{(-bx-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="maxima")
```

```
[Out] -a^3*b^2*e^(-a)*gamma(-2, b*x) - 3*a^2*b^2*e^(-a)*gamma(-1, b*x) + 3*a*b^2*
Ei(-b*x)*e^(-a) - b^2*e^(-b*x - a)
```

Fricas [A] time = 1.47975, size = 146, normalized size = 1.12

$$\frac{\left(a^{3}-6\,a^{2}+6\,a\right)b^{2}x^{2}\mathrm{Ei}\left(-bx\right)e^{(-a)}-\left(2\,b^{2}x^{2}+a^{3}-\left(a^{3}-6\,a^{2}\right)bx\right)e^{(-bx-a)}}{2\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="fricas")
```

```
[Out] 1/2*((a^3 - 6*a^2 + 6*a)*b^2*x^2*Ei(-b*x)*e^(-a) - (2*b^2*x^2 + a^3 - (a^3
- 6*a^2)*b*x)*e^(-b*x - a))/x^2
```

Sympy [A] time = 6.58302, size = 56, normalized size = 0.43

$$\left(-\frac{a^{3}\,\mathrm{E}_{3}\left(bx\right)}{x^{2}}-\frac{3a^{2}b\,\mathrm{E}_{2}\left(bx\right)}{x}+3ab^{2}\,\mathrm{Ei}\left(-bx\right)+b^{3}\left(\begin{cases}x & \text{for } b=0\\ -\frac{e^{-bx}}{b} & \text{otherwise}\end{cases}\right)\right)e^{-a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**3,x)
```

```
[Out] (-a**3*expint(3, b*x)/x**2 - 3*a**2*b*expint(2, b*x)/x + 3*a*b**2*Ei(-b*x)
+ b**3*Piecewise((x, Eq(b, 0)), (-exp(-b*x)/b, True)))*exp(-a)
```

Giac [A] time = 1.33416, size = 169, normalized size = 1.3

$$\frac{a^{3}b^{2}x^{2}\mathrm{Ei}\left(-bx\right)e^{(-a)}-6\,a^{2}b^{2}x^{2}\mathrm{Ei}\left(-bx\right)e^{(-a)}+6\,ab^{2}x^{2}\mathrm{Ei}\left(-bx\right)e^{(-a)}+a^{3}bxe^{(-bx-a)}-6\,a^{2}bxe^{(-bx-a)}-2\,b^{2}x^{2}e^{(-bx-a)}-a}{2\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="giac")
```

```
[Out] 1/2*(a^3*b^2*x^2*Ei(-b*x)*e^(-a) - 6*a^2*b^2*x^2*Ei(-b*x)*e^(-a) + 6*a*b^2*
x^2*Ei(-b*x)*e^(-a) + a^3*b*x*e^(-b*x - a) - 6*a^2*b*x*e^(-b*x - a) - 2*b^2
*x^2*e^(-b*x - a) - a^3*e^(-b*x - a))/x^2
```

3.63 $\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx$

Optimal. Leaf size=198

$$-\frac{1}{6}e^{-a}a^3b^3\text{Ei}(-bx)+\frac{3}{2}e^{-a}a^2b^3\text{Ei}(-bx)-\frac{a^3b^2e^{-a-bx}}{6x}+\frac{3a^2b^2e^{-a-bx}}{2x}+\frac{a^3be^{-a-bx}}{6x^2}-\frac{a^3e^{-a-bx}}{3x^3}-\frac{3a^2be^{-a-bx}}{2x^2}-3e^{-a}ab^3\text{Ei}(-b$$

```
[Out] -(a^3*E^(-a - b*x))/(3*x^3) - (3*a^2*b*E^(-a - b*x))/(2*x^2) + (a^3*b*E^(-a
 - b*x))/(6*x^2) - (3*a*b^2*E^(-a - b*x))/x + (3*a^2*b^2*E^(-a - b*x))/(2*x
) - (a^3*b^2*E^(-a - b*x))/(6*x) + (b^3*ExpIntegralEi[-(b*x)])/E^a - (3*a*b
^3*ExpIntegralEi[-(b*x)])/E^a + (3*a^2*b^3*ExpIntegralEi[-(b*x)])/(2*E^a) -
 (a^3*b^3*ExpIntegralEi[-(b*x)])/(6*E^a)
```

Rubi [A] time = 0.290449, antiderivative size = 198, normalized size of antiderivative = 1., number of steps used = 12, number of rules used = 3, integrand size = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2199, 2177, 2178}

$$-\frac{1}{6}e^{-a}a^3b^3\text{Ei}(-bx)+\frac{3}{2}e^{-a}a^2b^3\text{Ei}(-bx)-\frac{a^3b^2e^{-a-bx}}{6x}+\frac{3a^2b^2e^{-a-bx}}{2x}+\frac{a^3be^{-a-bx}}{6x^2}-\frac{a^3e^{-a-bx}}{3x^3}-\frac{3a^2be^{-a-bx}}{2x^2}-3e^{-a}ab^3\text{Ei}(-b$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^4,x]
```

```
[Out] -(a^3*E^(-a - b*x))/(3*x^3) - (3*a^2*b*E^(-a - b*x))/(2*x^2) + (a^3*b*E^(-a
 - b*x))/(6*x^2) - (3*a*b^2*E^(-a - b*x))/x + (3*a^2*b^2*E^(-a - b*x))/(2*x
) - (a^3*b^2*E^(-a - b*x))/(6*x) + (b^3*ExpIntegralEi[-(b*x)])/E^a - (3*a*b
^3*ExpIntegralEi[-(b*x)])/E^a + (3*a^2*b^3*ExpIntegralEi[-(b*x)])/(2*E^a) -
 (a^3*b^3*ExpIntegralEi[-(b*x)])/(6*E^a)
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = \int \left(\frac{a^3e^{-a-bx}}{x^4} + \frac{3a^2be^{-a-bx}}{x^3} + \frac{3ab^2e^{-a-bx}}{x^2} + \frac{b^3e^{-a-bx}}{x}\right) dx$$
$$= a^3 \int \frac{e^{-a-bx}}{x^4}\,dx + \left(3a^2b\right) \int \frac{e^{-a-bx}}{x^3}\,dx + \left(3ab^2\right) \int \frac{e^{-a-bx}}{x^2}\,dx + b^3 \int \frac{e^{-a-bx}}{x}\,dx$$
$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} - \frac{3ab^2e^{-a-bx}}{x} + b^3e^{-a}\text{Ei}(-bx) - \frac{1}{3}\left(a^3b\right) \int \frac{e^{-a-bx}}{x^3}\,dx - \frac{1}{2}\left(3a^2b^2\right) \int \frac{e}{}$$
$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} + b^3e^{-a}\text{Ei}(-bx) - 3ab^3e^{-a}\text{Ei}$$
$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{a^3b^2e^{-a-bx}}{6x} + b^3e^{-a}\text{Ei}(-bx$$
$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{a^3b^2e^{-a-bx}}{6x} + b^3e^{-a}\text{Ei}(-bx$$

Mathematica [A] time = 0.105909, size = 81, normalized size = 0.41

$$\frac{1}{6}e^{-a}\left(-\left(a^3-9a^2+18a-6\right)b^3\text{Ei}(-bx) - \frac{ae^{-bx}\left(a^2\left(b^2x^2-bx+2\right)-9abx(bx-1)+18b^2x^2\right)}{x^3}\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^4,x]
```

```
[Out] (-((a*(18*b^2*x^2 - 9*a*b*x*(-1 + b*x) + a^2*(2 - b*x + b^2*x^2)))/(E^(b*x)
*x^3)) - (-6 + 18*a - 9*a^2 + a^3)*b^3*ExpIntegralEi[-(b*x)])/(6*E^a)
```

Maple [A] time = 0.008, size = 167, normalized size = 0.8

$$b^3\left(-e^{-a}\text{Ei}\,(1,bx) - a^3\left(\frac{e^{-bx-a}}{3\,b^3x^3} - \frac{e^{-bx-a}}{6\,b^2x^2} + \frac{e^{-bx-a}}{6\,bx} - \frac{e^{-a}\text{Ei}\,(1,bx)}{6}\right) + 3\,a^2\left(-1/2\,\frac{e^{-bx-a}}{b^2x^2} + 1/2\,\frac{e^{-bx-a}}{bx} - 1/2\,e^{-a}\text{Ei}\,(1,bx)\right)\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^4,x)
```

```
[Out] b^3*(-exp(-a)*Ei(1,b*x)-a^3*(1/3*exp(-b*x-a)/b^3/x^3-1/6*exp(-b*x-a)/b^2/x^
2+1/6*exp(-b*x-a)/b/x-1/6*exp(-a)*Ei(1,b*x))+3*a^2*(-1/2*exp(-b*x-a)/b^2/x^
2+1/2*exp(-b*x-a)/b/x-1/2*exp(-a)*Ei(1,b*x))-3*a*(exp(-b*x-a)/b/x-exp(-a)*E
i(1,b*x)))
```

Maxima [A] time = 1.23261, size = 85, normalized size = 0.43

$$-a^3b^3e^{(-a)}\Gamma\,(-3,bx) - 3\,a^2b^3e^{(-a)}\Gamma\,(-2,bx) - 3\,ab^3e^{(-a)}\Gamma\,(-1,bx) + b^3\text{Ei}\,(-bx)\,e^{(-a)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="maxima")
```

```
[Out] -a^3*b^3*e^(-a)*gamma(-3, b*x) - 3*a^2*b^3*e^(-a)*gamma(-2, b*x) - 3*a*b^3*
e^(-a)*gamma(-1, b*x) + b^3*Ei(-b*x)*e^(-a)
```

Fricas [A] time = 1.44072, size = 182, normalized size = 0.92

$$-\frac{\left(a^3-9\,a^2+18\,a-6\right)b^3x^3\mathrm{Ei}\left(-bx\right)e^{(-a)}+\left(\left(a^3-9\,a^2+18\,a\right)b^2x^2+2\,a^3-\left(a^3-9\,a^2\right)bx\right)e^{(-bx-a)}}{6\,x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="fricas")
```

```
[Out] -1/6*((a^3 - 9*a^2 + 18*a - 6)*b^3*x^3*Ei(-b*x)*e^(-a) + ((a^3 - 9*a^2 + 18
*a)*b^2*x^2 + 2*a^3 - (a^3 - 9*a^2)*b*x)*e^(-b*x - a))/x^3
```

Sympy [A] time = 6.89928, size = 53, normalized size = 0.27

$$\left(-\frac{a^3\,\mathrm{E}_4\left(bx\right)}{x^3}-\frac{3a^2b\,\mathrm{E}_3\left(bx\right)}{x^2}-\frac{3ab^2\,\mathrm{E}_2\left(bx\right)}{x}+b^3\,\mathrm{Ei}\left(-bx\right)\right)e^{-a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**4,x)
```

```
[Out] (-a**3*expint(4, b*x)/x**3 - 3*a**2*b*expint(3, b*x)/x**2 - 3*a*b**2*expint
(2, b*x)/x + b**3*Ei(-b*x))*exp(-a)
```

Giac [A] time = 1.36748, size = 247, normalized size = 1.25

$$-\frac{a^3b^3x^3\mathrm{Ei}\left(-bx\right)e^{(-a)}-9\,a^2b^3x^3\mathrm{Ei}\left(-bx\right)e^{(-a)}+18\,ab^3x^3\mathrm{Ei}\left(-bx\right)e^{(-a)}+a^3b^2x^2e^{(-bx-a)}-6\,b^3x^3\mathrm{Ei}\left(-bx\right)e^{(-a)}-9\,a^2b^2x^2e^{\cdots}}{6\,x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="giac")
```

```
[Out] -1/6*(a^3*b^3*x^3*Ei(-b*x)*e^(-a) - 9*a^2*b^3*x^3*Ei(-b*x)*e^(-a) + 18*a*b^
3*x^3*Ei(-b*x)*e^(-a) + a^3*b^2*x^2*e^(-b*x - a) - 6*b^3*x^3*Ei(-b*x)*e^(-a
) - 9*a^2*b^2*x^2*e^(-b*x - a) - a^3*b*x*e^(-b*x - a) + 18*a*b^2*x^2*e^(-b*
x - a) + 9*a^2*b*x*e^(-b*x - a) + 2*a^3*e^(-b*x - a))/x^3
```

3.64 $\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx$

Optimal. Leaf size=139

$$-\frac{2efx^mF^{a+bc}(-bdx\log(F))^{-m}\text{Gamma}(m+2,-bdx\log(F))}{b^2d^2\log^2(F)}+\frac{f^2x^mF^{a+bc}(-bdx\log(F))^{-m}\text{Gamma}(m+3,-bdx\log(F$$

```
[Out] (f^2*F^(a + b*c)*x^m*Gamma[3 + m, -(b*d*x*Log[F])])/(b^3*d^3*Log[F]^3*(-(b*
d*x*Log[F]))^m) - (2*e*f*F^(a + b*c)*x^m*Gamma[2 + m, -(b*d*x*Log[F])])/(b^
2*d^2*Log[F]^2*(-(b*d*x*Log[F]))^m) + (e^2*F^(a + b*c)*x^m*Gamma[1 + m, -(b
*d*x*Log[F])])/(b*d*Log[F]*(-(b*d*x*Log[F]))^m)
```

Rubi [A] time = 0.309197, antiderivative size = 139, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.091, Rules used = {2199, 2181}

$$-\frac{2efx^mF^{a+bc}(-bdx\log(F))^{-m}\text{Gamma}(m+2,-bdx\log(F))}{b^2d^2\log^2(F)}+\frac{f^2x^mF^{a+bc}(-bdx\log(F))^{-m}\text{Gamma}(m+3,-bdx\log(F$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*(c + d*x))*x^m*(e + f*x)^2,x]
```

```
[Out] (f^2*F^(a + b*c)*x^m*Gamma[3 + m, -(b*d*x*Log[F])])/(b^3*d^3*Log[F]^3*(-(b*
d*x*Log[F]))^m) - (2*e*f*F^(a + b*c)*x^m*Gamma[2 + m, -(b*d*x*Log[F])])/(b^
2*d^2*Log[F]^2*(-(b*d*x*Log[F]))^m) + (e^2*F^(a + b*c)*x^m*Gamma[1 + m, -(b
*d*x*Log[F])])/(b*d*Log[F]*(-(b*d*x*Log[F]))^m)
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

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*Lo
g[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] &&  !I
ntegerQ[m]
```

Rubi steps

$$\begin{aligned}\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx &= \int \left(e^2F^{a+bc+bdx}x^m+2efF^{a+bc+bdx}x^{1+m}+f^2F^{a+bc+bdx}x^{2+m}\right)dx\\ &= e^2\int F^{a+bc+bdx}x^m\,dx+(2ef)\int F^{a+bc+bdx}x^{1+m}\,dx+f^2\int F^{a+bc+bdx}x^{2+m}\,dx\\ &= \frac{f^2F^{a+bc}x^m\Gamma(3+m,-bdx\log(F))(-bdx\log(F))^{-m}}{b^3d^3\log^3(F)}-\frac{2efF^{a+bc}x^m\Gamma(2+m,-bdx\log(F))(-}{b^2d^2\log^2(F)}\end{aligned}$$

Mathematica [A] time = 0.124451, size = 86, normalized size = 0.62

$$\frac{x^mF^{a+bc}(-bdx\log(F))^{-m}\left(bde\log(F)(bde\log(F)\text{Gamma}(m+1,-bdx\log(F))-2f\text{Gamma}(m+2,-bdx\log(F)))+f^2\right.}{b^3d^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*(c + d*x))*x^m*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*c)*x^m*(f^2*Gamma[3 + m, -(b*d*x*Log[F])] + b*d*e*Log[F]*(-2*f*Ga
mma[2 + m, -(b*d*x*Log[F])] + b*d*e*Gamma[1 + m, -(b*d*x*Log[F])]*Log[F])))
/(b^3*d^3*Log[F]^3*(-(b*d*x*Log[F]))^m)
```

Maple [B] time = 0.097, size = 433, normalized size = 3.1

$$-\frac{(\ln(F))^{-3-m}(-bd)^{-m}F^{bc+a}f^2\left(x^m(-bd)^m(\ln(F))^m m\left(m^2+3m+2\right)\Gamma(m)(-bdx\ln(F))^{-m}-x^m(-bd)^m(\ln(F))^m\left(b^2d^2x^2\right.\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x)
```

```
[Out] -1/b^3/d^3*ln(F)^(-3-m)*(-b*d)^(-m)*F^(b*c+a)*f^2*(x^m*(-b*d)^m*ln(F)^m*m*(
m^2+3*m+2)*GAMMA(m)*(-b*d*x*ln(F))^(-m)-x^m*(-b*d)^m*ln(F)^m*(b^2*d^2*x^2*l
n(F)^2-m*b*d*x*ln(F)+m^2-2*b*d*x*ln(F)+3*m+2)*exp(b*d*x*ln(F))-x^m*(-b*d)^m
*ln(F)^m*m*(m^2+3*m+2)*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F)))+2/b^2/d^2
*ln(F)^(-2-m)*(-b*d)^(-m)*F^(b*c+a)*f*e*(x^m*(-b*d)^m*ln(F)^m*(1+m)*m*GAMMA
(m)*(-b*d*x*ln(F))^(-m)+x^m*(-b*d)^m*ln(F)^m*(b*d*x*ln(F)-1-m)*exp(b*d*x*ln
(F))-x^m*(-b*d)^m*ln(F)^m*(1+m)*m*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F))
)-F^(b*c+a)*(-b*d)^(-m)*ln(F)^(-m-1)*e^2/b/d*(x^m*(-b*d)^m*ln(F)^m*m*GAMMA(
m)*(-b*d*x*ln(F))^(-m)-x^m*(-b*d)^m*ln(F)^m*exp(b*d*x*ln(F))-x^m*(-b*d)^m*l
n(F)^m*m*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F)))
```

Maxima [A] time = 1.27436, size = 166, normalized size = 1.19

$$-(-bdx\log(F))^{-m-3}F^{bc+a}f^2x^{m+3}\Gamma(m+3,-bdx\log(F))-2(-bdx\log(F))^{-m-2}F^{bc+a}efx^{m+2}\Gamma(m+2,-bdx\log(F))-(-$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] -(-b*d*x*log(F))^(-m - 3)*F^(b*c + a)*f^2*x^(m + 3)*gamma(m + 3, -b*d*x*log
(F)) - 2*(-b*d*x*log(F))^(-m - 2)*F^(b*c + a)*e*f*x^(m + 2)*gamma(m + 2, -b
*d*x*log(F)) - (-b*d*x*log(F))^(-m - 1)*F^(b*c + a)*e^2*x^(m + 1)*gamma(m +
 1, -b*d*x*log(F))
```

Fricas [A] time = 1.60851, size = 386, normalized size = 2.78

$$-\frac{\left(\left(bdf^2m+2\,bdf^2\right)x\log(F)-\left(b^2d^2f^2x^2+2\,b^2d^2efx\right)\log(F)^2\right)F^{bdx+bc+a}x^m-\left(b^2d^2e^2\log(F)^2+f^2m^2+3\,f^2m+2\,f^2-\right.}{b^3d^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] -(((b*d*f^2*m + 2*b*d*f^2)*x*log(F) - (b^2*d^2*f^2*x^2 + 2*b^2*d^2*e*f*x)*l
og(F)^2)*F^(b*d*x + b*c + a)*x^m - (b^2*d^2*e^2*log(F)^2 + f^2*m^2 + 3*f^2*
```

```
m + 2*f^2 - 2*(b*d*e*f*m + b*d*e*f)*log(F))*e^(-m*log(-b*d*log(F)) + (b*c +
 a)*log(F))*gamma(m + 1, -b*d*x*log(F)))/(b^3*d^3*log(F)^3)
```

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

$$\int F^{a+b(c+dx)}x^m\left(e+fx\right)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*x**m*(f*x+e)**2,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*x**m*(e + f*x)**2, x)
```

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

$$\int\left(fx+e\right)^2F^{(dx+c)b+a}x^m\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)*x^m, x)
```

3.65 $\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx$

Optimal. Leaf size=414

$$-\frac{3e^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{6e^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{8efx^3F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{24efx^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{48efxF^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{48efF^{a+bc+bd}}{b^5d^5\log^5(F)}$$

```
[Out] (-120*f^2*F^(a + b*c + b*d*x))/(b^6*d^6*Log[F]^6) + (48*e*f*F^(a + b*c + b*
d*x))/(b^5*d^5*Log[F]^5) + (120*f^2*F^(a + b*c + b*d*x)*x)/(b^5*d^5*Log[F]^
5) - (6*e^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) - (48*e*f*F^(a + b*c +
b*d*x)*x)/(b^4*d^4*Log[F]^4) - (60*f^2*F^(a + b*c + b*d*x)*x^2)/(b^4*d^4*Lo
g[F]^4) + (6*e^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) + (24*e*f*F^(a +
 b*c + b*d*x)*x^2)/(b^3*d^3*Log[F]^3) + (20*f^2*F^(a + b*c + b*d*x)*x^3)/(b
^3*d^3*Log[F]^3) - (3*e^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (8*
e*f*F^(a + b*c + b*d*x)*x^3)/(b^2*d^2*Log[F]^2) - (5*f^2*F^(a + b*c + b*d*x
)*x^4)/(b^2*d^2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F]) + (2
*e*f*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^5)/
(b*d*Log[F])
```

Rubi [A] time = 0.671541, antiderivative size = 414, normalized size of antiderivative = 1., number of steps used = 17, number of rules used = 3, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2196, 2176, 2194}

$$-\frac{3e^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{6e^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{8efx^3F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{24efx^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{48efxF^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{48efF^{a+bc+bd}}{b^5d^5\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*(c + d*x))*x^3*(e + f*x)^2,x]
```

```
[Out] (-120*f^2*F^(a + b*c + b*d*x))/(b^6*d^6*Log[F]^6) + (48*e*f*F^(a + b*c + b*
d*x))/(b^5*d^5*Log[F]^5) + (120*f^2*F^(a + b*c + b*d*x)*x)/(b^5*d^5*Log[F]^
5) - (6*e^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) - (48*e*f*F^(a + b*c +
b*d*x)*x)/(b^4*d^4*Log[F]^4) - (60*f^2*F^(a + b*c + b*d*x)*x^2)/(b^4*d^4*Lo
g[F]^4) + (6*e^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) + (24*e*f*F^(a +
 b*c + b*d*x)*x^2)/(b^3*d^3*Log[F]^3) + (20*f^2*F^(a + b*c + b*d*x)*x^3)/(b
^3*d^3*Log[F]^3) - (3*e^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (8*
e*f*F^(a + b*c + b*d*x)*x^3)/(b^2*d^2*Log[F]^2) - (5*f^2*F^(a + b*c + b*d*x
)*x^4)/(b^2*d^2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F]) + (2
*e*f*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^5)/
(b*d*Log[F])
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx = \int \left(e^2F^{a+bc+bdx}x^3 + 2efF^{a+bc+bdx}x^4 + f^2F^{a+bc+bdx}x^5\right)dx$$
$$= e^2\int F^{a+bc+bdx}x^3\,dx + (2ef)\int F^{a+bc+bdx}x^4\,dx + f^2\int F^{a+bc+bdx}x^5\,dx$$
$$= \frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^4}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)} - \frac{\left(3e^2\right)\int F^{a+bc+bdx}x^2\,dx}{bd\log(F)} - \frac{(8ef)\int F^{a+}}{bd\,\mathrm{lo}}$$
$$= -\frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)} - \frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}$$
$$= \frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)} + \frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)} - \frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)}$$
$$= -\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)} - \frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)} + \frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)}$$
$$= \frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)} + \frac{120f^2F^{a+bc+bdx}x}{b^5d^5\log^5(F)} - \frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)} - \frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)}$$
$$= -\frac{120f^2F^{a+bc+bdx}}{b^6d^6\log^6(F)} + \frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)} + \frac{120f^2F^{a+bc+bdx}x}{b^5d^5\log^5(F)} - \frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)}$$

Mathematica [A] time = 0.119706, size = 159, normalized size = 0.38

$$\frac{F^{a+b(c+dx)}\left(-b^4d^4x^2\log^4(F)\left(3e^2+8efx+5f^2x^2\right)+2b^3d^3x\log^3(F)\left(3e^2+12efx+10f^2x^2\right)-6b^2d^2\log^2(F)\left(e^2+8efx\right.\right.}{b^6d^6\log^6(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*(c + d*x))*x^3*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(-120*f^2 + 24*b*d*f*(2*e + 5*f*x)*Log[F] - 6*b^2*d^2*
(e^2 + 8*e*f*x + 10*f^2*x^2)*Log[F]^2 + 2*b^3*d^3*x*(3*e^2 + 12*e*f*x + 10*
f^2*x^2)*Log[F]^3 - b^4*d^4*x^2*(3*e^2 + 8*e*f*x + 5*f^2*x^2)*Log[F]^4 + b^
5*d^5*x^3*(e + f*x)^2*Log[F]^5))/(b^6*d^6*Log[F]^6)
```

Maple [A] time = 0.009, size = 250, normalized size = 0.6

$$\left(f^2x^5(\ln(F))^5b^5d^5 + 2(\ln(F))^5b^5d^5efx^4 + (\ln(F))^5b^5d^5e^2x^3 - 5(\ln(F))^4b^4d^4f^2x^4 - 8(\ln(F))^4b^4d^4efx^3 - 3(\ln(F$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x)
```

```
[Out] (f^2*x^5*ln(F)^5*b^5*d^5+2*ln(F)^5*b^5*d^5*e*f*x^4+ln(F)^5*b^5*d^5*e^2*x^3-
5*ln(F)^4*b^4*d^4*f^2*x^4-8*ln(F)^4*b^4*d^4*e*f*x^3-3*ln(F)^4*b^4*d^4*e^2*x
^2+20*ln(F)^3*b^3*d^3*f^2*x^3+24*ln(F)^3*b^3*d^3*e*f*x^2+6*ln(F)^3*b^3*d^3*
e^2*x-60*ln(F)^2*b^2*d^2*f^2*x^2-48*ln(F)^2*b^2*d^2*e*f*x-6*ln(F)^2*b^2*d^2
```

```
*e^2+120*ln(F)*b*d*f^2*x+48*f*e*ln(F)*b*d-120*f^2)*F^(b*d*x+b*c+a)/ln(F)^6/
b^6/d^6
```

Maxima [A] time = 1.06091, size = 443, normalized size = 1.07

$$\frac{\left(F^{bc+a}b^3d^3x^3\log\left(F\right)^3-3\,F^{bc+a}b^2d^2x^2\log\left(F\right)^2+6\,F^{bc+a}bdx\log\left(F\right)-6\,F^{bc+a}\right)F^{bdx}e^2}{b^4d^4\log\left(F\right)^4}+\frac{2\left(F^{bc+a}b^4d^4x^4\log\left(F\right)^4-4\,F^{bc+a}b^3\ldots\right.}{\ldots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b^3*d^3*x^3*log(F)^3 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*
F^(b*c + a)*b*d*x*log(F) - 6*F^(b*c + a))*F^(b*d*x)*e^2/(b^4*d^4*log(F)^4)
+ 2*(F^(b*c + a)*b^4*d^4*x^4*log(F)^4 - 4*F^(b*c + a)*b^3*d^3*x^3*log(F)^3
+ 12*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 24*F^(b*c + a)*b*d*x*log(F) + 24*F^
(b*c + a))*F^(b*d*x)*e*f/(b^5*d^5*log(F)^5) + (F^(b*c + a)*b^5*d^5*x^5*log(
F)^5 - 5*F^(b*c + a)*b^4*d^4*x^4*log(F)^4 + 20*F^(b*c + a)*b^3*d^3*x^3*log(
F)^3 - 60*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 120*F^(b*c + a)*b*d*x*log(F) -
 120*F^(b*c + a))*F^(b*d*x)*f^2/(b^6*d^6*log(F)^6)
```

Fricas [A] time = 1.55277, size = 493, normalized size = 1.19

$$\frac{\left(\left(b^5d^5f^2x^5+2\,b^5d^5efx^4+b^5d^5e^2x^3\right)\log\left(F\right)^5-\left(5\,b^4d^4f^2x^4+8\,b^4d^4efx^3+3\,b^4d^4e^2x^2\right)\log\left(F\right)^4+2\left(10\,b^3d^3f^2x^3+12\,b^3\ldots\right.\right.}{b^6d\ldots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^5*d^5*f^2*x^5 + 2*b^5*d^5*e*f*x^4 + b^5*d^5*e^2*x^3)*log(F)^5 - (5*b^4*
d^4*f^2*x^4 + 8*b^4*d^4*e*f*x^3 + 3*b^4*d^4*e^2*x^2)*log(F)^4 + 2*(10*b^3*d
^3*f^2*x^3 + 12*b^3*d^3*e*f*x^2 + 3*b^3*d^3*e^2*x)*log(F)^3 - 6*(10*b^2*d^2
*f^2*x^2 + 8*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 - 120*f^2 + 24*(5*b*d*f^
2*x + 2*b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^6*d^6*log(F)^6)
```

Sympy [A] time = 0.209837, size = 323, normalized size = 0.78

$$\begin{cases}\frac{F^{a+b(c+dx)}\left(b^5d^5e^2x^3\log\left(F\right)^5+2b^5d^5efx^4\log\left(F\right)^5+b^5d^5f^2x^5\log\left(F\right)^5-3b^4d^4e^2x^2\log\left(F\right)^4-8b^4d^4efx^3\log\left(F\right)^4-5b^4d^4f^2x^4\log\left(F\right)^4+6b^3d^3e^2x\log\left(F\right)^3+24b^3d^3efx\ldots\right.}{b^6d^6\log\left(F\right)^6} \\ \frac{e^2x^4}{4}+\frac{2efx^5}{5}+\frac{f^2x^6}{6}\end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*x**3*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**5*d**5*e**2*x**3*log(F)**5 + 2*b**5*d**
5*e*f*x**4*log(F)**5 + b**5*d**5*f**2*x**5*log(F)**5 - 3*b**4*d**4*e**2*x**
2*log(F)**4 - 8*b**4*d**4*e*f*x**3*log(F)**4 - 5*b**4*d**4*f**2*x**4*log(F)
**4 + 6*b**3*d**3*e**2*x*log(F)**3 + 24*b**3*d**3*e*f*x**2*log(F)**3 + 20*b
**3*d**3*f**2*x**3*log(F)**3 - 6*b**2*d**2*e**2*log(F)**2 - 48*b**2*d**2*e*
```

```
f*x*log(F)**2 - 60*b**2*d**2*f**2*x**2*log(F)**2 + 48*b*d*e*f*log(F) + 120*
b*d*f**2*x*log(F) - 120*f**2)/(b**6*d**6*log(F)**6), Ne(b**6*d**6*log(F)**6
, 0)), (e**2*x**4/4 + 2*e*f*x**5/5 + f**2*x**6/6, True))
```

Giac [C] time = 1.85998, size = 13437, normalized size = 32.46

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] ((4*(pi^3*b^3*d^3*x^3*sgn(F) - 3*pi*b^3*d^3*x^3*log(abs(F))^2*sgn(F) - pi^3
*b^3*d^3*x^3 + 3*pi*b^3*d^3*x^3*log(abs(F))^2 + 6*pi*b^2*d^2*x^2*log(abs(F)
)*sgn(F) - 6*pi*b^2*d^2*x^2*log(abs(F)) - 6*pi*b*d*x*sgn(F) + 6*pi*b*d*x)*(
pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^
4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi^4*b^4*d^4*sgn(F) - 6*pi^
2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^
2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b
^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs
(F))^3)^2) - (pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)*(3*pi
^2*b^3*d^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*x^3*log(abs(F)) + 2*b^3*
d^3*x^3*log(abs(F))^3 - 3*pi^2*b^2*d^2*x^2*sgn(F) + 3*pi^2*b^2*d^2*x^2 - 6*
b^2*d^2*x^2*log(abs(F))^2 + 12*b*d*x*log(abs(F)) - 12)/((pi^4*b^4*d^4*sgn(F
) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log
(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(
F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^
4*log(abs(F))^3)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*s
gn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) + ((pi^4*b^4*d^4*sgn(F) -
6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs
(F))^2 - 2*b^4*d^4*log(abs(F))^4)*(pi^3*b^3*d^3*x^3*sgn(F) - 3*pi*b^3*d^3*x
^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*x^3 + 3*pi*b^3*d^3*x^3*log(abs(F))^2
 + 6*pi*b^2*d^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*d^2*x^2*log(abs(F)) - 6*p
i*b*d*x*sgn(F) + 6*pi*b*d*x)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs
(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log
(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F)
)^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2) + 4*(p
i^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4
*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)*(3*pi^2*b^3*d^3*x^3*log(abs(F)
)*sgn(F) - 3*pi^2*b^3*d^3*x^3*log(abs(F)) + 2*b^3*d^3*x^3*log(abs(F))^3 - 3
*pi^2*b^2*d^2*x^2*sgn(F) + 3*pi^2*b^2*d^2*x^2 - 6*b^2*d^2*x^2*log(abs(F))^2
 + 12*b*d*x*log(abs(F)) - 12)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(ab
s(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*lo
g(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F
))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2))*sin(
-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*
pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs
(F)) + 2) - 1/2*I*((8*pi^3*b^3*d^3*x^3*sgn(F) + 24*I*pi^2*b^3*d^3*x^3*log(a
bs(F))*sgn(F) - 24*pi*b^3*d^3*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*d^3*x^3
 - 24*I*pi^2*b^3*d^3*x^3*log(abs(F)) + 24*pi*b^3*d^3*x^3*log(abs(F))^2 + 16
*I*b^3*d^3*x^3*log(abs(F))^3 - 24*I*pi^2*b^2*d^2*x^2*sgn(F) + 48*pi*b^2*d^2
*x^2*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*d^2*x^2 - 48*pi*b^2*d^2*x^2*log(abs
(F)) - 48*I*b^2*d^2*x^2*log(abs(F))^2 - 48*pi*b*d*x*sgn(F) + 48*pi*b*d*x +
96*I*b*d*x*log(abs(F)) - 96*I)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x +
1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(8*pi^
4*b^4*d^4*sgn(F) + 32*I*pi^3*b^4*d^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*d^4*l
```

```
og(abs(F))^2*sgn(F) - 32*I*pi*b^4*d^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*d^4
 - 32*I*pi^3*b^4*d^4*log(abs(F)) + 48*pi^2*b^4*d^4*log(abs(F))^2 + 32*I*pi*
b^4*d^4*log(abs(F))^3 - 16*b^4*d^4*log(abs(F))^4) + (8*pi^3*b^3*d^3*x^3*sgn
(F) - 24*I*pi^2*b^3*d^3*x^3*log(abs(F))*sgn(F) - 24*pi*b^3*d^3*x^3*log(abs(
F))^2*sgn(F) - 8*pi^3*b^3*d^3*x^3 + 24*I*pi^2*b^3*d^3*x^3*log(abs(F)) + 24*
pi*b^3*d^3*x^3*log(abs(F))^2 - 16*I*b^3*d^3*x^3*log(abs(F))^3 + 24*I*pi^2*b
^2*d^2*x^2*sgn(F) + 48*pi*b^2*d^2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*d^
2*x^2 - 48*pi*b^2*d^2*x^2*log(abs(F)) + 48*I*b^2*d^2*x^2*log(abs(F))^2 - 48
*pi*b*d*x*sgn(F) + 48*pi*b*d*x - 96*I*b*d*x*log(abs(F)) + 96*I)*e^(-1/2*I*p
i*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*
I*pi*a*sgn(F) + 1/2*I*pi*a)/(8*pi^4*b^4*d^4*sgn(F) - 32*I*pi^3*b^4*d^4*log(
abs(F))*sgn(F) - 48*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) + 32*I*pi*b^4*d^4*log
(abs(F))^3*sgn(F) - 8*pi^4*b^4*d^4 + 32*I*pi^3*b^4*d^4*log(abs(F)) + 48*pi^
2*b^4*d^4*log(abs(F))^2 - 32*I*pi*b^4*d^4*log(abs(F))^3 - 16*b^4*d^4*log(ab
s(F))^4))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 2) - 2*(
(4*(pi^3*b^4*d^4*f*x^4*log(abs(F))*sgn(F) - pi*b^4*d^4*f*x^4*log(abs(F))^3*
sgn(F) - pi^3*b^4*d^4*f*x^4*log(abs(F)) + pi*b^4*d^4*f*x^4*log(abs(F))^3 -
pi^3*b^3*d^3*f*x^3*sgn(F) + 3*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) + pi^3*
b^3*d^3*f*x^3 - 3*pi*b^3*d^3*f*x^3*log(abs(F))^2 - 6*pi*b^2*d^2*f*x^2*log(a
bs(F))*sgn(F) + 6*pi*b^2*d^2*f*x^2*log(abs(F)) + 6*pi*b*d*f*x*sgn(F) - 6*pi
*b*d*f*x)*(pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*p
i*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))
^2 - 5*pi*b^5*d^5*log(abs(F))^4)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*lo
g(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*
pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^
5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^
5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2)
 - (pi^4*b^4*d^4*f*x^4*sgn(F) - 6*pi^2*b^4*d^4*f*x^4*log(abs(F))^2*sgn(F) -
 pi^4*b^4*d^4*f*x^4 + 6*pi^2*b^4*d^4*f*x^4*log(abs(F))^2 - 2*b^4*d^4*f*x^4*
log(abs(F))^4 + 12*pi^2*b^3*d^3*f*x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*d^3*
f*x^3*log(abs(F)) + 8*b^3*d^3*f*x^3*log(abs(F))^3 - 12*pi^2*b^2*d^2*f*x^2*s
gn(F) + 12*pi^2*b^2*d^2*f*x^2 - 24*b^2*d^2*f*x^2*log(abs(F))^2 + 48*b*d*f*x
*log(abs(F)) - 48*f)*(5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*l
og(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(
F))^3 - 2*b^5*d^5*log(abs(F))^5)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*lo
g(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*
pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^
5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^
5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2)
)*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c
 - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^4*b^4*d^4*f*x^4*sgn(F) - 6*pi^2*b^4*d^
4*f*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4*f*x^4 + 6*pi^2*b^4*d^4*f*x^4*lo
g(abs(F))^2 - 2*b^4*d^4*f*x^4*log(abs(F))^4 + 12*pi^2*b^3*d^3*f*x^3*log(abs
(F))*sgn(F) - 12*pi^2*b^3*d^3*f*x^3*log(abs(F)) + 8*b^3*d^3*f*x^3*log(abs(F
))^3 - 12*pi^2*b^2*d^2*f*x^2*sgn(F) + 12*pi^2*b^2*d^2*f*x^2 - 24*b^2*d^2*f*
x^2*log(abs(F))^2 + 48*b*d*f*x*log(abs(F)) - 48*f)*(pi^5*b^5*d^5*sgn(F) - 1
0*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - p
i^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)/(
(pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*
log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*
b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5
*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*lo
g(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2) + 4*(pi^3*b^4*d^4*f*x^4*log(abs(F
))*sgn(F) - pi*b^4*d^4*f*x^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*f*x^4*log(
abs(F)) + pi*b^4*d^4*f*x^4*log(abs(F))^3 - pi^3*b^3*d^3*f*x^3*sgn(F) + 3*pi
*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) + pi^3*b^3*d^3*f*x^3 - 3*pi*b^3*d^3*f*x
^3*log(abs(F))^2 - 6*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) + 6*pi*b^2*d^2*f*x
^2*log(abs(F)) + 6*pi*b*d*f*x*sgn(F) - 6*pi*b*d*f*x)*(5*pi^4*b^5*d^5*log(ab
s(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(ab
```

```
s(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)/((pi^5*b^5
*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F
))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*l
og(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(
abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))
^3 - 2*b^5*d^5*log(abs(F))^5)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x -
 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log
(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 1) + 1/2*I*((-32*I*pi^4*b^4*d^
4*f*x^4*sgn(F) + 128*pi^3*b^4*d^4*f*x^4*log(abs(F))*sgn(F) + 192*I*pi^2*b^4
*d^4*f*x^4*log(abs(F))^2*sgn(F) - 128*pi*b^4*d^4*f*x^4*log(abs(F))^3*sgn(F)
 + 32*I*pi^4*b^4*d^4*f*x^4 - 128*pi^3*b^4*d^4*f*x^4*log(abs(F)) - 192*I*pi^
2*b^4*d^4*f*x^4*log(abs(F))^2 + 128*pi*b^4*d^4*f*x^4*log(abs(F))^3 + 64*I*b
^4*d^4*f*x^4*log(abs(F))^4 - 128*pi^3*b^3*d^3*f*x^3*sgn(F) - 384*I*pi^2*b^3
*d^3*f*x^3*log(abs(F))*sgn(F) + 384*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) +
 128*pi^3*b^3*d^3*f*x^3 + 384*I*pi^2*b^3*d^3*f*x^3*log(abs(F)) - 384*pi*b^3
*d^3*f*x^3*log(abs(F))^2 - 256*I*b^3*d^3*f*x^3*log(abs(F))^3 + 384*I*pi^2*b
^2*d^2*f*x^2*sgn(F) - 768*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 384*I*pi^2*
b^2*d^2*f*x^2 + 768*pi*b^2*d^2*f*x^2*log(abs(F)) + 768*I*b^2*d^2*f*x^2*log(
abs(F))^2 + 768*pi*b*d*f*x*sgn(F) - 768*pi*b*d*f*x - 1536*I*b*d*f*x*log(abs
(F)) + 1536*I*f)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*s
gn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(16*I*pi^5*b^5*d^5*s
gn(F) - 80*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 160*I*pi^3*b^5*d^5*log(abs(F))
^2*sgn(F) + 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) + 80*I*pi*b^5*d^5*log(abs
(F))^4*sgn(F) - 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*log(abs(F)) + 160*I*pi^
3*b^5*d^5*log(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))^3 - 80*I*pi*b^5*d^5*
log(abs(F))^4 + 32*b^5*d^5*log(abs(F))^5) - (-32*I*pi^4*b^4*d^4*f*x^4*sgn(F
) - 128*pi^3*b^4*d^4*f*x^4*log(abs(F))*sgn(F) + 192*I*pi^2*b^4*d^4*f*x^4*lo
g(abs(F))^2*sgn(F) + 128*pi*b^4*d^4*f*x^4*log(abs(F))^3*sgn(F) + 32*I*pi^4*
b^4*d^4*f*x^4 + 128*pi^3*b^4*d^4*f*x^4*log(abs(F)) - 192*I*pi^2*b^4*d^4*f*x
^4*log(abs(F))^2 - 128*pi*b^4*d^4*f*x^4*log(abs(F))^3 + 64*I*b^4*d^4*f*x^4*
log(abs(F))^4 + 128*pi^3*b^3*d^3*f*x^3*sgn(F) - 384*I*pi^2*b^3*d^3*f*x^3*lo
g(abs(F))*sgn(F) - 384*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) - 128*pi^3*b^3
*d^3*f*x^3 + 384*I*pi^2*b^3*d^3*f*x^3*log(abs(F)) + 384*pi*b^3*d^3*f*x^3*lo
g(abs(F))^2 - 256*I*b^3*d^3*f*x^3*log(abs(F))^3 + 384*I*pi^2*b^2*d^2*f*x^2*
sgn(F) + 768*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 384*I*pi^2*b^2*d^2*f*x^2
 - 768*pi*b^2*d^2*f*x^2*log(abs(F)) + 768*I*b^2*d^2*f*x^2*log(abs(F))^2 - 7
68*pi*b*d*f*x*sgn(F) + 768*pi*b*d*f*x - 1536*I*b*d*f*x*log(abs(F)) + 1536*I
*f)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*
I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(-16*I*pi^5*b^5*d^5*sgn(F) - 80*
pi^4*b^5*d^5*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) +
 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*d^5*log(abs(F))^4*sgn(
F) + 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*log(abs(F)) - 160*I*pi^3*b^5*d^5*l
og(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))^3 + 80*I*pi*b^5*d^5*log(abs(F))
^4 + 32*b^5*d^5*log(abs(F))^5))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*
log(abs(F)) + 1) - (((5*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 10*pi^2*b
^5*d^5*f^2*x^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*f^2*x^5*log(abs(F)) +
10*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3 - 2*b^5*d^5*f^2*x^5*log(abs(F))^5 - 5
*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 30*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F)
 + 5*pi^4*b^4*d^4*f^2*x^4 - 30*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 + 10*b^4*
d^4*f^2*x^4*log(abs(F))^4 - 60*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 60
*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 40*b^3*d^3*f^2*x^3*log(abs(F))^3 + 60*p
i^2*b^2*d^2*f^2*x^2*sgn(F) - 60*pi^2*b^2*d^2*f^2*x^2 + 120*b^2*d^2*f^2*x^2*
log(abs(F))^2 - 240*b*d*f^2*x*log(abs(F)) + 240*f^2)*(pi^6*b^6*d^6*sgn(F) -
 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F
) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(
F))^4 + 2*b^6*d^6*log(abs(F))^6)/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*lo
g(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 +
15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*l
og(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*lo
```

g(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log
(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)^2) -
 2*(pi^5*b^5*d^5*f^2*x^5*sgn(F) - 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2*sgn
(F) + 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5*f^2*x^5 + 10
*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2 - 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4 +
20*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - 20*pi*b^4*d^4*f^2*x^4*log(abs(
F))^3*sgn(F) - 20*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + 20*pi*b^4*d^4*f^2*x^4*
log(abs(F))^3 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 60*pi*b^3*d^3*f^2*x^3*log(
abs(F))^2*sgn(F) + 20*pi^3*b^3*d^3*f^2*x^3 - 60*pi*b^3*d^3*f^2*x^3*log(abs(
F))^2 - 120*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 120*pi*b^2*d^2*f^2*x^2*
log(abs(F)) + 120*pi*b*d*f^2*x*sgn(F) - 120*pi*b*d*f^2*x)*(3*pi^5*b^6*d^6*l
og(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log
(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F)
)^3 - 3*pi*b^6*d^6*log(abs(F))^5)/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*l
og(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 +
 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*
log(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*l
og(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*lo
g(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)^2))
*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c -
 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^5*b^5*d^5*f^2*x^5*sgn(F) - 10*pi^3*b^5*
d^5*f^2*x^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4*sgn(F
) - pi^5*b^5*d^5*f^2*x^5 + 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2 - 5*pi*b^5
*d^5*f^2*x^5*log(abs(F))^4 + 20*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - 2
0*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 20*pi^3*b^4*d^4*f^2*x^4*log(abs
(F)) + 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F)
 + 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) + 20*pi^3*b^3*d^3*f^2*x^3 - 6
0*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 120*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn
(F) + 120*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 120*pi*b*d*f^2*x*sgn(F) - 120*pi
*b*d*f^2*x)*(pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 1
5*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(ab
s(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)/((pi^6*b
^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(
abs(F))^4*sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b
^6*d^6*log(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(a
bs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs
(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3
 - 3*pi*b^6*d^6*log(abs(F))^5)^2) + 2*(5*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sg
n(F) - 10*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*f^2*x^
5*log(abs(F)) + 10*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3 - 2*b^5*d^5*f^2*x^5*l
og(abs(F))^5 - 5*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 30*pi^2*b^4*d^4*f^2*x^4*log(
abs(F))^2*sgn(F) + 5*pi^4*b^4*d^4*f^2*x^4 - 30*pi^2*b^4*d^4*f^2*x^4*log(abs
(F))^2 + 10*b^4*d^4*f^2*x^4*log(abs(F))^4 - 60*pi^2*b^3*d^3*f^2*x^3*log(abs
(F))*sgn(F) + 60*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 40*b^3*d^3*f^2*x^3*log(
abs(F))^3 + 60*pi^2*b^2*d^2*f^2*x^2*sgn(F) - 60*pi^2*b^2*d^2*f^2*x^2 + 120*
b^2*d^2*f^2*x^2*log(abs(F))^2 - 240*b*d*f^2*x*log(abs(F)) + 240*f^2)*(3*pi^
5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*
b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6
*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)/((pi^6*b^6*d^6*sgn(F) - 15*pi^
4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^
6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 +
 2*b^6*d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^
3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5
*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs
(F))^5)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1
/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs
(F)) + a*log(abs(F))) - 1/2*I*((32*pi^5*b^5*d^5*f^2*x^5*sgn(F) + 160*I*pi^4
*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 320*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^
2*sgn(F) - 320*I*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3*sgn(F) + 160*pi*b^5*d^5

```
*f^2*x^5*log(abs(F))^4*sgn(F) - 32*pi^5*b^5*d^5*f^2*x^5 - 160*I*pi^4*b^5*d^
5*f^2*x^5*log(abs(F)) + 320*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2 + 320*I*pi^2
*b^5*d^5*f^2*x^5*log(abs(F))^3 - 160*pi*b^5*d^5*f^2*x^5*log(abs(F))^4 - 64*
I*b^5*d^5*f^2*x^5*log(abs(F))^5 - 160*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 640*p
i^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) + 960*I*pi^2*b^4*d^4*f^2*x^4*log(abs
(F))^2*sgn(F) - 640*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) + 160*I*pi^4*b^
4*d^4*f^2*x^4 - 640*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) - 960*I*pi^2*b^4*d^4*f
^2*x^4*log(abs(F))^2 + 640*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 320*I*b^4*d^4
*f^2*x^4*log(abs(F))^4 - 640*pi^3*b^3*d^3*f^2*x^3*sgn(F) - 1920*I*pi^2*b^3*
d^3*f^2*x^3*log(abs(F))*sgn(F) + 1920*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(
F) + 640*pi^3*b^3*d^3*f^2*x^3 + 1920*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 1
920*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 1280*I*b^3*d^3*f^2*x^3*log(abs(F))^3
 + 1920*I*pi^2*b^2*d^2*f^2*x^2*sgn(F) - 3840*pi*b^2*d^2*f^2*x^2*log(abs(F))
*sgn(F) - 1920*I*pi^2*b^2*d^2*f^2*x^2 + 3840*pi*b^2*d^2*f^2*x^2*log(abs(F))
 + 3840*I*b^2*d^2*f^2*x^2*log(abs(F))^2 + 3840*pi*b*d*f^2*x*sgn(F) - 3840*p
i*b*d*f^2*x - 7680*I*b*d*f^2*x*log(abs(F)) + 7680*I*f^2)*e^(1/2*I*pi*b*d*x*
sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*s
gn(F) - 1/2*I*pi*a)/(32*pi^6*b^6*d^6*sgn(F) + 192*I*pi^5*b^6*d^6*log(abs(F)
)*sgn(F) - 480*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) - 640*I*pi^3*b^6*d^6*log(a
bs(F))^3*sgn(F) + 480*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) + 192*I*pi*b^6*d^6*
log(abs(F))^5*sgn(F) - 32*pi^6*b^6*d^6 - 192*I*pi^5*b^6*d^6*log(abs(F)) + 4
80*pi^4*b^6*d^6*log(abs(F))^2 + 640*I*pi^3*b^6*d^6*log(abs(F))^3 - 480*pi^2
*b^6*d^6*log(abs(F))^4 - 192*I*pi*b^6*d^6*log(abs(F))^5 + 64*b^6*d^6*log(ab
s(F))^6) + (32*pi^5*b^5*d^5*f^2*x^5*sgn(F) - 160*I*pi^4*b^5*d^5*f^2*x^5*log
(abs(F))*sgn(F) - 320*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2*sgn(F) + 320*I*pi^
2*b^5*d^5*f^2*x^5*log(abs(F))^3*sgn(F) + 160*pi*b^5*d^5*f^2*x^5*log(abs(F))
^4*sgn(F) - 32*pi^5*b^5*d^5*f^2*x^5 + 160*I*pi^4*b^5*d^5*f^2*x^5*log(abs(F)
) + 320*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2 - 320*I*pi^2*b^5*d^5*f^2*x^5*log
(abs(F))^3 - 160*pi*b^5*d^5*f^2*x^5*log(abs(F))^4 + 64*I*b^5*d^5*f^2*x^5*lo
g(abs(F))^5 + 160*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 640*pi^3*b^4*d^4*f^2*x^4*
log(abs(F))*sgn(F) - 960*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - 640*
pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 160*I*pi^4*b^4*d^4*f^2*x^4 - 640*
pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + 960*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2
 + 640*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - 320*I*b^4*d^4*f^2*x^4*log(abs(F))
^4 - 640*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 1920*I*pi^2*b^3*d^3*f^2*x^3*log(abs(
F))*sgn(F) + 1920*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) + 640*pi^3*b^3*d^
3*f^2*x^3 - 1920*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 1920*pi*b^3*d^3*f^2*x
^3*log(abs(F))^2 + 1280*I*b^3*d^3*f^2*x^3*log(abs(F))^3 - 1920*I*pi^2*b^2*d
^2*f^2*x^2*sgn(F) - 3840*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 1920*I*pi^
2*b^2*d^2*f^2*x^2 + 3840*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 3840*I*b^2*d^2*f^
2*x^2*log(abs(F))^2 + 3840*pi*b*d*f^2*x*sgn(F) - 3840*pi*b*d*f^2*x + 7680*I
*b*d*f^2*x*log(abs(F)) - 7680*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b
*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)
/(32*pi^6*b^6*d^6*sgn(F) - 192*I*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 480*pi^4
*b^6*d^6*log(abs(F))^2*sgn(F) + 640*I*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 4
80*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - 192*I*pi*b^6*d^6*log(abs(F))^5*sgn(F
) - 32*pi^6*b^6*d^6 + 192*I*pi^5*b^6*d^6*log(abs(F)) + 480*pi^4*b^6*d^6*log
(abs(F))^2 - 640*I*pi^3*b^6*d^6*log(abs(F))^3 - 480*pi^2*b^6*d^6*log(abs(F)
)^4 + 192*I*pi*b^6*d^6*log(abs(F))^5 + 64*b^6*d^6*log(abs(F))^6))*e^(b*d*x*
log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)))
```

3.66 $\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$

Optimal. Leaf size=328

$$-\frac{2e^2xF^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6efx^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{12efxF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{4f^2x^3F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{12f^2x^2F^{a+bc+bd}}{b^3d^3\log^3(F)}$$

```
[Out] (24*f^2*F^(a + b*c + b*d*x))/(b^5*d^5*Log[F]^5) - (12*e*f*F^(a + b*c + b*d*
x))/(b^4*d^4*Log[F]^4) - (24*f^2*F^(a + b*c + b*d*x)*x)/(b^4*d^4*Log[F]^4)
+ (2*e^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) + (12*e*f*F^(a + b*c + b*d
*x)*x)/(b^3*d^3*Log[F]^3) + (12*f^2*F^(a + b*c + b*d*x)*x^2)/(b^3*d^3*Log[F
]^3) - (2*e^2*F^(a + b*c + b*d*x)*x)/(b^2*d^2*Log[F]^2) - (6*e*f*F^(a + b*c
 + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (4*f^2*F^(a + b*c + b*d*x)*x^3)/(b^2*d^
2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^2)/(b*d*Log[F]) + (2*e*f*F^(a + b*
c + b*d*x)*x^3)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F])
```

Rubi [A] time = 0.53245, antiderivative size = 328, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 3, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2196, 2176, 2194}

$$-\frac{2e^2xF^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6efx^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{12efxF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{4f^2x^3F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{12f^2x^2F^{a+bc+bd}}{b^3d^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*(c + d*x))*x^2*(e + f*x)^2,x]
```

```
[Out] (24*f^2*F^(a + b*c + b*d*x))/(b^5*d^5*Log[F]^5) - (12*e*f*F^(a + b*c + b*d*
x))/(b^4*d^4*Log[F]^4) - (24*f^2*F^(a + b*c + b*d*x)*x)/(b^4*d^4*Log[F]^4)
+ (2*e^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) + (12*e*f*F^(a + b*c + b*d
*x)*x)/(b^3*d^3*Log[F]^3) + (12*f^2*F^(a + b*c + b*d*x)*x^2)/(b^3*d^3*Log[F
]^3) - (2*e^2*F^(a + b*c + b*d*x)*x)/(b^2*d^2*Log[F]^2) - (6*e*f*F^(a + b*c
 + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (4*f^2*F^(a + b*c + b*d*x)*x^3)/(b^2*d^
2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^2)/(b*d*Log[F]) + (2*e*f*F^(a + b*
c + b*d*x)*x^3)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F])
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx = \int \left(e^2F^{a+bc+bdx}x^2 + 2efF^{a+bc+bdx}x^3 + f^2F^{a+bc+bdx}x^4\right)dx$$
$$= e^2\int F^{a+bc+bdx}x^2\,dx + (2ef)\int F^{a+bc+bdx}x^3\,dx + f^2\int F^{a+bc+bdx}x^4\,dx$$
$$= \frac{e^2F^{a+bc+bdx}x^2}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^3}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^4}{bd\log(F)} - \frac{\left(2e^2\right)\int F^{a+bc+bdx}x\,dx}{bd\log(F)} - \frac{(6ef)\int F^{a+b}}{bd\log}$$
$$= -\frac{2e^2F^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{6efF^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{4f^2F^{a+bc+bdx}x^3}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x^2}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^3}{bd\log(F)} -$$
$$= \frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12efF^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{12f^2F^{a+bc+bdx}x^2}{b^3d^3\log^3(F)} - \frac{2e^2F^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{6efF^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} -$$
$$= -\frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{24f^2F^{a+bc+bdx}x}{b^4d^4\log^4(F)} + \frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12efF^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{12f^2F^{a+bc+bdx}x^2}{b^3d^3\log^3(F)}$$
$$= \frac{24f^2F^{a+bc+bdx}}{b^5d^5\log^5(F)} - \frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{24f^2F^{a+bc+bdx}x}{b^4d^4\log^4(F)} + \frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12efF^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{1}{}$$

Mathematica [A] time = 0.237664, size = 121, normalized size = 0.37

$$\frac{F^{a+b(c+dx)}\left(-2b^3d^3x\log^3(F)\left(e^2+3efx+2f^2x^2\right)+2b^2d^2\log^2(F)\left(e^2+6efx+6f^2x^2\right)+b^4d^4x^2\log^4(F)(e+fx)^2-12b\right.}{b^5d^5\log^5(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*(c + d*x))*x^2*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(24*f^2 - 12*b*d*f*(e + 2*f*x)*Log[F] + 2*b^2*d^2*(e^2
 + 6*e*f*x + 6*f^2*x^2)*Log[F]^2 - 2*b^3*d^3*x*(e^2 + 3*e*f*x + 2*f^2*x^2)*
Log[F]^3 + b^4*d^4*x^2*(e + f*x)^2*Log[F]^4))/(b^5*d^5*Log[F]^5)
```

Maple [A] time = 0.007, size = 197, normalized size = 0.6

$$\frac{\left((\ln(F))^4b^4d^4f^2x^4+2\,(\ln(F))^4b^4d^4efx^3+(\ln(F))^4b^4d^4e^2x^2-4\,(\ln(F))^3b^3d^3f^2x^3-6\,(\ln(F))^3b^3d^3efx^2-2\,(\ln(F\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x)
```

```
[Out] (ln(F)^4*b^4*d^4*f^2*x^4+2*ln(F)^4*b^4*d^4*e*f*x^3+ln(F)^4*b^4*d^4*e^2*x^2-
4*ln(F)^3*b^3*d^3*f^2*x^3-6*ln(F)^3*b^3*d^3*e*f*x^2-2*ln(F)^3*b^3*d^3*e^2*x
+12*ln(F)^2*b^2*d^2*f^2*x^2+12*ln(F)^2*b^2*d^2*e*f*x+2*ln(F)^2*b^2*d^2*e^2-
24*ln(F)*b*d*f^2*x-12*f*e*ln(F)*b*d+24*f^2)*F^(b*d*x+b*c+a)/ln(F)^5/b^5/d^5
```

Maxima [A] time = 1.04444, size = 354, normalized size = 1.08

$$\frac{\left(F^{bc+a}b^2d^2x^2\log(F)^2-2\,F^{bc+a}bdx\log(F)+2\,F^{bc+a}\right)F^{bdx}e^2}{b^3d^3\log(F)^3}+\frac{2\left(F^{bc+a}b^3d^3x^3\log(F)^3-3\,F^{bc+a}b^2d^2x^2\log(F)^2+6\,F^{bc+}\right.}{b^4d^4\log(F)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*c +
 a))*F^(b*d*x)*e^2/(b^3*d^3*log(F)^3) + 2*(F^(b*c + a)*b^3*d^3*x^3*log(F)^3
 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*F^(b*c + a)*b*d*x*log(F) - 6*F^(b
*c + a))*F^(b*d*x)*e*f/(b^4*d^4*log(F)^4) + (F^(b*c + a)*b^4*d^4*x^4*log(F)
^4 - 4*F^(b*c + a)*b^3*d^3*x^3*log(F)^3 + 12*F^(b*c + a)*b^2*d^2*x^2*log(F)
^2 - 24*F^(b*c + a)*b*d*x*log(F) + 24*F^(b*c + a))*F^(b*d*x)*f^2/(b^5*d^5*l
og(F)^5)
```

Fricas [A] time = 1.48157, size = 386, normalized size = 1.18

$$\frac{\left(\left(b^4d^4f^2x^4 + 2\,b^4d^4efx^3 + b^4d^4e^2x^2\right)\log\left(F\right)^4 - 2\left(2\,b^3d^3f^2x^3 + 3\,b^3d^3efx^2 + b^3d^3e^2x\right)\log\left(F\right)^3 + 2\left(6\,b^2d^2f^2x^2 + 6\,b^2d^2e \cdots\right.\right.}{b^5d^5\log\left(F\right)^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^4*d^4*f^2*x^4 + 2*b^4*d^4*e*f*x^3 + b^4*d^4*e^2*x^2)*log(F)^4 - 2*(2*b^
3*d^3*f^2*x^3 + 3*b^3*d^3*e*f*x^2 + b^3*d^3*e^2*x)*log(F)^3 + 2*(6*b^2*d^2*
f^2*x^2 + 6*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 + 24*f^2 - 12*(2*b*d*f^2*
x + b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^5*d^5*log(F)^5)
```

Sympy [A] time = 0.194154, size = 260, normalized size = 0.79

$$\begin{cases} \frac{F^{a+b(c+dx)}\left(b^4d^4e^2x^2\log\left(F\right)^4+2b^4d^4efx^3\log\left(F\right)^4+b^4d^4f^2x^4\log\left(F\right)^4-2b^3d^3e^2x\log\left(F\right)^3-6b^3d^3efx^2\log\left(F\right)^3-4b^3d^3f^2x^3\log\left(F\right)^3+2b^2d^2e^2\log\left(F\right)^2+12b^2d^2efx\,\mathrm{lo}\cdots\right.}{b^5d^5\log\left(F\right)^5} \\ \frac{e^2x^3}{3}+\frac{efx^4}{2}+\frac{f^2x^5}{5} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*x**2*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**4*d**4*e**2*x**2*log(F)**4 + 2*b**4*d**
4*e*f*x**3*log(F)**4 + b**4*d**4*f**2*x**4*log(F)**4 - 2*b**3*d**3*e**2*x*l
og(F)**3 - 6*b**3*d**3*e*f*x**2*log(F)**3 - 4*b**3*d**3*f**2*x**3*log(F)**3
 + 2*b**2*d**2*e**2*log(F)**2 + 12*b**2*d**2*e*f*x*log(F)**2 + 12*b**2*d**2
*f**2*x**2*log(F)**2 - 12*b*d*e*f*log(F) - 24*b*d*f**2*x*log(F) + 24*f**2)/
(b**5*d**5*log(F)**5), Ne(b**5*d**5*log(F)**5, 0)), (e**2*x**3/3 + e*f*x**4
/2 + f**2*x**5/5, True))
```

Giac [C] time = 2.00664, size = 9532, normalized size = 29.06

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] (((3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d
^3*log(abs(F))^3)*(pi^2*b^2*d^2*x^2*sgn(F) - pi^2*b^2*d^2*x^2 + 2*b^2*d^2*x
^2*log(abs(F))^2 - 4*b*d*x*log(abs(F)) + 4)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^
3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 +
 (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^
3*log(abs(F))^3)^2) - 2*(pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*s
gn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)*(pi*b^2*d^2*x^2*log(abs(
F))*sgn(F) - pi*b^2*d^2*x^2*log(abs(F)) - pi*b*d*x*sgn(F) + pi*b*d*x)/((pi^
3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*
b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*
d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1
/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a)
+ ((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3
+ 3*pi*b^3*d^3*log(abs(F))^2)*(pi^2*b^2*d^2*x^2*sgn(F) - pi^2*b^2*d^2*x^2 +
 2*b^2*d^2*x^2*log(abs(F))^2 - 4*b*d*x*log(abs(F)) + 4)/((pi^3*b^3*d^3*sgn(
F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(ab
s(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)
) + 2*b^3*d^3*log(abs(F))^3)^2) + 2*(3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*
pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)*(pi*b^2*d^2*x^2*log(abs
(F))*sgn(F) - pi*b^2*d^2*x^2*log(abs(F)) - pi*b*d*x*sgn(F) + pi*b*d*x)/((pi
^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi
*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*d*x*sgn(F) +
1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a)
)*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 2) + 1/2*I*((4*I
*pi^2*b^2*d^2*x^2*sgn(F) - 8*pi*b^2*d^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*b
^2*d^2*x^2 + 8*pi*b^2*d^2*x^2*log(abs(F)) + 8*I*b^2*d^2*x^2*log(abs(F))^2 +
 8*pi*b*d*x*sgn(F) - 8*pi*b*d*x - 16*I*b*d*x*log(abs(F)) + 16*I)*e^(1/2*I*p
i*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*
I*pi*a*sgn(F) - 1/2*I*pi*a)/(-4*I*pi^3*b^3*d^3*sgn(F) + 12*pi^2*b^3*d^3*log
(abs(F))*sgn(F) + 12*I*pi*b^3*d^3*log(abs(F))^2*sgn(F) + 4*I*pi^3*b^3*d^3 -
 12*pi^2*b^3*d^3*log(abs(F)) - 12*I*pi*b^3*d^3*log(abs(F))^2 + 8*b^3*d^3*lo
g(abs(F))^3) - (4*I*pi^2*b^2*d^2*x^2*sgn(F) + 8*pi*b^2*d^2*x^2*log(abs(F))*
sgn(F) - 4*I*pi^2*b^2*d^2*x^2 - 8*pi*b^2*d^2*x^2*log(abs(F)) + 8*I*b^2*d^2*
x^2*log(abs(F))^2 - 8*pi*b*d*x*sgn(F) + 8*pi*b*d*x - 16*I*b*d*x*log(abs(F))
 + 16*I)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) +
 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(4*I*pi^3*b^3*d^3*sgn(F) +
12*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*d^3*log(abs(F))^2*sgn(F) -
 4*I*pi^3*b^3*d^3 - 12*pi^2*b^3*d^3*log(abs(F)) + 12*I*pi*b^3*d^3*log(abs(F
))^2 + 8*b^3*d^3*log(abs(F))^3))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a
*log(abs(F)) + 2) - 2*(((3*pi^2*b^3*d^3*f*x^3*log(abs(F))*sgn(F) - 3*pi^2*b
^3*d^3*f*x^3*log(abs(F)) + 2*b^3*d^3*f*x^3*log(abs(F))^3 - 3*pi^2*b^2*d^2*f
*x^2*sgn(F) + 3*pi^2*b^2*d^2*f*x^2 - 6*b^2*d^2*f*x^2*log(abs(F))^2 + 12*b*d
*f*x*log(abs(F)) - 12*f)*(pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^
2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(
F))^4)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b
^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi
^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*
d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*d^3*f*x^3*sgn(
F) - 3*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*f*x^3 + 3*pi*b^
3*d^3*f*x^3*log(abs(F))^2 + 6*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 6*pi*b^
2*d^2*f*x^2*log(abs(F)) - 6*pi*b*d*f*x*sgn(F) + 6*pi*b*d*f*x)*(pi^3*b^4*d^4
*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(ab
s(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*lo
g(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^
4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(a
bs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2))*
cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c -
1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^3*b^3*d^3*f*x^3*sgn(F) - 3*pi*b^3*d^3*f*
```

```
x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*f*x^3 + 3*pi*b^3*d^3*f*x^3*log(abs(
F))^2 + 6*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*d^2*f*x^2*log(abs(
F)) - 6*pi*b*d*f*x*sgn(F) + 6*pi*b*d*f*x)*(pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4
*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2
*b^4*d^4*log(abs(F))^4)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^
2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(
F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*s
gn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2) + 4*(3*pi^2
*b^3*d^3*f*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*f*x^3*log(abs(F)) + 2*b^
3*d^3*f*x^3*log(abs(F))^3 - 3*pi^2*b^2*d^2*f*x^2*sgn(F) + 3*pi^2*b^2*d^2*f*
x^2 - 6*b^2*d^2*f*x^2*log(abs(F))^2 + 12*b*d*f*x*log(abs(F)) - 12*f)*(pi^3*
b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4
*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4
*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2
*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^
4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^
3)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi
*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F))
+ a*log(abs(F)) + 1) - 1/2*I*((16*pi^3*b^3*d^3*f*x^3*sgn(F) + 48*I*pi^2*b^3
*d^3*f*x^3*log(abs(F))*sgn(F) - 48*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) -
16*pi^3*b^3*d^3*f*x^3 - 48*I*pi^2*b^3*d^3*f*x^3*log(abs(F)) + 48*pi*b^3*d^3
*f*x^3*log(abs(F))^2 + 32*I*b^3*d^3*f*x^3*log(abs(F))^3 - 48*I*pi^2*b^2*d^2
*f*x^2*sgn(F) + 96*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) + 48*I*pi^2*b^2*d^2*
f*x^2 - 96*pi*b^2*d^2*f*x^2*log(abs(F)) - 96*I*b^2*d^2*f*x^2*log(abs(F))^2
- 96*pi*b*d*f*x*sgn(F) + 96*pi*b*d*f*x + 192*I*b*d*f*x*log(abs(F)) - 192*I*
f)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*
pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(8*pi^4*b^4*d^4*sgn(F) + 32*I*pi^3
*b^4*d^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - 32*I*p
i*b^4*d^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*d^4 - 32*I*pi^3*b^4*d^4*log(abs
(F)) + 48*pi^2*b^4*d^4*log(abs(F))^2 + 32*I*pi*b^4*d^4*log(abs(F))^3 - 16*b
^4*d^4*log(abs(F))^4) + (16*pi^3*b^3*d^3*f*x^3*sgn(F) - 48*I*pi^2*b^3*d^3*f
*x^3*log(abs(F))*sgn(F) - 48*pi*b^3*d^3*f*x^3*log(abs(F))^2*sgn(F) - 16*pi^
3*b^3*d^3*f*x^3 + 48*I*pi^2*b^3*d^3*f*x^3*log(abs(F)) + 48*pi*b^3*d^3*f*x^3
*log(abs(F))^2 - 32*I*b^3*d^3*f*x^3*log(abs(F))^3 + 48*I*pi^2*b^2*d^2*f*x^2
*sgn(F) + 96*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 48*I*pi^2*b^2*d^2*f*x^2
- 96*pi*b^2*d^2*f*x^2*log(abs(F)) + 96*I*b^2*d^2*f*x^2*log(abs(F))^2 - 96*p
i*b*d*f*x*sgn(F) + 96*pi*b*d*f*x - 192*I*b*d*f*x*log(abs(F)) + 192*I*f)*e^(
-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*
c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(8*pi^4*b^4*d^4*sgn(F) - 32*I*pi^3*b^4*
d^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) + 32*I*pi*b^4
*d^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*d^4 + 32*I*pi^3*b^4*d^4*log(abs(F))
+ 48*pi^2*b^4*d^4*log(abs(F))^2 - 32*I*pi*b^4*d^4*log(abs(F))^3 - 16*b^4*d^
4*log(abs(F))^4))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) +
1) - ((4*(pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - pi*b^4*d^4*f^2*x^4*log(
abs(F))^3*sgn(F) - pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + pi*b^4*d^4*f^2*x^4*lo
g(abs(F))^3 - pi^3*b^3*d^3*f^2*x^3*sgn(F) + 3*pi*b^3*d^3*f^2*x^3*log(abs(F)
)^2*sgn(F) + pi^3*b^3*d^3*f^2*x^3 - 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 6*
pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 6*pi*b^2*d^2*f^2*x^2*log(abs(F)) +
6*pi*b*d*f^2*x*sgn(F) - 6*pi*b*d*f^2*x)*(pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*
d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5
 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)/((pi^5*b^5*d
^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))
^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log
(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(ab
s(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3
 - 2*b^5*d^5*log(abs(F))^5)^2) - (pi^4*b^4*d^4*f^2*x^4*sgn(F) - 6*pi^2*b^4*
d^4*f^2*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4*f^2*x^4 + 6*pi^2*b^4*d^4*f^
2*x^4*log(abs(F))^2 - 2*b^4*d^4*f^2*x^4*log(abs(F))^4 + 12*pi^2*b^3*d^3*f^2
*x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 8*b^3*d^3*f
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^2*x^3*log(abs(F))^3 - 12*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 12*pi^2*b^2*d^2*f^2
*x^2 - 24*b^2*d^2*f^2*x^2*log(abs(F))^2 + 48*b*d*f^2*x*log(abs(F)) - 48*f^2
)*(5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F)
 - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*l
og(abs(F))^5)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F)
+ 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(ab
s(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F
) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*
pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*d*x
*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) +
 1/2*pi*a) - ((pi^4*b^4*d^4*f^2*x^4*sgn(F) - 6*pi^2*b^4*d^4*f^2*x^4*log(abs
(F))^2*sgn(F) - pi^4*b^4*d^4*f^2*x^4 + 6*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2
 - 2*b^4*d^4*f^2*x^4*log(abs(F))^4 + 12*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sg
n(F) - 12*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 8*b^3*d^3*f^2*x^3*log(abs(F))^
3 - 12*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 12*pi^2*b^2*d^2*f^2*x^2 - 24*b^2*d^2*f
^2*x^2*log(abs(F))^2 + 48*b*d*f^2*x*log(abs(F)) - 48*f^2)*(pi^5*b^5*d^5*sgn
(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn
(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F
))^4)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b
^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2
- 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*p
i^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5
*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2) + 4*(pi^3*b^4*d^4*f^2*x^4*
log(abs(F))*sgn(F) - pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4
*f^2*x^4*log(abs(F)) + pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - pi^3*b^3*d^3*f^2*
x^3*sgn(F) + 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) + pi^3*b^3*d^3*f^2*x
^3 - 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*
sgn(F) + 6*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 6*pi*b*d*f^2*x*sgn(F) - 6*pi*b*
d*f^2*x)*(5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3
*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^
5*d^5*log(abs(F))^5)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*
sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5
*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F)
)*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)
) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2))*sin(-1/2*p
i*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*s
gn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)))
+ 1/2*I*((-16*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 64*pi^3*b^4*d^4*f^2*x^4*log(a
bs(F))*sgn(F) + 96*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - 64*pi*b^4*
d^4*f^2*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4*d^4*f^2*x^4 - 64*pi^3*b^4*
d^4*f^2*x^4*log(abs(F)) - 96*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 + 64*pi*b
^4*d^4*f^2*x^4*log(abs(F))^3 + 32*I*b^4*d^4*f^2*x^4*log(abs(F))^4 - 64*pi^3
*b^3*d^3*f^2*x^3*sgn(F) - 192*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 1
92*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) + 64*pi^3*b^3*d^3*f^2*x^3 + 192*
I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 192*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 -
 128*I*b^3*d^3*f^2*x^3*log(abs(F))^3 + 192*I*pi^2*b^2*d^2*f^2*x^2*sgn(F) -
384*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 192*I*pi^2*b^2*d^2*f^2*x^2 + 38
4*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 384*I*b^2*d^2*f^2*x^2*log(abs(F))^2 + 38
4*pi*b*d*f^2*x*sgn(F) - 384*pi*b*d*f^2*x - 768*I*b*d*f^2*x*log(abs(F)) + 76
8*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) -
1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(16*I*pi^5*b^5*d^5*sgn(F) -
80*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 160*I*pi^3*b^5*d^5*log(abs(F))^2*sgn(F
) + 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) + 80*I*pi*b^5*d^5*log(abs(F))^4*s
gn(F) - 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*log(abs(F)) + 160*I*pi^3*b^5*d^
5*log(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))^3 - 80*I*pi*b^5*d^5*log(abs(
F))^4 + 32*b^5*d^5*log(abs(F))^5) - (-16*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) - 64
*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) + 96*I*pi^2*b^4*d^4*f^2*x^4*log(ab
s(F))^2*sgn(F) + 64*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) + 16*I*pi^4*b^4
*d^4*f^2*x^4 + 64*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) - 96*I*pi^2*b^4*d^4*f^2*
```

```
x^4*log(abs(F))^2 - 64*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 32*I*b^4*d^4*f^2*
x^4*log(abs(F))^4 + 64*pi^3*b^3*d^3*f^2*x^3*sgn(F) - 192*I*pi^2*b^3*d^3*f^2
*x^3*log(abs(F))*sgn(F) - 192*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - 64*
pi^3*b^3*d^3*f^2*x^3 + 192*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 192*pi*b^3*
d^3*f^2*x^3*log(abs(F))^2 - 128*I*b^3*d^3*f^2*x^3*log(abs(F))^3 + 192*I*pi^
2*b^2*d^2*f^2*x^2*sgn(F) + 384*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 192*
I*pi^2*b^2*d^2*f^2*x^2 - 384*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 384*I*b^2*d^2
*f^2*x^2*log(abs(F))^2 - 384*pi*b*d*f^2*x*sgn(F) + 384*pi*b*d*f^2*x - 768*I
*b*d*f^2*x*log(abs(F)) + 768*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*
d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/
(-16*I*pi^5*b^5*d^5*sgn(F) - 80*pi^4*b^5*d^5*log(abs(F))*sgn(F) + 160*I*pi^
3*b^5*d^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 80
*I*pi*b^5*d^5*log(abs(F))^4*sgn(F) + 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*lo
g(abs(F)) - 160*I*pi^3*b^5*d^5*log(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))
^3 + 80*I*pi*b^5*d^5*log(abs(F))^4 + 32*b^5*d^5*log(abs(F))^5))*e^(b*d*x*lo
g(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)))
```

3.67 $\int F^{a+b(c+dx)}x(e+fx)^2\,dx$

Optimal. Leaf size=242

$$-\frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{4efxF^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{3f^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{6f^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{e^2xF^{a+bc+bdx}}{bd\log(F)}+$$

```
[Out] (-6*f^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) + (4*e*f*F^(a + b*c + b*d*x
))/(b^3*d^3*Log[F]^3) + (6*f^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) -
(e^2*F^(a + b*c + b*d*x))/(b^2*d^2*Log[F]^2) - (4*e*f*F^(a + b*c + b*d*x)*x
)/(b^2*d^2*Log[F]^2) - (3*f^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) +
 (e^2*F^(a + b*c + b*d*x)*x)/(b*d*Log[F]) + (2*e*f*F^(a + b*c + b*d*x)*x^2)
/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F])
```

Rubi [A] time = 0.355587, antiderivative size = 242, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 3, integrand size = 20, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.15, Rules used = {2196, 2176, 2194}

$$-\frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{4efxF^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{3f^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{6f^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{e^2xF^{a+bc+bdx}}{bd\log(F)}+$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*(c + d*x))*x*(e + f*x)^2,x]
```

```
[Out] (-6*f^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) + (4*e*f*F^(a + b*c + b*d*x
))/(b^3*d^3*Log[F]^3) + (6*f^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) -
(e^2*F^(a + b*c + b*d*x))/(b^2*d^2*Log[F]^2) - (4*e*f*F^(a + b*c + b*d*x)*x
)/(b^2*d^2*Log[F]^2) - (3*f^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) +
 (e^2*F^(a + b*c + b*d*x)*x)/(b*d*Log[F]) + (2*e*f*F^(a + b*c + b*d*x)*x^2)
/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F])
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx = \int \left(e^2F^{a+bc+bdx}x + 2efF^{a+bc+bdx}x^2 + f^2F^{a+bc+bdx}x^3\right)dx$$
$$= e^2\int F^{a+bc+bdx}x\,dx + (2ef)\int F^{a+bc+bdx}x^2\,dx + f^2\int F^{a+bc+bdx}x^3\,dx$$
$$= \frac{e^2F^{a+bc+bdx}x}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^2}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^3}{bd\log(F)} - \frac{e^2\int F^{a+bc+bdx}\,dx}{bd\log(F)} - \frac{(4ef)\int F^{a+bc+bdx}x\,dx}{bd\log(F)}$$
$$= -\frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{3f^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^2}{bd\log(F)} + \frac{f^2F^{a+}}{bd\,l}$$
$$= \frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{6f^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} - \frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{3f^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+}}{bd\log}$$
$$= -\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} + \frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{6f^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} - \frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{3f^2F^{a+bc}}{b^2d^2\log}$$

Mathematica [A] time = 0.149704, size = 91, normalized size = 0.38

$$\frac{F^{a+b(c+dx)}\left(-b^2d^2\log^2(F)\left(e^2+4efx+3f^2x^2\right)+b^3d^3x\log^3(F)(e+fx)^2+2bdf\log(F)(2e+3fx)-6f^2\right)}{b^4d^4\log^4(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*(c + d*x))*x*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(-6*f^2 + 2*b*d*f*(2*e + 3*f*x)*Log[F] - b^2*d^2*(e^2
+ 4*e*f*x + 3*f^2*x^2)*Log[F]^2 + b^3*d^3*x*(e + f*x)^2*Log[F]^3))/(b^4*d^4
*Log[F]^4)
```

Maple [A] time = 0.007, size = 144, normalized size = 0.6

$$\frac{\left((\ln(F))^3b^3d^3f^2x^3+2(\ln(F))^3b^3d^3efx^2+(\ln(F))^3b^3d^3e^2x-3(\ln(F))^2b^2d^2f^2x^2-4(\ln(F))^2b^2d^2efx-(\ln(F))^2b^2d^2\right.}{(\ln(F))^4b^4d^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*x*(f*x+e)^2,x)
```

```
[Out] (ln(F)^3*b^3*d^3*f^2*x^3+2*ln(F)^3*b^3*d^3*e*f*x^2+ln(F)^3*b^3*d^3*e^2*x-3*
ln(F)^2*b^2*d^2*f^2*x^2-4*ln(F)^2*b^2*d^2*e*f*x-ln(F)^2*b^2*d^2*e^2+6*ln(F)
*b*d*f^2*x+4*f*e*ln(F)*b*d-6*f^2)*F^(b*d*x+b*c+a)/ln(F)^4/b^4/d^4
```

Maxima [A] time = 1.0494, size = 265, normalized size = 1.1

$$\frac{\left(F^{bc+a}bdx\log(F)-F^{bc+a}\right)F^{bdx}e^2}{b^2d^2\log(F)^2}+\frac{2\left(F^{bc+a}b^2d^2x^2\log(F)^2-2F^{bc+a}bdx\log(F)+2F^{bc+a}\right)F^{bdx}ef}{b^3d^3\log(F)^3}+\frac{\left(F^{bc+a}b^3d^3x^3\log(F)^3\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b*d*x*log(F) - F^(b*c + a))*F^(b*d*x)*e^2/(b^2*d^2*log(F)^2) +
 2*(F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*
c + a))*F^(b*d*x)*e*f/(b^3*d^3*log(F)^3) + (F^(b*c + a)*b^3*d^3*x^3*log(F)^
3 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*F^(b*c + a)*b*d*x*log(F) - 6*F^(
b*c + a))*F^(b*d*x)*f^2/(b^4*d^4*log(F)^4)
```

Fricas [A] time = 1.57332, size = 288, normalized size = 1.19

$$\frac{\left(\left(b^3d^3f^2x^3+2\,b^3d^3efx^2+b^3d^3e^2x\right)\log\left(F\right)^3-\left(3\,b^2d^2f^2x^2+4\,b^2d^2efx+b^2d^2e^2\right)\log\left(F\right)^2-6\,f^2+2\left(3\,bdf^2x+2\,bde\right.\right.}{b^4d^4\log\left(F\right)^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^3*d^3*f^2*x^3 + 2*b^3*d^3*e*f*x^2 + b^3*d^3*e^2*x)*log(F)^3 - (3*b^2*d^
2*f^2*x^2 + 4*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 - 6*f^2 + 2*(3*b*d*f^2*
x + 2*b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^4*d^4*log(F)^4)
```

Sympy [A] time = 0.175929, size = 199, normalized size = 0.82

$$\begin{cases} \frac{F^{a+b(c+dx)}\left(b^3d^3e^2x\log(F)^3+2b^3d^3efx^2\log(F)^3+b^3d^3f^2x^3\log(F)^3-b^2d^2e^2\log(F)^2-4b^2d^2efx\log(F)^2-3b^2d^2f^2x^2\log(F)^2+4bdef\log(F)+6bdf^2x\log(F)-\right.}{b^4d^4\log(F)^4} \\ \frac{e^2x^2}{2}+\frac{2efx^3}{3}+\frac{f^2x^4}{4} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*x*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**3*d**3*e**2*x*log(F)**3 + 2*b**3*d**3*e
*f*x**2*log(F)**3 + b**3*d**3*f**2*x**3*log(F)**3 - b**2*d**2*e**2*log(F)**
2 - 4*b**2*d**2*e*f*x*log(F)**2 - 3*b**2*d**2*f**2*x**2*log(F)**2 + 4*b*d*e
*f*log(F) + 6*b*d*f**2*x*log(F) - 6*f**2)/(b**4*d**4*log(F)**4), Ne(b**4*d*
*4*log(F)**4, 0)), (e**2*x**2/2 + 2*e*f*x**3/3 + f**2*x**4/4, True))
```

Giac [C] time = 1.48567, size = 6340, normalized size = 26.2

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] (2*((pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F)))*(pi*b*d*x*sgn(
F) - pi*b*d*x)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))
^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F)))^2) + (pi
^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))^2)*(b*d*x*log(abs(
F)) - 1)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))^2)^2
+ 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F)))^2))*cos(-1/2*p
i*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*s
gn(F) + 1/2*pi*a) + ((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(ab
```

```
s(F))^2)*(pi*b*d*x*sgn(F) - pi*b*d*x)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2
+ 2*b^2*d^2*log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^
2*log(abs(F)))^2) - 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F
)))*(b*d*x*log(abs(F)) - 1)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^
2*log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(
F)))^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*
pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)
) + a*log(abs(F)) + 2) - 1/2*I*((2*pi*b*d*x*sgn(F) - 2*pi*b*d*x - 4*I*b*d*x
*log(abs(F)) + 4*I)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*
c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(2*pi^2*b^2*d^2*s
gn(F) + 4*I*pi*b^2*d^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*d^2 - 4*I*pi*b^2*d^2
*log(abs(F)) + 4*b^2*d^2*log(abs(F))^2) + (2*pi*b*d*x*sgn(F) - 2*pi*b*d*x +
 4*I*b*d*x*log(abs(F)) - 4*I)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x -
1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(2*pi^
2*b^2*d^2*sgn(F) - 4*I*pi*b^2*d^2*log(abs(F))*sgn(F) - 2*pi^2*b^2*d^2 + 4*I
*pi*b^2*d^2*log(abs(F)) + 4*b^2*d^2*log(abs(F))^2))*e^(b*d*x*log(abs(F)) +
b*c*log(abs(F)) + a*log(abs(F)) + 2) + 2*(((pi^2*b^2*d^2*f*x^2*sgn(F) - pi^
2*b^2*d^2*f*x^2 + 2*b^2*d^2*f*x^2*log(abs(F))^2 - 4*b*d*f*x*log(abs(F)) + 4
*f)*(3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3
*d^3*log(abs(F))^3)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(
F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs
(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2) - 2*
(pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3
*pi*b^3*d^3*log(abs(F))^2)*(pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - pi*b^2*d^
2*f*x^2*log(abs(F)) - pi*b*d*f*x*sgn(F) + pi*b*d*f*x)/((pi^3*b^3*d^3*sgn(F)
 - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(
F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F))
+ 2*b^3*d^3*log(abs(F))^3)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/
2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) + ((pi^3*b^3*d^3
*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*l
og(abs(F))^2)*(pi^2*b^2*d^2*f*x^2*sgn(F) - pi^2*b^2*d^2*f*x^2 + 2*b^2*d^2*f
*x^2*log(abs(F))^2 - 4*b*d*f*x*log(abs(F)) + 4*f)/((pi^3*b^3*d^3*sgn(F) - 3
*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^
2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*
b^3*d^3*log(abs(F))^3)^2) + 2*(3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b
^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)*(pi*b^2*d^2*f*x^2*log(abs(F))
*sgn(F) - pi*b^2*d^2*f*x^2*log(abs(F)) - pi*b*d*f*x*sgn(F) + pi*b*d*f*x)/((
pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*
pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b
^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*d*x*sgn(F)
+ 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*
a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 1) + 1/2*I*((8
*I*pi^2*b^2*d^2*f*x^2*sgn(F) - 16*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 8*I
*pi^2*b^2*d^2*f*x^2 + 16*pi*b^2*d^2*f*x^2*log(abs(F)) + 16*I*b^2*d^2*f*x^2*
log(abs(F))^2 + 16*pi*b*d*f*x*sgn(F) - 16*pi*b*d*f*x - 32*I*b*d*f*x*log(abs
(F)) + 32*I*f)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn
(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(-4*I*pi^3*b^3*d^3*sgn
(F) + 12*pi^2*b^3*d^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*d^3*log(abs(F))^2*sg
n(F) + 4*I*pi^3*b^3*d^3 - 12*pi^2*b^3*d^3*log(abs(F)) - 12*I*pi*b^3*d^3*log
(abs(F))^2 + 8*b^3*d^3*log(abs(F))^3) - (8*I*pi^2*b^2*d^2*f*x^2*sgn(F) + 16
*pi*b^2*d^2*f*x^2*log(abs(F))*sgn(F) - 8*I*pi^2*b^2*d^2*f*x^2 - 16*pi*b^2*d
^2*f*x^2*log(abs(F)) + 16*I*b^2*d^2*f*x^2*log(abs(F))^2 - 16*pi*b*d*f*x*sgn
(F) + 16*pi*b*d*f*x - 32*I*b*d*f*x*log(abs(F)) + 32*I*f)*e^(-1/2*I*pi*b*d*x
*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*
sgn(F) + 1/2*I*pi*a)/(4*I*pi^3*b^3*d^3*sgn(F) + 12*pi^2*b^3*d^3*log(abs(F))
*sgn(F) - 12*I*pi*b^3*d^3*log(abs(F))^2*sgn(F) - 4*I*pi^3*b^3*d^3 - 12*pi^2
*b^3*d^3*log(abs(F)) + 12*I*pi*b^3*d^3*log(abs(F))^2 + 8*b^3*d^3*log(abs(F)
)^3))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 1) - (((3*pi
^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*f^2*x^3*log(abs(F))
```

```
+ 2*b^3*d^3*f^2*x^3*log(abs(F))^3 - 3*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 3*pi^2*
b^2*d^2*f^2*x^2 - 6*b^2*d^2*f^2*x^2*log(abs(F))^2 + 12*b*d*f^2*x*log(abs(F)
) - 12*f^2)*(pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi
^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)/((pi^4
*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi
^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*lo
g(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F
)) + pi*b^4*d^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*d^3*f^2*x^3*sgn(F) - 3*pi*b
^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*f^2*x^3 + 3*pi*b^3*d^3*f
^2*x^3*log(abs(F))^2 + 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*d
^2*f^2*x^2*log(abs(F)) - 6*pi*b*d*f^2*x*sgn(F) + 6*pi*b*d*f^2*x)*(pi^3*b^4*
d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log
(abs(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4
*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4
*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*lo
g(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2
))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c
 - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^3*b^3*d^3*f^2*x^3*sgn(F) - 3*pi*b^3*d
^3*f^2*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*f^2*x^3 + 3*pi*b^3*d^3*f^2*x
^3*log(abs(F))^2 + 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*d^2*f
^2*x^2*log(abs(F)) - 6*pi*b*d*f^2*x*sgn(F) + 6*pi*b*d*f^2*x)*(pi^4*b^4*d^4*
sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^
4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b
^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 -
 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*
d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F)
)^3)^2) + 4*(3*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*f^2
*x^3*log(abs(F)) + 2*b^3*d^3*f^2*x^3*log(abs(F))^3 - 3*pi^2*b^2*d^2*f^2*x^2
*sgn(F) + 3*pi^2*b^2*d^2*f^2*x^2 - 6*b^2*d^2*f^2*x^2*log(abs(F))^2 + 12*b*d
*f^2*x*log(abs(F)) - 12*f^2)*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*
log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)
/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4
 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4
*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*lo
g(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi
*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b
*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F))) - 1/2*I*((8*pi^3*b^3*d^
3*f^2*x^3*sgn(F) + 24*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 24*pi*b^3
*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*d^3*f^2*x^3 - 24*I*pi^2*b^3*
d^3*f^2*x^3*log(abs(F)) + 24*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 16*I*b^3*d^
3*f^2*x^3*log(abs(F))^3 - 24*I*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 48*pi*b^2*d^2*
f^2*x^2*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*d^2*f^2*x^2 - 48*pi*b^2*d^2*f^2*
x^2*log(abs(F)) - 48*I*b^2*d^2*f^2*x^2*log(abs(F))^2 - 48*pi*b*d*f^2*x*sgn(
F) + 48*pi*b*d*f^2*x + 96*I*b*d*f^2*x*log(abs(F)) - 96*I*f^2)*e^(1/2*I*pi*b
*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*p
i*a*sgn(F) - 1/2*I*pi*a)/(8*pi^4*b^4*d^4*sgn(F) + 32*I*pi^3*b^4*d^4*log(abs
(F))*sgn(F) - 48*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - 32*I*pi*b^4*d^4*log(ab
s(F))^3*sgn(F) - 8*pi^4*b^4*d^4 - 32*I*pi^3*b^4*d^4*log(abs(F)) + 48*pi^2*b
^4*d^4*log(abs(F))^2 + 32*I*pi*b^4*d^4*log(abs(F))^3 - 16*b^4*d^4*log(abs(F
))^4) + (8*pi^3*b^3*d^3*f^2*x^3*sgn(F) - 24*I*pi^2*b^3*d^3*f^2*x^3*log(abs(
F))*sgn(F) - 24*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - 8*pi^3*b^3*d^3*f^
2*x^3 + 24*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 24*pi*b^3*d^3*f^2*x^3*log(a
bs(F))^2 - 16*I*b^3*d^3*f^2*x^3*log(abs(F))^3 + 24*I*pi^2*b^2*d^2*f^2*x^2*s
gn(F) + 48*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 24*I*pi^2*b^2*d^2*f^2*x^
2 - 48*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 48*I*b^2*d^2*f^2*x^2*log(abs(F))^2
- 48*pi*b*d*f^2*x*sgn(F) + 48*pi*b*d*f^2*x - 96*I*b*d*f^2*x*log(abs(F)) + 9
6*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) +
 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(8*pi^4*b^4*d^4*sgn(F) - 32
*I*pi^3*b^4*d^4*log(abs(F))*sgn(F) - 48*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) +
```

```
 32*I*pi*b^4*d^4*log(abs(F))^3*sgn(F) - 8*pi^4*b^4*d^4 + 32*I*pi^3*b^4*d^4*
log(abs(F)) + 48*pi^2*b^4*d^4*log(abs(F))^2 - 32*I*pi*b^4*d^4*log(abs(F))^3
 - 16*b^4*d^4*log(abs(F))^4))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*lo
g(abs(F)))
```

3.68 $\int F^{a+b(c+dx)}(e+fx)^2\,dx$

Optimal. Leaf size=85

$$-\frac{2f(e+fx)F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{(e+fx)^2F^{a+bc+bdx}}{bd\log(F)}$$

```
[Out] (2*f^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) - (2*f*F^(a + b*c + b*d*x)*(
e + f*x))/(b^2*d^2*Log[F]^2) + (F^(a + b*c + b*d*x)*(e + f*x)^2)/(b*d*Log[F
])
```

Rubi [A] time = 0.120364, antiderivative size = 85, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2187, 2176, 2194}

$$-\frac{2f(e+fx)F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{(e+fx)^2F^{a+bc+bdx}}{bd\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(a + b*(c + d*x))*(e + f*x)^2,x]
```

```
[Out] (2*f^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) - (2*f*F^(a + b*c + b*d*x)*(
e + f*x))/(b^2*d^2*Log[F]^2) + (F^(a + b*c + b*d*x)*(e + f*x)^2)/(b*d*Log[F
])
```

Rule 2187

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] &&  !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx = \int F^{a+bc+bdx}(e+fx)^2\,dx$$
$$= \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)} - \frac{(2f)\int F^{a+bc+bdx}(e+fx)\,dx}{bd\log(F)}$$
$$= -\frac{2fF^{a+bc+bdx}(e+fx)}{b^2d^2\log^2(F)} + \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)} + \frac{\left(2f^2\right)\int F^{a+bc+bdx}\,dx}{b^2d^2\log^2(F)}$$
$$= \frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} - \frac{2fF^{a+bc+bdx}(e+fx)}{b^2d^2\log^2(F)} + \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)}$$

Mathematica [A] time = 0.0689011, size = 58, normalized size = 0.68

$$\frac{F^{a+b(c+dx)}\left(b^2d^2\log^2(F)(e+fx)^2 - 2bdf\log(F)(e+fx) + 2f^2\right)}{b^3d^3\log^3(F)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(a + b*(c + d*x))*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(2*f^2 - 2*b*d*f*(e + f*x)*Log[F] + b^2*d^2*(e + f*x)^
2*Log[F]^2))/(b^3*d^3*Log[F]^3)
```

Maple [A] time = 0.007, size = 93, normalized size = 1.1

$$\frac{\left((\ln(F))^2 b^2d^2f^2x^2 + 2\,(\ln(F))^2 b^2d^2efx + (\ln(F))^2 b^2d^2e^2 - 2\,\ln(F)\,bdf^2x - 2\,fe\ln(F)\,bd + 2\,f^2\right)F^{bdx+bc+a}}{(\ln(F))^3\,b^3d^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2,x)
```

```
[Out] (ln(F)^2*b^2*d^2*f^2*x^2+2*ln(F)^2*b^2*d^2*e*f*x+ln(F)^2*b^2*d^2*e^2-2*ln(F
)*b*d*f^2*x-2*f*e*ln(F)*b*d+2*f^2)*F^(b*d*x+b*c+a)/b^3/d^3/ln(F)^3
```

Maxima [A] time = 1.02178, size = 181, normalized size = 2.13

$$\frac{F^{bdx+bc+a}e^2}{bd\log(F)} + \frac{2\left(F^{bc+a}bdx\log(F) - F^{bc+a}\right)F^{bdx}ef}{b^2d^2\log(F)^2} + \frac{\left(F^{bc+a}b^2d^2x^2\log(F)^2 - 2\,F^{bc+a}bdx\log(F) + 2\,F^{bc+a}\right)F^{bdx}f^2}{b^3d^3\log(F)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] F^(b*d*x + b*c + a)*e^2/(b*d*log(F)) + 2*(F^(b*c + a)*b*d*x*log(F) - F^(b*c
 + a))*F^(b*d*x)*e*f/(b^2*d^2*log(F)^2) + (F^(b*c + a)*b^2*d^2*x^2*log(F)^2
 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*c + a))*F^(b*d*x)*f^2/(b^3*d^3*log(F
)^3)
```

Fricas [A] time = 1.48697, size = 192, normalized size = 2.26

$$\frac{\left(\left(b^2d^2f^2x^2+2\,b^2d^2efx+b^2d^2e^2\right)\log\left(F\right)^2+2\,f^2-2\,\left(bdf^2x+bdef\right)\log\left(F\right)\right)F^{bdx+bc+a}}{b^3d^3\log\left(F\right)^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^2*d^2*f^2*x^2 + 2*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 + 2*f^2 - 2*(b*
d*f^2*x + b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^3*d^3*log(F)^3)
```

Sympy [A] time = 0.155241, size = 134, normalized size = 1.58

$$\begin{cases}\frac{F^{a+b(c+dx)}\left(b^2d^2e^2\log\left(F\right)^2+2b^2d^2efx\log\left(F\right)^2+b^2d^2f^2x^2\log\left(F\right)^2-2bdef\log\left(F\right)-2bdf^2x\log\left(F\right)+2f^2\right)}{b^3d^3\log\left(F\right)^3} & \text{for } b^3d^3\log\left(F\right)^3\neq 0\\ e^2x+efx^2+\frac{f^2x^3}{3} & \text{otherwise}\end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**2*d**2*e**2*log(F)**2 + 2*b**2*d**2*e*f
*x*log(F)**2 + b**2*d**2*f**2*x**2*log(F)**2 - 2*b*d*e*f*log(F) - 2*b*d*f**
2*x*log(F) + 2*f**2)/(b**3*d**3*log(F)**3), Ne(b**3*d**3*log(F)**3, 0)), (e
**2*x + e*f*x**2 + f**2*x**3/3, True))
```

Giac [C] time = 1.38049, size = 3708, normalized size = 43.62

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] 2*(2*b*d*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*
pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a)*log(abs(F))/(4*b^2*d^2*log(abs(F))^2 +
 (pi*b*d*sgn(F) - pi*b*d)^2) - (pi*b*d*sgn(F) - pi*b*d)*sin(-1/2*pi*b*d*x*s
gn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1
/2*pi*a)/(4*b^2*d^2*log(abs(F))^2 + (pi*b*d*sgn(F) - pi*b*d)^2))*e^(b*d*x*l
og(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 2) - 1/2*I*(-2*I*e^(1/2*I*pi
*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I
*pi*a*sgn(F) - 1/2*I*pi*a)/(I*pi*b*d*sgn(F) - I*pi*b*d + 2*b*d*log(abs(F)))
 + 2*I*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1
/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(-I*pi*b*d*sgn(F) + I*pi*b*d
+ 2*b*d*log(abs(F))))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)
) + 2) + 2*(2*((pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F)))*(pi
*b*d*f*x*sgn(F) - pi*b*d*f*x)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*
d^2*log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(ab
s(F)))^2) + (pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))^2)*
(b*d*f*x*log(abs(F)) - f)/((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*
log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F) - pi*b^2*d^2*log(abs(F)
))^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi
```

```
*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) + ((pi^2*b^2*d^2*sgn(F) - pi^2*b^2*d^2 +
 2*b^2*d^2*log(abs(F))^2)*(pi*b*d*f*x*sgn(F) - pi*b*d*f*x)/((pi^2*b^2*d^2*s
gn(F) - pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F
))*sgn(F) - pi*b^2*d^2*log(abs(F)))^2) - 4*(pi*b^2*d^2*log(abs(F))*sgn(F) -
 pi*b^2*d^2*log(abs(F)))*(b*d*f*x*log(abs(F)) - f)/((pi^2*b^2*d^2*sgn(F) -
pi^2*b^2*d^2 + 2*b^2*d^2*log(abs(F))^2)^2 + 4*(pi*b^2*d^2*log(abs(F))*sgn(F
) - pi*b^2*d^2*log(abs(F)))^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1
/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(a
bs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 1) - 1/2*I*((4*pi*b*d*f*x*sgn(F)
 - 4*pi*b*d*f*x - 8*I*b*d*f*x*log(abs(F)) + 8*I*f)*e^(1/2*I*pi*b*d*x*sgn(F)
 - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F)
- 1/2*I*pi*a)/(2*pi^2*b^2*d^2*sgn(F) + 4*I*pi*b^2*d^2*log(abs(F))*sgn(F) -
2*pi^2*b^2*d^2 - 4*I*pi*b^2*d^2*log(abs(F)) + 4*b^2*d^2*log(abs(F))^2) + (4
*pi*b*d*f*x*sgn(F) - 4*pi*b*d*f*x + 8*I*b*d*f*x*log(abs(F)) - 8*I*f)*e^(-1/
2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c -
 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(2*pi^2*b^2*d^2*sgn(F) - 4*I*pi*b^2*d^2*lo
g(abs(F))*sgn(F) - 2*pi^2*b^2*d^2 + 4*I*pi*b^2*d^2*log(abs(F)) + 4*b^2*d^2*
log(abs(F))^2))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)) + 1)
 - ((2*(pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - pi*b^2*d^2*f^2*x^2*log(abs(
F)) - pi*b*d*f^2*x*sgn(F) + pi*b*d*f^2*x)*(pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d
^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)/((pi^3
*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b
^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d
^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2) - (pi^2*b^2*d^2*f^2*x^2*sgn(F)
 - pi^2*b^2*d^2*f^2*x^2 + 2*b^2*d^2*f^2*x^2*log(abs(F))^2 - 4*b*d*f^2*x*log
(abs(F)) + 4*f^2)*(3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(a
bs(F)) + 2*b^3*d^3*log(abs(F))^3)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(
abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b
^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(
F))^3)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/
2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^2*b^2*d^2*f^2*x^2*sgn(F) - pi
^2*b^2*d^2*f^2*x^2 + 2*b^2*d^2*f^2*x^2*log(abs(F))^2 - 4*b*d*f^2*x*log(abs(
F)) + 4*f^2)*(pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^
3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^
3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*
pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*lo
g(abs(F))^3)^2) + 2*(pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - pi*b^2*d^2*f^2
*x^2*log(abs(F)) - pi*b*d*f^2*x*sgn(F) + pi*b*d*f^2*x)*(3*pi^2*b^3*d^3*log(
abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)/((pi
^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi
*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3
*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2))*sin(-1/2*pi*b*d*x*sgn(F) +
1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a)
)*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F))) + 1/2*I*((4*I*pi^
2*b^2*d^2*f^2*x^2*sgn(F) - 8*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 4*I*pi
^2*b^2*d^2*f^2*x^2 + 8*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 8*I*b^2*d^2*f^2*x^2
*log(abs(F))^2 + 8*pi*b*d*f^2*x*sgn(F) - 8*pi*b*d*f^2*x - 16*I*b*d*f^2*x*lo
g(abs(F)) + 16*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*
b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(-4*I*pi^3*b^3*
d^3*sgn(F) + 12*pi^2*b^3*d^3*log(abs(F))*sgn(F) + 12*I*pi*b^3*d^3*log(abs(F
))^2*sgn(F) + 4*I*pi^3*b^3*d^3 - 12*pi^2*b^3*d^3*log(abs(F)) - 12*I*pi*b^3*
d^3*log(abs(F))^2 + 8*b^3*d^3*log(abs(F))^3) - (4*I*pi^2*b^2*d^2*f^2*x^2*sg
n(F) + 8*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*d^2*f^2*x^2 -
 8*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 8*I*b^2*d^2*f^2*x^2*log(abs(F))^2 - 8*p
i*b*d*f^2*x*sgn(F) + 8*pi*b*d*f^2*x - 16*I*b*d*f^2*x*log(abs(F)) + 16*I*f^2
)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*
pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(4*I*pi^3*b^3*d^3*sgn(F) + 12*pi^2
*b^3*d^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*d^3*log(abs(F))^2*sgn(F) - 4*I*pi
^3*b^3*d^3 - 12*pi^2*b^3*d^3*log(abs(F)) + 12*I*pi*b^3*d^3*log(abs(F))^2 +
```

```
8*b^3*d^3*log(abs(F))^3))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(ab
s(F)))
```

3.69 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx$

Optimal. Leaf size=96

$$-\frac{f^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+e^2F^{a+bc}\mathrm{Ei}(bdx\log(F))+\frac{2efF^{a+bc+bdx}}{bd\log(F)}+\frac{f^2xF^{a+bc+bdx}}{bd\log(F)}$$

```
[Out] e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (f^2*F^(a + b*c + b*d*x))/(b^
2*d^2*Log[F]^2) + (2*e*f*F^(a + b*c + b*d*x))/(b*d*Log[F]) + (f^2*F^(a + b*
c + b*d*x)*x)/(b*d*Log[F])
```

Rubi [A] time = 0.257749, antiderivative size = 96, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 4, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.182, Rules used = {2199, 2194, 2178, 2176}

$$-\frac{f^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+e^2F^{a+bc}\mathrm{Ei}(bdx\log(F))+\frac{2efF^{a+bc+bdx}}{bd\log(F)}+\frac{f^2xF^{a+bc+bdx}}{bd\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x,x]
```

```
[Out] e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (f^2*F^(a + b*c + b*d*x))/(b^
2*d^2*Log[F]^2) + (2*e*f*F^(a + b*c + b*d*x))/(b*d*Log[F]) + (f^2*F^(a + b*
c + b*d*x)*x)/(b*d*Log[F])
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = \int \left(2efF^{a+bc+bdx} + \frac{e^2F^{a+bc+bdx}}{x} + f^2F^{a+bc+bdx}x\right)dx$$
$$= e^2\int \frac{F^{a+bc+bdx}}{x}\,dx + (2ef)\int F^{a+bc+bdx}\,dx + f^2\int F^{a+bc+bdx}x\,dx$$
$$= e^2F^{a+bc}\text{Ei}(bdx\log(F)) + \frac{2efF^{a+bc+bdx}}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x}{bd\log(F)} - \frac{f^2\int F^{a+bc+bdx}\,dx}{bd\log(F)}$$
$$= e^2F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{f^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} + \frac{2efF^{a+bc+bdx}}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x}{bd\log(F)}$$

Mathematica [A] time = 0.125699, size = 54, normalized size = 0.56

$$F^{a+bc}\left(\frac{fF^{bdx}(bd\log(F)(2e+fx)-f)}{b^2d^2\log^2(F)} + e^2\text{Ei}(bdx\log(F))\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x,x]
```

```
[Out] F^(a + b*c)*(e^2*ExpIntegralEi[b*d*x*Log[F]] + (f*F^(b*d*x)*(-f + b*d*(2*e
+ f*x)*Log[F]))/(b^2*d^2*Log[F]^2))
```

Maple [A] time = 0.045, size = 126, normalized size = 1.3

$$-e^2F^{bc}F^a\text{Ei}\left(1, bc\ln(F) + \ln(F)a - bdx\ln(F) - (bc+a)\ln(F)\right) + \frac{f^2F^{bdx}F^{bc+a}x}{bd\ln(F)} - \frac{f^2F^{bdx}F^{bc+a}}{b^2d^2(\ln(F))^2} + 2\frac{feF^{bdx}F^{bc+a}}{bd\ln(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x,x)
```

```
[Out] -e^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))+f^2/ln(F
)/b/d*F^(b*d*x)*F^(b*c+a)*x-f^2/ln(F)^2/b^2/d^2*F^(b*d*x)*F^(b*c+a)+2*f/ln(
F)/b/d*e*F^(b*d*x)*F^(b*c+a)
```

Maxima [A] time = 1.15666, size = 117, normalized size = 1.22

$$F^{bc+a}e^2\text{Ei}(bdx\log(F)) + \frac{2F^{bdx+bc+a}ef}{bd\log(F)} + \frac{\left(F^{bc+a}bdx\log(F) - F^{bc+a}\right)F^{bdx}f^2}{b^2d^2\log(F)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="maxima")
```

```
[Out] F^(b*c + a)*e^2*Ei(b*d*x*log(F)) + 2*F^(b*d*x + b*c + a)*e*f/(b*d*log(F)) +
 (F^(b*c + a)*b*d*x*log(F) - F^(b*c + a))*F^(b*d*x)*f^2/(b^2*d^2*log(F)^2)
```

Fricas [A] time = 1.52764, size = 180, normalized size = 1.88

$$\frac{F^{bc+a}b^2d^2e^2\operatorname{Ei}\left(bdx\log\left(F\right)\right)\log\left(F\right)^2-\left(f^2-\left(bdf^2x+2\,bdef\right)\log\left(F\right)\right)F^{bdx+bc+a}}{b^2d^2\log\left(F\right)^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="fricas")
```

```
[Out] (F^(b*c + a)*b^2*d^2*e^2*Ei(b*d*x*log(F))*log(F)^2 - (f^2 - (b*d*f^2*x + 2*
b*d*e*f)*log(F))*F^(b*d*x + b*c + a))/(b^2*d^2*log(F)^2)
```

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

$$\int \frac{F^{a+b(c+dx)}\left(e+fx\right)^2}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x, x)
```

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

$$\int \frac{\left(fx+e\right)^2F^{(dx+c)b+a}}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x, x)
```

3.70 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx$

Optimal. Leaf size=85

$$bde^2\log(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{x} + 2efF^{a+bc}\text{Ei}(bdx\log(F)) + \frac{f^2F^{a+bc+bdx}}{bd\log(F)}$$

```
[Out] -((e^2*F^(a + b*c + b*d*x))/x) + 2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[
F]] + (f^2*F^(a + b*c + b*d*x))/(b*d*Log[F]) + b*d*e^2*F^(a + b*c)*ExpInteg
ralEi[b*d*x*Log[F]]*Log[F]
```

Rubi [A] time = 0.276619, antiderivative size = 85, normalized size of antiderivative = 1., number of steps used = 6, number of rules used = 4, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.182, Rules used = {2199, 2194, 2177, 2178}

$$bde^2\log(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{x} + 2efF^{a+bc}\text{Ei}(bdx\log(F)) + \frac{f^2F^{a+bc+bdx}}{bd\log(F)}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^2,x]
```

```
[Out] -((e^2*F^(a + b*c + b*d*x))/x) + 2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[
F]] + (f^2*F^(a + b*c + b*d*x))/(b*d*Log[F]) + b*d*e^2*F^(a + b*c)*ExpInteg
ralEi[b*d*x*Log[F]]*Log[F]
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = \int \left(f^2F^{a+bc+bdx} + \frac{e^2F^{a+bc+bdx}}{x^2} + \frac{2efF^{a+bc+bdx}}{x}\right)dx$$
$$= e^2\int \frac{F^{a+bc+bdx}}{x^2}\,dx + (2ef)\int \frac{F^{a+bc+bdx}}{x}\,dx + f^2\int F^{a+bc+bdx}\,dx$$
$$= -\frac{e^2F^{a+bc+bdx}}{x} + 2efF^{a+bc}\text{Ei}(bdx\log(F)) + \frac{f^2F^{a+bc+bdx}}{bd\log(F)} + \left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x}\,dx$$
$$= -\frac{e^2F^{a+bc+bdx}}{x} + 2efF^{a+bc}\text{Ei}(bdx\log(F)) + \frac{f^2F^{a+bc+bdx}}{bd\log(F)} + bde^2F^{a+bc}\text{Ei}(bdx\log(F))\log(F)$$

Mathematica [A] time = 0.149333, size = 58, normalized size = 0.68

$$F^{a+bc}\left(F^{bdx}\left(\frac{f^2}{bd\log(F)} - \frac{e^2}{x}\right) + e(bde\log(F)+2f)\text{Ei}(bdx\log(F))\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^2,x]
```

```
[Out] F^(a + b*c)*(F^(b*d*x)*(-(e^2/x) + f^2/(b*d*Log[F])) + e*ExpIntegralEi[b*d*
x*Log[F]]*(2*f + b*d*e*Log[F]))
```

Maple [A] time = 0.053, size = 135, normalized size = 1.6

$$-\frac{e^2F^{bdx}F^{bc+a}}{x} + \frac{f^2F^{bdx}F^{bc+a}}{bd\ln(F)} - \ln(F)\,bde^2F^{bc}F^a\text{Ei}\left(1, bc\ln(F) + \ln(F)\,a - bdx\ln(F) - (bc+a)\ln(F)\right) - 2\,feF^{bc}F^a\text{Ei}\left(1, bc\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x)
```

```
[Out] -e^2*F^(b*d*x)*F^(b*c+a)/x+1/ln(F)/b/d*f^2*F^(b*d*x)*F^(b*c+a)-ln(F)*b*d*e^
2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))-2*f*e*F^(b*
c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))
```

Maxima [A] time = 1.19312, size = 92, normalized size = 1.08

$$F^{bc+a}bde^2\Gamma\left(-1, -bdx\log(F)\right)\log(F) + 2\,F^{bc+a}ef\text{Ei}\left(bdx\log(F)\right) + \frac{F^{bdx+bc+a}f^2}{bd\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="maxima")
```

```
[Out] F^(b*c + a)*b*d*e^2*gamma(-1, -b*d*x*log(F))*log(F) + 2*F^(b*c + a)*e*f*Ei(
b*d*x*log(F)) + F^(b*d*x + b*c + a)*f^2/(b*d*log(F))
```

Fricas [A] time = 1.49197, size = 189, normalized size = 2.22

$$\frac{\left(b^2d^2e^2x\log(F)^2 + 2\,bdefx\log(F)\right)F^{bc+a}\text{Ei}\left(bdx\log(F)\right) - \left(bde^2\log(F) - f^2x\right)F^{bdx+bc+a}}{bdx\log(F)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="fricas")
```

```
[Out] ((b^2*d^2*e^2*x*log(F)^2 + 2*b*d*e*f*x*log(F))*F^(b*c + a)*Ei(b*d*x*log(F))
 - (b*d*e^2*log(F) - f^2*x)*F^(b*d*x + b*c + a))/(b*d*x*log(F))
```

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

$$\int \frac{F^{a+b(c+dx)}\left(e+fx\right)^{2}}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**2,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**2, x)
```

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

$$\int \frac{\left(fx+e\right)^{2}F^{(dx+c)b+a}}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^2, x)
```

3.71 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx$

Optimal. Leaf size=136

$$\frac{1}{2}b^2d^2e^2\log^2(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{2x^2} - \frac{bde^2\log(F)F^{a+bc+bdx}}{2x} + 2bdef\log(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{2efF^{a+bc-}}{x}$$

```
[Out] -(e^2*F^(a + b*c + b*d*x))/(2*x^2) - (2*e*f*F^(a + b*c + b*d*x))/x + f^2*F^
(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F]
)/(2*x) + 2*b*d*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F] + (b^2*d
^2*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2
```

Rubi [A] time = 0.362979, antiderivative size = 136, normalized size of antiderivative = 1., number of steps used = 8, number of rules used = 3, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2199, 2177, 2178}

$$\frac{1}{2}b^2d^2e^2\log^2(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{2x^2} - \frac{bde^2\log(F)F^{a+bc+bdx}}{2x} + 2bdef\log(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{2efF^{a+bc-}}{x}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^3,x]
```


```
[Out] -(e^2*F^(a + b*c + b*d*x))/(2*x^2) - (2*e*f*F^(a + b*c + b*d*x))/x + f^2*F^
(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F]
)/(2*x) + 2*b*d*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F] + (b^2*d
^2*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx &= \int \left(\frac{e^2F^{a+bc+bdx}}{x^3}+\frac{2efF^{a+bc+bdx}}{x^2}+\frac{f^2F^{a+bc+bdx}}{x}\right)dx\\ &= e^2\int \frac{F^{a+bc+bdx}}{x^3}\,dx+(2ef)\int \frac{F^{a+bc+bdx}}{x^2}\,dx+f^2\int \frac{F^{a+bc+bdx}}{x}\,dx\\ &= -\frac{e^2F^{a+bc+bdx}}{2x^2}-\frac{2efF^{a+bc+bdx}}{x}+f^2F^{a+bc}\mathrm{Ei}(bdx\log(F))+\frac{1}{2}\left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x^2}\,dx+\\ &= -\frac{e^2F^{a+bc+bdx}}{2x^2}-\frac{2efF^{a+bc+bdx}}{x}+f^2F^{a+bc}\mathrm{Ei}(bdx\log(F))-\frac{bde^2F^{a+bc+bdx}\log(F)}{2x}+2bdefF^{a+}\\ &= -\frac{e^2F^{a+bc+bdx}}{2x^2}-\frac{2efF^{a+bc+bdx}}{x}+f^2F^{a+bc}\mathrm{Ei}(bdx\log(F))-\frac{bde^2F^{a+bc+bdx}\log(F)}{2x}+2bdefF^{a+}\end{aligned}$$

Mathematica [A] time = 0.14826, size = 76, normalized size = 0.56

$$\frac{F^{a+bc}\left(x^2\left(b^2d^2e^2\log^2(F)+4bdef\log(F)+2f^2\right)\mathrm{Ei}(bdx\log(F))-eF^{bdx}(bdex\log(F)+e+4fx)\right)}{2x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^3,x]
```

```
[Out] (F^(a + b*c)*(-(e*F^(b*d*x)*(e + 4*f*x + b*d*e*x*Log[F])) + x^2*ExpIntegral
Ei[b*d*x*Log[F]]*(2*f^2 + 4*b*d*e*f*Log[F] + b^2*d^2*e^2*Log[F]^2)))/(2*x^2
)
```

Maple [A] time = 0.059, size = 204, normalized size = 1.5

$$-\frac{b^2d^2(\ln(F))^2e^2F^{bc}F^a\mathrm{Ei}(1,bc\ln(F)+\ln(F)a-bdx\ln(F)-(bc+a)\ln(F))}{2}-f^2F^{bc}F^a\mathrm{Ei}(1,bc\ln(F)+\ln(F)a-bdx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x)
```

```
[Out] -1/2*b^2*d^2*ln(F)^2*e^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*
c+a)*ln(F))-f^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F
))-2*f*e*F^(b*d*x)*F^(b*c+a)/x-2*b*d*ln(F)*f*e*F^(b*c)*F^a*Ei(1,b*c*ln(F)+l
n(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))-1/2*b*d*ln(F)*e^2*F^(b*d*x)*F^(b*c+a)/x-1
/2*e^2*F^(b*d*x)*F^(b*c+a)/x^2
```

Maxima [A] time = 1.32388, size = 100, normalized size = 0.74

$$-F^{bc+a}b^2d^2e^2\Gamma(-2,-bdx\log(F))\log(F)^2+2F^{bc+a}bdef\Gamma(-1,-bdx\log(F))\log(F)+F^{bc+a}f^2\mathrm{Ei}(bdx\log(F))$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="maxima")
```

```
[Out] -F^(b*c + a)*b^2*d^2*e^2*gamma(-2, -b*d*x*log(F))*log(F)^2 + 2*F^(b*c + a)*
b*d*e*f*gamma(-1, -b*d*x*log(F))*log(F) + F^(b*c + a)*f^2*Ei(b*d*x*log(F))
```

Fricas [A] time = 1.50513, size = 215, normalized size = 1.58

$$\frac{\left(b^2d^2e^2x^2\log\left(F\right)^2+4\,bdefx^2\log\left(F\right)+2\,f^2x^2\right)F^{bc+a}\mathrm{Ei}\left(bdx\log\left(F\right)\right)-\left(bde^2x\log\left(F\right)+4\,efx+e^2\right)F^{bdx+bc+a}}{2\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="fricas")
```

```
[Out] 1/2*((b^2*d^2*e^2*x^2*log(F)^2 + 4*b*d*e*f*x^2*log(F) + 2*f^2*x^2)*F^(b*c +
 a)*Ei(b*d*x*log(F)) - (b*d*e^2*x*log(F) + 4*e*f*x + e^2)*F^(b*d*x + b*c +
a))/x^2
```

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

$$\int \frac{F^{a+b(c+dx)}\left(e+fx\right)^2}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**3,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**3, x)
```

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

$$\int \frac{\left(fx+e\right)^2F^{(dx+c)b+a}}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^3, x)
```

3.72 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx$

Optimal. Leaf size=217

$$\frac{1}{6}b^3d^3e^2\log^3(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{6x} + b^2d^2ef\log^2(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{b}{}$$

```
[Out] -(e^2*F^(a + b*c + b*d*x))/(3*x^3) - (e*f*F^(a + b*c + b*d*x))/x^2 - (f^2*F
^(a + b*c + b*d*x))/x - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(6*x^2) - (b*d
*e*f*F^(a + b*c + b*d*x)*Log[F])/x + b*d*f^2*F^(a + b*c)*ExpIntegralEi[b*d*
x*Log[F]]*Log[F] - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(6*x) + b^2*d
^2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2 + (b^3*d^3*e^2*F^(a
 + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^3)/6
```

Rubi [A] time = 0.458988, antiderivative size = 217, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 3, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2199, 2177, 2178}

$$\frac{1}{6}b^3d^3e^2\log^3(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{6x} + b^2d^2ef\log^2(F)F^{a+bc}\text{Ei}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{b}{}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^4,x]
```


```
[Out] -(e^2*F^(a + b*c + b*d*x))/(3*x^3) - (e*f*F^(a + b*c + b*d*x))/x^2 - (f^2*F
^(a + b*c + b*d*x))/x - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(6*x^2) - (b*d
*e*f*F^(a + b*c + b*d*x)*Log[F])/x + b*d*f^2*F^(a + b*c)*ExpIntegralEi[b*d*
x*Log[F]]*Log[F] - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(6*x) + b^2*d
^2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2 + (b^3*d^3*e^2*F^(a
 + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^3)/6
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = \int \left(\frac{e^2F^{a+bc+bdx}}{x^4} + \frac{2efF^{a+bc+bdx}}{x^3} + \frac{f^2F^{a+bc+bdx}}{x^2}\right) dx$$
$$= e^2\int \frac{F^{a+bc+bdx}}{x^4}\,dx + (2ef)\int \frac{F^{a+bc+bdx}}{x^3}\,dx + f^2\int \frac{F^{a+bc+bdx}}{x^2}\,dx$$
$$= -\frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{f^2F^{a+bc+bdx}}{x} + \frac{1}{3}\left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x^3}\,dx + (bdef\log(F))$$
$$= -\frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{f^2F^{a+bc+bdx}}{x} - \frac{bde^2F^{a+bc+bdx}\log(F)}{6x^2} - \frac{bdefF^{a+bc+bdx}\log(F)}{x} + b$$
$$= -\frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{f^2F^{a+bc+bdx}}{x} - \frac{bde^2F^{a+bc+bdx}\log(F)}{6x^2} - \frac{bdefF^{a+bc+bdx}\log(F)}{x} + b$$
$$= -\frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{f^2F^{a+bc+bdx}}{x} - \frac{bde^2F^{a+bc+bdx}\log(F)}{6x^2} - \frac{bdefF^{a+bc+bdx}\log(F)}{x} + b$$

Mathematica [A] time = 0.223677, size = 116, normalized size = 0.53

$$\frac{F^{a+bc}\left(bdx^3\log(F)\left(b^2d^2e^2\log^2(F) + 6bdef\log(F) + 6f^2\right)\text{Ei}(bdx\log(F)) - F^{bdx}\left(b^2d^2e^2x^2\log^2(F) + bdex\log(F)(e+6fx)\right.}{6x^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^4,x]
```

```
[Out] (F^(a + b*c)*(b*d*x^3*ExpIntegralEi[b*d*x*Log[F]]*Log[F]*(6*f^2 + 6*b*d*e*f
*Log[F] + b^2*d^2*e^2*Log[F]^2) - F^(b*d*x)*(2*(e^2 + 3*e*f*x + 3*f^2*x^2)
+ b*d*e*x*(e + 6*f*x)*Log[F] + b^2*d^2*e^2*x^2*Log[F]^2)))/(6*x^3)
```

Maple [A] time = 0.065, size = 290, normalized size = 1.3

$$-\frac{(\ln(F))^3 b^3d^3e^2F^{bc}F^a\text{Ei}(1, bc\ln(F) + \ln(F)a - bdx\ln(F) - (bc+a)\ln(F))}{6} - \frac{feF^{bdx}F^{bc+a}}{x^2} - \frac{fe\ln(F)bdF^{bdx}F^{bc+a}}{x} - (\ln$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x)
```

```
[Out] -1/6*ln(F)^3*b^3*d^3*e^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*
c+a)*ln(F))-f*e*F^(b*d*x)*F^(b*c+a)/x^2-ln(F)*b*d*f*e*F^(b*d*x)*F^(b*c+a)/x
-ln(F)^2*b^2*d^2*f*e*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)
*ln(F))-1/3*e^2*F^(b*d*x)*F^(b*c+a)/x^3-1/6*ln(F)*b*d*e^2*F^(b*d*x)*F^(b*c+
a)/x^2-1/6*ln(F)^2*b^2*d^2*e^2*F^(b*d*x)*F^(b*c+a)/x-f^2*F^(b*d*x)*F^(b*c+a
)/x-ln(F)*b*d*f^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln
(F))
```

Maxima [A] time = 1.21015, size = 115, normalized size = 0.53

$$F^{bc+a}b^3d^3e^2\Gamma(-3, -bdx\log(F))\log(F)^3 - 2F^{bc+a}b^2d^2ef\Gamma(-2, -bdx\log(F))\log(F)^2 + F^{bc+a}bdf^2\Gamma(-1, -bdx\log(F))\log($$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="maxima")
```

```
[Out] F^(b*c + a)*b^3*d^3*e^2*gamma(-3, -b*d*x*log(F))*log(F)^3 - 2*F^(b*c + a)*b
^2*d^2*e*f*gamma(-2, -b*d*x*log(F))*log(F)^2 + F^(b*c + a)*b*d*f^2*gamma(-1
, -b*d*x*log(F))*log(F)
```

Fricas [A] time = 1.53015, size = 317, normalized size = 1.46

$$\frac{\left(b^3d^3e^2x^3\log\left(F\right)^3+6\,b^2d^2efx^3\log\left(F\right)^2+6\,bdf^2x^3\log\left(F\right)\right)F^{bc+a}\mathrm{Ei}\left(bdx\log\left(F\right)\right)-\left(b^2d^2e^2x^2\log\left(F\right)^2+6\,f^2x^2+6\,efx\right.}{6\,x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="fricas")
```

```
[Out] 1/6*((b^3*d^3*e^2*x^3*log(F)^3 + 6*b^2*d^2*e*f*x^3*log(F)^2 + 6*b*d*f^2*x^3
*log(F))*F^(b*c + a)*Ei(b*d*x*log(F)) - (b^2*d^2*e^2*x^2*log(F)^2 + 6*f^2*x
^2 + 6*e*f*x + 2*e^2 + (6*b*d*e*f*x^2 + b*d*e^2*x)*log(F))*F^(b*d*x + b*c +
 a))/x^3
```

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

$$\int \frac{F^{a+b(c+dx)}\left(e+fx\right)^2}{x^4}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**4,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**4, x)
```

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

$$\int \frac{\left(fx+e\right)^2F^{(dx+c)b+a}}{x^4}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^4, x)
```

3.73 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5} dx$

Optimal. Leaf size=321

$$\frac{1}{24}b^4d^4e^2\log^4(F)F^{a+bc}\text{Ei}(bdx\log(F))-\frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{24x^2}-\frac{b^3d^3e^2\log^3(F)F^{a+bc+bdx}}{24x}+\frac{1}{3}b^3d^3ef\log^3(F)F^{a+bc}\text{Ei}(bdx$$

```
[Out] -(e^2*F^(a + b*c + b*d*x))/(4*x^4) - (2*e*f*F^(a + b*c + b*d*x))/(3*x^3) -
(f^2*F^(a + b*c + b*d*x))/(2*x^2) - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(1
2*x^3) - (b*d*e*f*F^(a + b*c + b*d*x)*Log[F])/(3*x^2) - (b*d*f^2*F^(a + b*c
 + b*d*x)*Log[F])/(2*x) - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(24*x^
2) - (b^2*d^2*e*f*F^(a + b*c + b*d*x)*Log[F]^2)/(3*x) + (b^2*d^2*f^2*F^(a +
 b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2 - (b^3*d^3*e^2*F^(a + b*c + b
*d*x)*Log[F]^3)/(24*x) + (b^3*d^3*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F
]]*Log[F]^3)/3 + (b^4*d^4*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F
]^4)/24
```

Rubi [A] time = 0.577845, antiderivative size = 321, normalized size of antiderivative = 1., number of steps used = 14, number of rules used = 3, integrand size = 22, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2199, 2177, 2178}

$$\frac{1}{24}b^4d^4e^2\log^4(F)F^{a+bc}\text{Ei}(bdx\log(F))-\frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{24x^2}-\frac{b^3d^3e^2\log^3(F)F^{a+bc+bdx}}{24x}+\frac{1}{3}b^3d^3ef\log^3(F)F^{a+bc}\text{Ei}(bdx$$

Antiderivative was successfully verified.

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^5,x]
```

```
[Out] -(e^2*F^(a + b*c + b*d*x))/(4*x^4) - (2*e*f*F^(a + b*c + b*d*x))/(3*x^3) -
(f^2*F^(a + b*c + b*d*x))/(2*x^2) - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(1
2*x^3) - (b*d*e*f*F^(a + b*c + b*d*x)*Log[F])/(3*x^2) - (b*d*f^2*F^(a + b*c
 + b*d*x)*Log[F])/(2*x) - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(24*x^
2) - (b^2*d^2*e*f*F^(a + b*c + b*d*x)*Log[F]^2)/(3*x) + (b^2*d^2*f^2*F^(a +
 b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2 - (b^3*d^3*e^2*F^(a + b*c + b
*d*x)*Log[F]^3)/(24*x) + (b^3*d^3*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F
]]*Log[F]^3)/3 + (b^4*d^4*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F
]^4)/24
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
```

```
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \int \left(\frac{e^2F^{a+bc+bdx}}{x^5}+\frac{2efF^{a+bc+bdx}}{x^4}+\frac{f^2F^{a+bc+bdx}}{x^3}\right)dx$$
$$= e^2\int \frac{F^{a+bc+bdx}}{x^5}\,dx+(2ef)\int \frac{F^{a+bc+bdx}}{x^4}\,dx+f^2\int \frac{F^{a+bc+bdx}}{x^3}\,dx$$
$$= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}+\frac{1}{4}\left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x^4}\,dx+\frac{1}{3}(2bdef\,\log(F$$
$$= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}-\frac{bdefF^{a+bc+bdx}\log(F}{3x^2}$$
$$= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}-\frac{bdefF^{a+bc+bdx}\log(F}{3x^2}$$
$$= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}-\frac{bdefF^{a+bc+bdx}\log(F}{3x^2}$$
$$= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}-\frac{bdefF^{a+bc+bdx}\log(F}{3x^2}$$

Mathematica [A] time = 0.296526, size = 156, normalized size = 0.49

$$\frac{F^{a+bc}\left(b^2d^2x^4\log^2(F)\left(b^2d^2e^2\log^2(F)+8bdef\log(F)+12f^2\right)\text{Ei}(bdx\log(F))-F^{bdx}\left(b^3d^3e^2x^3\log^3(F)+b^2d^2ex^2\log^2(F\right.\right.}{24x^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^5,x]
```

```
[Out] (F^(a + b*c)*(b^2*d^2*x^4*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2*(12*f^2 + 8*
b*d*e*f*Log[F] + b^2*d^2*e^2*Log[F]^2) - F^(b*d*x)*(2*(3*e^2 + 8*e*f*x + 6*
f^2*x^2) + 2*b*d*x*(e^2 + 4*e*f*x + 6*f^2*x^2)*Log[F] + b^2*d^2*e*x^2*(e +
8*f*x)*Log[F]^2 + b^3*d^3*e^2*x^3*Log[F]^3)))/(24*x^4)
```

Maple [A] time = 0.066, size = 382, normalized size = 1.2

$$-\frac{(\ln(F))^4\,b^4d^4e^2F^{bc}F^a\text{Ei}\left(1,bc\ln(F)+\ln(F)\,a-bdx\ln(F)-(bc+a)\ln(F)\right)}{24}-\frac{2\,feF^{bdx}F^{bc+a}}{3\,x^3}-\frac{fe\ln(F)\,bdF^{bdx}F^{bc+a}}{3\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x)
```

```
[Out] -1/24*ln(F)^4*b^4*d^4*e^2*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b
*c+a)*ln(F))-2/3*f*e*F^(b*d*x)*F^(b*c+a)/x^3-1/3*ln(F)*b*d*f*e*F^(b*d*x)*F^
(b*c+a)/x^2-1/3*ln(F)^2*b^2*d^2*f*e*F^(b*d*x)*F^(b*c+a)/x-1/3*ln(F)^3*b^3*d
^3*f*e*F^(b*c)*F^a*Ei(1,b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))-1/2*ln
(F)*b*d*f^2*F^(b*d*x)*F^(b*c+a)/x-1/2*ln(F)^2*b^2*d^2*f^2*F^(b*c)*F^a*Ei(1,
b*c*ln(F)+ln(F)*a-b*d*x*ln(F)-(b*c+a)*ln(F))-1/2*f^2*F^(b*d*x)*F^(b*c+a)/x^
2-1/4*e^2*F^(b*d*x)*F^(b*c+a)/x^4-1/12*ln(F)*b*d*e^2*F^(b*d*x)*F^(b*c+a)/x^
3-1/24*ln(F)^2*b^2*d^2*e^2*F^(b*d*x)*F^(b*c+a)/x^2-1/24*ln(F)^3*b^3*d^3*e^2
*F^(b*d*x)*F^(b*c+a)/x
```

Maxima [A] time = 1.24327, size = 126, normalized size = 0.39

$$-F^{bc+a}b^4d^4e^2\Gamma(-4, -bdx\log(F))\log(F)^4 + 2F^{bc+a}b^3d^3ef\Gamma(-3, -bdx\log(F))\log(F)^3 - F^{bc+a}b^2d^2f^2\Gamma(-2, -bdx\log(F))\,\mathrm{l}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="maxima")
```

```
[Out] -F^(b*c + a)*b^4*d^4*e^2*gamma(-4, -b*d*x*log(F))*log(F)^4 + 2*F^(b*c + a)*
b^3*d^3*e*f*gamma(-3, -b*d*x*log(F))*log(F)^3 - F^(b*c + a)*b^2*d^2*f^2*gam
ma(-2, -b*d*x*log(F))*log(F)^2
```

Fricas [A] time = 1.50121, size = 421, normalized size = 1.31

$$\frac{\left(b^4d^4e^2x^4\log(F)^4 + 8b^3d^3efx^4\log(F)^3 + 12b^2d^2f^2x^4\log(F)^2\right)F^{bc+a}\mathrm{Ei}(bdx\log(F)) - \left(b^3d^3e^2x^3\log(F)^3 + 12f^2x^2 + 16\right.}{24x^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="fricas")
```

```
[Out] 1/24*((b^4*d^4*e^2*x^4*log(F)^4 + 8*b^3*d^3*e*f*x^4*log(F)^3 + 12*b^2*d^2*f
^2*x^4*log(F)^2)*F^(b*c + a)*Ei(b*d*x*log(F)) - (b^3*d^3*e^2*x^3*log(F)^3 +
 12*f^2*x^2 + 16*e*f*x + (8*b^2*d^2*e*f*x^3 + b^2*d^2*e^2*x^2)*log(F)^2 + 6
*e^2 + 2*(6*b*d*f^2*x^3 + 4*b*d*e*f*x^2 + b*d*e^2*x)*log(F))*F^(b*d*x + b*c
 + a))/x^4
```

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

$$\int \frac{F^{a+b(c+dx)}\left(e+fx\right)^2}{x^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**5,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**5, x)
```

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

$$\int \frac{\left(fx+e\right)^2F^{(dx+c)b+a}}{x^5}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^5, x)
```

3.74 $\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx$

Optimal. Leaf size=754

$$-\frac{3d^2e^{-a-bx}(a+bx)^6(bc-ad)}{b^4}-\frac{18d^2e^{-a-bx}(a+bx)^5(bc-ad)}{b^4}-\frac{90d^2e^{-a-bx}(a+bx)^4(bc-ad)}{b^4}-\frac{360d^2e^{-a-bx}(a+bx)^3(}{b^4}$$

```
[Out] (-5040*d^3*E^(-a - b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x))/b^4 - (3
60*d*(b*c - a*d)^2*E^(-a - b*x))/b^4 - (24*(b*c - a*d)^3*E^(-a - b*x))/b^4
- (5040*d^3*E^(-a - b*x)*(a + b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x
)*(a + b*x))/b^4 - (360*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x))/b^4 - (24*(
b*c - a*d)^3*E^(-a - b*x)*(a + b*x))/b^4 - (2520*d^3*E^(-a - b*x)*(a + b*x)
^2)/b^4 - (1080*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2)/b^4 - (180*d*(b*c
 - a*d)^2*E^(-a - b*x)*(a + b*x)^2)/b^4 - (12*(b*c - a*d)^3*E^(-a - b*x)*(a
 + b*x)^2)/b^4 - (840*d^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (360*d^2*(b*c - a
*d)*E^(-a - b*x)*(a + b*x)^3)/b^4 - (60*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b
*x)^3)/b^4 - (4*(b*c - a*d)^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (210*d^3*E^(-
a - b*x)*(a + b*x)^4)/b^4 - (90*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^4)/b
^4 - (15*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^4 - ((b*c - a*d)^3*E^(
-a - b*x)*(a + b*x)^4)/b^4 - (42*d^3*E^(-a - b*x)*(a + b*x)^5)/b^4 - (18*d^
2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^4 - (3*d*(b*c - a*d)^2*E^(-a - b*
x)*(a + b*x)^5)/b^4 - (7*d^3*E^(-a - b*x)*(a + b*x)^6)/b^4 - (3*d^2*(b*c -
a*d)*E^(-a - b*x)*(a + b*x)^6)/b^4 - (d^3*E^(-a - b*x)*(a + b*x)^7)/b^4
```

Rubi [A] time = 0.915864, antiderivative size = 754, normalized size of antiderivative = 1., number of steps used = 28, number of rules used = 3, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.12, Rules used = {2196, 2176, 2194}

$$-\frac{3d^2e^{-a-bx}(a+bx)^6(bc-ad)}{b^4}-\frac{18d^2e^{-a-bx}(a+bx)^5(bc-ad)}{b^4}-\frac{90d^2e^{-a-bx}(a+bx)^4(bc-ad)}{b^4}-\frac{360d^2e^{-a-bx}(a+bx)^3(}{b^4}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^3,x]
```

```
[Out] (-5040*d^3*E^(-a - b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x))/b^4 - (3
60*d*(b*c - a*d)^2*E^(-a - b*x))/b^4 - (24*(b*c - a*d)^3*E^(-a - b*x))/b^4
- (5040*d^3*E^(-a - b*x)*(a + b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x
)*(a + b*x))/b^4 - (360*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x))/b^4 - (24*(
b*c - a*d)^3*E^(-a - b*x)*(a + b*x))/b^4 - (2520*d^3*E^(-a - b*x)*(a + b*x)
^2)/b^4 - (1080*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2)/b^4 - (180*d*(b*c
 - a*d)^2*E^(-a - b*x)*(a + b*x)^2)/b^4 - (12*(b*c - a*d)^3*E^(-a - b*x)*(a
 + b*x)^2)/b^4 - (840*d^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (360*d^2*(b*c - a
*d)*E^(-a - b*x)*(a + b*x)^3)/b^4 - (60*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b
*x)^3)/b^4 - (4*(b*c - a*d)^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (210*d^3*E^(-
a - b*x)*(a + b*x)^4)/b^4 - (90*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^4)/b
^4 - (15*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^4 - ((b*c - a*d)^3*E^(
-a - b*x)*(a + b*x)^4)/b^4 - (42*d^3*E^(-a - b*x)*(a + b*x)^5)/b^4 - (18*d^
2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^4 - (3*d*(b*c - a*d)^2*E^(-a - b*
x)*(a + b*x)^5)/b^4 - (7*d^3*E^(-a - b*x)*(a + b*x)^6)/b^4 - (3*d^2*(b*c -
a*d)*E^(-a - b*x)*(a + b*x)^6)/b^4 - (d^3*E^(-a - b*x)*(a + b*x)^7)/b^4
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = \int \left(\frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^3}+\frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^3}+\frac{3d^2(bc-ad)e^{-a-bx}(a+bx\right.$$
$$=\frac{d^3\int e^{-a-bx}(a+bx)^7\,dx}{b^3}+\frac{\left(3d^2(bc-ad)\right)\int e^{-a-bx}(a+bx)^6\,dx}{b^3}+\frac{\left(3d(bc-ad)^2\right)\int e^{-a-bx}(}{b^3}$$
$$=-\frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4}-\frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4}-\frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4}$$
$$=-\frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4}-\frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4}-\frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4}$$
$$=-\frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4}-\frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4}-\frac{4(bc-ad)^3e^{-a-bx}(a+bx}{b^4}$$
$$=-\frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4}-\frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4}-\frac{12(bc-ad)^3e^{-a-bx}(a+b}{b^4}$$
$$=-\frac{24(bc-ad)^3e^{-a-bx}}{b^4}-\frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4}-\frac{108}{}$$
$$=-\frac{360d(bc-ad)^2e^{-a-bx}}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}}{b^4}-\frac{2160d^2(bc-ad)e^{-a-bx}(a+bx)}{b^4}-\frac{360d(bc}{}$$
$$=-\frac{2160d^2(bc-ad)e^{-a-bx}}{b^4}-\frac{360d(bc-ad)^2e^{-a-bx}}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}}{b^4}-\frac{5040d^3e^{-a-bx}(a}{b^4}$$
$$=-\frac{5040d^3e^{-a-bx}}{b^4}-\frac{2160d^2(bc-ad)e^{-a-bx}}{b^4}-\frac{360d(bc-ad)^2e^{-a-bx}}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}}{b^4}-$$

Mathematica [A] time = 0.695949, size = 458, normalized size = 0.61

$$\frac{e^{-a-bx}\left(-6b^5x^2(c+dx)\left(\left(a^2+2a+2\right)c^2+2\left(a^2+3a+4\right)cdx+\left(a^2+4a+7\right)d^2x^2\right)-2b^4x\left(3\left(2a^3+9a^2+24a+30\right)c^2a\right.}{}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^3,x]
```

```
[Out] (E^(-a - b*x)*(-6*(840 + 480*a + 120*a^2 + 16*a^3 + a^4)*d^3 - b^7*x^4*(c +
 d*x)^3 - b^6*x^3*(c + d*x)^2*(4*(1 + a)*c + (7 + 4*a)*d*x) - 6*b*d^2*((360
 + 240*a + 72*a^2 + 12*a^3 + a^4)*c + (840 + 480*a + 120*a^2 + 16*a^3 + a^4
)*d*x) - 6*b^5*x^2*(c + d*x)*((2 + 2*a + a^2)*c^2 + 2*(4 + 3*a + a^2)*c*d*x
 + (7 + 4*a + a^2)*d^2*x^2) - 3*b^2*d*((120 + 96*a + 36*a^2 + 8*a^3 + a^4)*
c^2 + 2*(360 + 240*a + 72*a^2 + 12*a^3 + a^4)*c*d*x + (840 + 480*a + 120*a^
2 + 16*a^3 + a^4)*d^2*x^2) - 2*b^4*x*(2*(6 + 6*a + 3*a^2 + a^3)*c^3 + 3*(30
 + 24*a + 9*a^2 + 2*a^3)*c^2*d*x + 6*(30 + 20*a + 6*a^2 + a^3)*c*d^2*x^2 +
(105 + 60*a + 15*a^2 + 2*a^3)*d^3*x^3) - b^3*((24 + 24*a + 12*a^2 + 4*a^3 +
```

```
a^4)*c^3 + 3*(120 + 96*a + 36*a^2 + 8*a^3 + a^4)*c^2*d*x + 3*(360 + 240*a
+ 72*a^2 + 12*a^3 + a^4)*c*d^2*x^2 + (840 + 480*a + 120*a^2 + 16*a^3 + a^4)
*d^3*x^3)))/b^4
```

Maple [A] time = 0.005, size = 1062, normalized size = 1.4

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x)
```

```
[Out] -(b^7*d^3*x^7+4*a*b^6*d^3*x^6+3*b^7*c*d^2*x^6+6*a^2*b^5*d^3*x^5+12*a*b^6*c*
d^2*x^5+3*b^7*c^2*d*x^5+7*b^6*d^3*x^6+4*a^3*b^4*d^3*x^4+18*a^2*b^5*c*d^2*x^
4+12*a*b^6*c^2*d*x^4+24*a*b^5*d^3*x^5+b^7*c^3*x^4+18*b^6*c*d^2*x^5+a^4*b^3*
d^3*x^3+12*a^3*b^4*c*d^2*x^3+18*a^2*b^5*c^2*d*x^3+30*a^2*b^4*d^3*x^4+4*a*b^
6*c^3*x^3+60*a*b^5*c*d^2*x^4+15*b^6*c^2*d*x^4+42*b^5*d^3*x^5+3*a^4*b^3*c*d^
2*x^2+12*a^3*b^4*c^2*d*x^2+16*a^3*b^3*d^3*x^3+6*a^2*b^5*c^3*x^2+72*a^2*b^4*
c*d^2*x^3+48*a*b^5*c^2*d*x^3+120*a*b^4*d^3*x^4+4*b^6*c^3*x^3+90*b^5*c*d^2*x
^4+3*a^4*b^3*c^2*d*x+3*a^4*b^2*d^3*x^2+4*a^3*b^4*c^3*x+36*a^3*b^3*c*d^2*x^2
+54*a^2*b^4*c^2*d*x^2+120*a^2*b^3*d^3*x^3+12*a*b^5*c^3*x^2+240*a*b^4*c*d^2*
x^3+60*b^5*c^2*d*x^3+210*b^4*d^3*x^4+a^4*b^3*c^3+6*a^4*b^2*c*d^2*x+24*a^3*b
^3*c^2*d*x+48*a^3*b^2*d^3*x^2+12*a^2*b^4*c^3*x+216*a^2*b^3*c*d^2*x^2+144*a*
b^4*c^2*d*x^2+480*a*b^3*d^3*x^3+12*b^5*c^3*x^2+360*b^4*c*d^2*x^3+3*a^4*b^2*
c^2*d+6*a^4*b*d^3*x+4*a^3*b^3*c^3+72*a^3*b^2*c*d^2*x+108*a^2*b^3*c^2*d*x+36
0*a^2*b^2*d^3*x^2+24*a*b^4*c^3*x+720*a*b^3*c*d^2*x^2+180*b^4*c^2*d*x^2+840*
b^3*d^3*x^3+6*a^4*b*c*d^2+24*a^3*b^2*c^2*d+96*a^3*b*d^3*x+12*a^2*b^3*c^3+43
2*a^2*b^2*c*d^2*x+288*a*b^3*c^2*d*x+1440*a*b^2*d^3*x^2+24*b^4*c^3*x+1080*b^
3*c*d^2*x^2+6*a^4*d^3+72*a^3*b*c*d^2+108*a^2*b^2*c^2*d+720*a^2*b*d^3*x+24*a
*b^3*c^3+1440*a*b^2*c*d^2*x+360*b^3*c^2*d*x+2520*b^2*d^3*x^2+96*a^3*d^3+432
*a^2*b*c*d^2+288*a*b^2*c^2*d+2880*a*b*d^3*x+24*b^3*c^3+2160*b^2*c*d^2*x+720
*a^2*d^3+1440*a*b*c*d^2+360*b^2*c^2*d+5040*b*d^3*x+2880*a*d^3+2160*b*c*d^2+
5040*d^3)*exp(-b*x-a)/b^4
```

Maxima [A] time = 1.1762, size = 1207, normalized size = 1.6

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c^3*e^(-b*x - a)/b - a^4*c^3*e^(-b*x - a)/b - 3*(b*x + 1)*
a^4*c^2*d*e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c^3*e^(-b*x - a)/b
 - 12*(b^2*x^2 + 2*b*x + 2)*a^3*c^2*d*e^(-b*x - a)/b^2 - 3*(b^2*x^2 + 2*b*x
 + 2)*a^4*c*d^2*e^(-b*x - a)/b^3 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*c^
3*e^(-b*x - a)/b - 18*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*c^2*d*e^(-b*x -
 a)/b^2 - 12*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*c*d^2*e^(-b*x - a)/b^3 -
 (b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^4*d^3*e^(-b*x - a)/b^4 - (b^4*x^4 + 4*
b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c^3*e^(-b*x - a)/b - 12*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*c^2*d*e^(-b*x - a)/b^2 - 18*(b^4*x^4 +
4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*c*d^2*e^(-b*x - a)/b^3 - 4*(b^4*x
^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^3*d^3*e^(-b*x - a)/b^4 - 3*(b^
5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*c^2*d*e^(-b*x
```

```
- a)/b^2 - 12*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 12
0)*a*c*d^2*e^(-b*x - a)/b^3 - 6*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*
x^2 + 120*b*x + 120)*a^2*d^3*e^(-b*x - a)/b^4 - 3*(b^6*x^6 + 6*b^5*x^5 + 30
*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b*x + 720)*c*d^2*e^(-b*x - a)/b^
3 - 4*(b^6*x^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b
*x + 720)*a*d^3*e^(-b*x - a)/b^4 - (b^7*x^7 + 7*b^6*x^6 + 42*b^5*x^5 + 210*
b^4*x^4 + 840*b^3*x^3 + 2520*b^2*x^2 + 5040*b*x + 5040)*d^3*e^(-b*x - a)/b^
4
```

Fricas [A] time = 1.50603, size = 1310, normalized size = 1.74

$$-\frac{\left(b^7d^3x^7+\left(a^4+4\,a^3+12\,a^2+24\,a+24\right)b^3c^3+\left(3\,b^7cd^2+(4\,a+7)b^6d^3\right)x^6+3\left(a^4+8\,a^3+36\,a^2+96\,a+120\right)b^2c^2d+\cdots\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="fricas")
```

```
[Out] -(b^7*d^3*x^7 + (a^4 + 4*a^3 + 12*a^2 + 24*a + 24)*b^3*c^3 + (3*b^7*c*d^2 +
 (4*a + 7)*b^6*d^3)*x^6 + 3*(a^4 + 8*a^3 + 36*a^2 + 96*a + 120)*b^2*c^2*d +
 3*(b^7*c^2*d + 2*(2*a + 3)*b^6*c*d^2 + 2*(a^2 + 4*a + 7)*b^5*d^3)*x^5 + 6*
(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b*c*d^2 + (b^7*c^3 + 3*(4*a + 5)*b^6*
c^2*d + 6*(3*a^2 + 10*a + 15)*b^5*c*d^2 + 2*(2*a^3 + 15*a^2 + 60*a + 105)*b
^4*d^3)*x^4 + 6*(a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*d^3 + (4*(a + 1)*b^6
*c^3 + 6*(3*a^2 + 8*a + 10)*b^5*c^2*d + 12*(a^3 + 6*a^2 + 20*a + 30)*b^4*c*
d^2 + (a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b^3*d^3)*x^3 + 3*(2*(a^2 + 2*a
 + 2)*b^5*c^3 + 2*(2*a^3 + 9*a^2 + 24*a + 30)*b^4*c^2*d + (a^4 + 12*a^3 + 7
2*a^2 + 240*a + 360)*b^3*c*d^2 + (a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b^2
*d^3)*x^2 + (4*(a^3 + 3*a^2 + 6*a + 6)*b^4*c^3 + 3*(a^4 + 8*a^3 + 36*a^2 +
96*a + 120)*b^3*c^2*d + 6*(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b^2*c*d^2 +
 6*(a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b*d^3)*x)*e^(-b*x - a)/b^4
```

Sympy [A] time = 0.491955, size = 1445, normalized size = 1.92

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c)**3,x)
```

```
[Out] Piecewise(((-a**4*b**3*c**3 - 3*a**4*b**3*c**2*d*x - 3*a**4*b**3*c*d**2*x**
2 - a**4*b**3*d**3*x**3 - 3*a**4*b**2*c**2*d - 6*a**4*b**2*c*d**2*x - 3*a**
4*b**2*d**3*x**2 - 6*a**4*b*c*d**2 - 6*a**4*b*d**3*x - 6*a**4*d**3 - 4*a**3
*b**4*c**3*x - 12*a**3*b**4*c**2*d*x**2 - 12*a**3*b**4*c*d**2*x**3 - 4*a**3
*b**4*d**3*x**4 - 4*a**3*b**3*c**3 - 24*a**3*b**3*c**2*d*x - 36*a**3*b**3*c
*d**2*x**2 - 16*a**3*b**3*d**3*x**3 - 24*a**3*b**2*c**2*d - 72*a**3*b**2*c*
d**2*x - 48*a**3*b**2*d**3*x**2 - 72*a**3*b*c*d**2 - 96*a**3*b*d**3*x - 96*
a**3*d**3 - 6*a**2*b**5*c**3*x**2 - 18*a**2*b**5*c**2*d*x**3 - 18*a**2*b**5
*c*d**2*x**4 - 6*a**2*b**5*d**3*x**5 - 12*a**2*b**4*c**3*x - 54*a**2*b**4*c
**2*d*x**2 - 72*a**2*b**4*c*d**2*x**3 - 30*a**2*b**4*d**3*x**4 - 12*a**2*b*
*3*c**3 - 108*a**2*b**3*c**2*d*x - 216*a**2*b**3*c*d**2*x**2 - 120*a**2*b**
3*d**3*x**3 - 108*a**2*b**2*c**2*d - 432*a**2*b**2*c*d**2*x - 360*a**2*b**2
*d**3*x**2 - 432*a**2*b*c*d**2 - 720*a**2*b*d**3*x - 720*a**2*d**3 - 4*a*b*
*6*c**3*x**3 - 12*a*b**6*c**2*d*x**4 - 12*a*b**6*c*d**2*x**5 - 4*a*b**6*d**
```

```
3*x**6 - 12*a*b**5*c**3*x**2 - 48*a*b**5*c**2*d*x**3 - 60*a*b**5*c*d**2*x**
4 - 24*a*b**5*d**3*x**5 - 24*a*b**4*c**3*x - 144*a*b**4*c**2*d*x**2 - 240*a
*b**4*c*d**2*x**3 - 120*a*b**4*d**3*x**4 - 24*a*b**3*c**3 - 288*a*b**3*c**2
*d*x - 720*a*b**3*c*d**2*x**2 - 480*a*b**3*d**3*x**3 - 288*a*b**2*c**2*d -
1440*a*b**2*c*d**2*x - 1440*a*b**2*d**3*x**2 - 1440*a*b*c*d**2 - 2880*a*b*d
**3*x - 2880*a*d**3 - b**7*c**3*x**4 - 3*b**7*c**2*d*x**5 - 3*b**7*c*d**2*x
**6 - b**7*d**3*x**7 - 4*b**6*c**3*x**3 - 15*b**6*c**2*d*x**4 - 18*b**6*c*d
**2*x**5 - 7*b**6*d**3*x**6 - 12*b**5*c**3*x**2 - 60*b**5*c**2*d*x**3 - 90*
b**5*c*d**2*x**4 - 42*b**5*d**3*x**5 - 24*b**4*c**3*x - 180*b**4*c**2*d*x**
2 - 360*b**4*c*d**2*x**3 - 210*b**4*d**3*x**4 - 24*b**3*c**3 - 360*b**3*c**
2*d*x - 1080*b**3*c*d**2*x**2 - 840*b**3*d**3*x**3 - 360*b**2*c**2*d - 2160
*b**2*c*d**2*x - 2520*b**2*d**3*x**2 - 2160*b*c*d**2 - 5040*b*d**3*x - 5040
*d**3)*exp(-a - b*x)/b**4, Ne(b**4, 0)), (a**4*c**3*x + b**4*d**3*x**8/8 +
x**7*(4*a*b**3*d**3/7 + 3*b**4*c*d**2/7) + x**6*(a**2*b**2*d**3 + 2*a*b**3*
c*d**2 + b**4*c**2*d/2) + x**5*(4*a**3*b*d**3/5 + 18*a**2*b**2*c*d**2/5 + 1
2*a*b**3*c**2*d/5 + b**4*c**3/5) + x**4*(a**4*d**3/4 + 3*a**3*b*c*d**2 + 9*
a**2*b**2*c**2*d/2 + a*b**3*c**3) + x**3*(a**4*c*d**2 + 4*a**3*b*c**2*d + 2
*a**2*b**2*c**3) + x**2*(3*a**4*c**2*d/2 + 2*a**3*b*c**3), True))
```

Giac [A] time = 1.2921, size = 1480, normalized size = 1.96

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="giac")
```

```
[Out] -(b^11*d^3*x^7 + 3*b^11*c*d^2*x^6 + 4*a*b^10*d^3*x^6 + 3*b^11*c^2*d*x^5 + 1
2*a*b^10*c*d^2*x^5 + 6*a^2*b^9*d^3*x^5 + 7*b^10*d^3*x^6 + b^11*c^3*x^4 + 12
*a*b^10*c^2*d*x^4 + 18*a^2*b^9*c*d^2*x^4 + 4*a^3*b^8*d^3*x^4 + 18*b^10*c*d^
2*x^5 + 24*a*b^9*d^3*x^5 + 4*a*b^10*c^3*x^3 + 18*a^2*b^9*c^2*d*x^3 + 12*a^3
*b^8*c*d^2*x^3 + a^4*b^7*d^3*x^3 + 15*b^10*c^2*d*x^4 + 60*a*b^9*c*d^2*x^4 +
 30*a^2*b^8*d^3*x^4 + 42*b^9*d^3*x^5 + 6*a^2*b^9*c^3*x^2 + 12*a^3*b^8*c^2*d
*x^2 + 3*a^4*b^7*c*d^2*x^2 + 4*b^10*c^3*x^3 + 48*a*b^9*c^2*d*x^3 + 72*a^2*b
^8*c*d^2*x^3 + 16*a^3*b^7*d^3*x^3 + 90*b^9*c*d^2*x^4 + 120*a*b^8*d^3*x^4 +
4*a^3*b^8*c^3*x + 3*a^4*b^7*c^2*d*x + 12*a*b^9*c^3*x^2 + 54*a^2*b^8*c^2*d*x
^2 + 36*a^3*b^7*c*d^2*x^2 + 3*a^4*b^6*d^3*x^2 + 60*b^9*c^2*d*x^3 + 240*a*b^
8*c*d^2*x^3 + 120*a^2*b^7*d^3*x^3 + 210*b^8*d^3*x^4 + a^4*b^7*c^3 + 12*a^2*
b^8*c^3*x + 24*a^3*b^7*c^2*d*x + 6*a^4*b^6*c*d^2*x + 12*b^9*c^3*x^2 + 144*a
*b^8*c^2*d*x^2 + 216*a^2*b^7*c*d^2*x^2 + 48*a^3*b^6*d^3*x^2 + 360*b^8*c*d^2
*x^3 + 480*a*b^7*d^3*x^3 + 4*a^3*b^7*c^3 + 3*a^4*b^6*c^2*d + 24*a*b^8*c^3*x
 + 108*a^2*b^7*c^2*d*x + 72*a^3*b^6*c*d^2*x + 6*a^4*b^5*d^3*x + 180*b^8*c^2
*d*x^2 + 720*a*b^7*c*d^2*x^2 + 360*a^2*b^6*d^3*x^2 + 840*b^7*d^3*x^3 + 12*a
^2*b^7*c^3 + 24*a^3*b^6*c^2*d + 6*a^4*b^5*c*d^2 + 24*b^8*c^3*x + 288*a*b^7*
c^2*d*x + 432*a^2*b^6*c*d^2*x + 96*a^3*b^5*d^3*x + 1080*b^7*c*d^2*x^2 + 144
0*a*b^6*d^3*x^2 + 24*a*b^7*c^3 + 108*a^2*b^6*c^2*d + 72*a^3*b^5*c*d^2 + 6*a
^4*b^4*d^3 + 360*b^7*c^2*d*x + 1440*a*b^6*c*d^2*x + 720*a^2*b^5*d^3*x + 252
0*b^6*d^3*x^2 + 24*b^7*c^3 + 288*a*b^6*c^2*d + 432*a^2*b^5*c*d^2 + 96*a^3*b
^4*d^3 + 2160*b^6*c*d^2*x + 2880*a*b^5*d^3*x + 360*b^6*c^2*d + 1440*a*b^5*c
*d^2 + 720*a^2*b^4*d^3 + 5040*b^5*d^3*x + 2160*b^5*c*d^2 + 2880*a*b^4*d^3 +
 5040*b^4*d^3)*e^(-b*x - a)/b^8
```

3.75 $\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx$

Optimal. Leaf size=495

$$-\frac{2de^{-a-bx}(a+bx)^5(bc-ad)}{b^3}-\frac{e^{-a-bx}(a+bx)^4(bc-ad)^2}{b^3}-\frac{10de^{-a-bx}(a+bx)^4(bc-ad)}{b^3}-\frac{4e^{-a-bx}(a+bx)^3(bc-ad)^2}{b^3}-4($$

```
[Out] (-720*d^2*E^(-a - b*x))/b^3 - (240*d*(b*c - a*d)*E^(-a - b*x))/b^3 - (24*(b
*c - a*d)^2*E^(-a - b*x))/b^3 - (720*d^2*E^(-a - b*x)*(a + b*x))/b^3 - (240
*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^3 - (24*(b*c - a*d)^2*E^(-a - b*x)
*(a + b*x))/b^3 - (360*d^2*E^(-a - b*x)*(a + b*x)^2)/b^3 - (120*d*(b*c - a*
d)*E^(-a - b*x)*(a + b*x)^2)/b^3 - (12*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)
^2)/b^3 - (120*d^2*E^(-a - b*x)*(a + b*x)^3)/b^3 - (40*d*(b*c - a*d)*E^(-a
- b*x)*(a + b*x)^3)/b^3 - (4*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^3)/b^3 -
(30*d^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (10*d*(b*c - a*d)*E^(-a - b*x)*(a +
 b*x)^4)/b^3 - ((b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (6*d^2*E^(-a
- b*x)*(a + b*x)^5)/b^3 - (2*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^3 -
(d^2*E^(-a - b*x)*(a + b*x)^6)/b^3
```

Rubi [A] time = 0.636341, antiderivative size = 495, normalized size of antiderivative = 1., number of steps used = 20, number of rules used = 3, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.12, Rules used = {2196, 2176, 2194}

$$-\frac{2de^{-a-bx}(a+bx)^5(bc-ad)}{b^3}-\frac{e^{-a-bx}(a+bx)^4(bc-ad)^2}{b^3}-\frac{10de^{-a-bx}(a+bx)^4(bc-ad)}{b^3}-\frac{4e^{-a-bx}(a+bx)^3(bc-ad)^2}{b^3}-4($$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^2,x]
```


```
[Out] (-720*d^2*E^(-a - b*x))/b^3 - (240*d*(b*c - a*d)*E^(-a - b*x))/b^3 - (24*(b
*c - a*d)^2*E^(-a - b*x))/b^3 - (720*d^2*E^(-a - b*x)*(a + b*x))/b^3 - (240
*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^3 - (24*(b*c - a*d)^2*E^(-a - b*x)
*(a + b*x))/b^3 - (360*d^2*E^(-a - b*x)*(a + b*x)^2)/b^3 - (120*d*(b*c - a*
d)*E^(-a - b*x)*(a + b*x)^2)/b^3 - (12*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)
^2)/b^3 - (120*d^2*E^(-a - b*x)*(a + b*x)^3)/b^3 - (40*d*(b*c - a*d)*E^(-a
- b*x)*(a + b*x)^3)/b^3 - (4*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^3)/b^3 -
(30*d^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (10*d*(b*c - a*d)*E^(-a - b*x)*(a +
 b*x)^4)/b^3 - ((b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (6*d^2*E^(-a
- b*x)*(a + b*x)^5)/b^3 - (2*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^3 -
(d^2*E^(-a - b*x)*(a + b*x)^6)/b^3
```


Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = \int \left(\frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^2}+\frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^2}+\frac{d^2e^{-a-bx}(a+bx)^6}{b^2}\right)dx$$
$$= \frac{d^2\int e^{-a-bx}(a+bx)^6\,dx}{b^2}+\frac{(2d(bc-ad))\int e^{-a-bx}(a+bx)^5\,dx}{b^2}+\frac{(bc-ad)^2\int e^{-a-bx}(a+$$
$$= -\frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3}-\frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3}-\frac{d^2e^{-a-bx}(a+bx)^6}{b^3}+\frac{(6d^2)}{}$$
$$= -\frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3}-\frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3}-\frac{(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}$$
$$= -\frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3}-\frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3}-\frac{4(bc-ad)^2e^{-a-bx}(a+}{b^3}$$
$$= -\frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}-\frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3}-\frac{12(bc-ad)^2e^{-a-bx}(a+}{b^3}$$
$$= -\frac{24(bc-ad)^2e^{-a-bx}}{b^3}-\frac{240d(bc-ad)e^{-a-bx}(a+bx)}{b^3}-\frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}-3$$
$$= -\frac{240d(bc-ad)e^{-a-bx}}{b^3}-\frac{24(bc-ad)^2e^{-a-bx}}{b^3}-\frac{720d^2e^{-a-bx}(a+bx)}{b^3}-\frac{240d(bc-ad)e^{-}}{b^3}$$
$$= -\frac{720d^2e^{-a-bx}}{b^3}-\frac{240d(bc-ad)e^{-a-bx}}{b^3}-\frac{24(bc-ad)^2e^{-a-bx}}{b^3}-\frac{720d^2e^{-a-bx}(a+bx)}{b^3}-2$$

Mathematica [A] time = 0.445216, size = 320, normalized size = 0.65

$$\frac{e^{-a-bx}\left(-2b^4x^2\left(3\left(a^2+2a+2\right)c^2+2\left(3a^2+8a+10\right)cdx+\left(3a^2+10a+15\right)d^2x^2\right)-4b^3x\left(\left(a^3+3a^2+6a+6\right)c^2+\left(\right.\right.\right.}{}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^2,x]
```

```
[Out] (E^(-a - b*x)*(-2*(360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d^2 - b^6*x^4*(c +
d*x)^2 - 2*b^5*x^3*(c + d*x)*(2*(1 + a)*c + (3 + 2*a)*d*x) - 2*b*d*((120 +
96*a + 36*a^2 + 8*a^3 + a^4)*c + (360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d*x)
 - 2*b^4*x^2*(3*(2 + 2*a + a^2)*c^2 + 2*(10 + 8*a + 3*a^2)*c*d*x + (15 + 10
*a + 3*a^2)*d^2*x^2) - 4*b^3*x*((6 + 6*a + 3*a^2 + a^3)*c^2 + (30 + 24*a +
9*a^2 + 2*a^3)*c*d*x + (30 + 20*a + 6*a^2 + a^3)*d^2*x^2) - b^2*((24 + 24*a
 + 12*a^2 + 4*a^3 + a^4)*c^2 + 2*(120 + 96*a + 36*a^2 + 8*a^3 + a^4)*c*d*x
+ (360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d^2*x^2)))/b^3
```

Maple [A] time = 0.005, size = 640, normalized size = 1.3

$$-\frac{\left(d^2b^6x^6+4\,ab^5d^2x^5+2\,b^6cdx^5+6\,a^2b^4d^2x^4+8\,ab^5cdx^4+b^6c^2x^4+6\,b^5d^2x^5+4\,a^3b^3d^2x^3+12\,a^2b^4cdx^3+4\,ab^5c^2x\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x)
```

```
[Out] -(b^6*d^2*x^6+4*a*b^5*d^2*x^5+2*b^6*c*d*x^5+6*a^2*b^4*d^2*x^4+8*a*b^5*c*d*x
^4+b^6*c^2*x^4+6*b^5*d^2*x^5+4*a^3*b^3*d^2*x^3+12*a^2*b^4*c*d*x^3+4*a*b^5*c
^2*x^3+20*a*b^4*d^2*x^4+10*b^5*c*d*x^4+a^4*b^2*d^2*x^2+8*a^3*b^3*c*d*x^2+6*
a^2*b^4*c^2*x^2+24*a^2*b^3*d^2*x^3+32*a*b^4*c*d*x^3+4*b^5*c^2*x^3+30*b^4*d^
2*x^4+2*a^4*b^2*c*d*x+4*a^3*b^3*c^2*x+12*a^3*b^2*d^2*x^2+36*a^2*b^3*c*d*x^2
+12*a*b^4*c^2*x^2+80*a*b^3*d^2*x^3+40*b^4*c*d*x^3+a^4*b^2*c^2+2*a^4*b*d^2*x
+16*a^3*b^2*c*d*x+12*a^2*b^3*c^2*x+72*a^2*b^2*d^2*x^2+96*a*b^3*c*d*x^2+12*b
^4*c^2*x^2+120*b^3*d^2*x^3+2*a^4*b*c*d+4*a^3*b^2*c^2+24*a^3*b*d^2*x+72*a^2*
b^2*c*d*x+24*a*b^3*c^2*x+240*a*b^2*d^2*x^2+120*b^3*c*d*x^2+2*a^4*d^2+16*a^3
*b*c*d+12*a^2*b^2*c^2+144*a^2*b*d^2*x+192*a*b^2*c*d*x+24*b^3*c^2*x+360*b^2*
d^2*x^2+24*a^3*d^2+72*a^2*b*c*d+24*a*b^2*c^2+480*a*b*d^2*x+240*b^2*c*d*x+14
4*a^2*d^2+192*a*b*c*d+24*b^2*c^2+720*b*d^2*x+480*a*d^2+240*b*c*d+720*d^2)*e
xp(-b*x-a)/b^3
```

Maxima [A] time = 1.18123, size = 809, normalized size = 1.63

$$-\frac{4\,(bx+1)a^3c^2e^{(-bx-a)}}{b}-\frac{a^4c^2e^{(-bx-a)}}{b}-\frac{2\,(bx+1)a^4cde^{(-bx-a)}}{b^2}-\frac{6\left(b^2x^2+2\,bx+2\right)a^2c^2e^{(-bx-a)}}{b}-\frac{8\left(b^2x^2+2\,bx+2\right)a^3cd}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c^2*e^(-b*x - a)/b - a^4*c^2*e^(-b*x - a)/b - 2*(b*x + 1)*
a^4*c*d*e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c^2*e^(-b*x - a)/b -
 8*(b^2*x^2 + 2*b*x + 2)*a^3*c*d*e^(-b*x - a)/b^2 - (b^2*x^2 + 2*b*x + 2)*a
^4*d^2*e^(-b*x - a)/b^3 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*c^2*e^(-b*x
 - a)/b - 12*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*c*d*e^(-b*x - a)/b^2 - 4
*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*d^2*e^(-b*x - a)/b^3 - (b^4*x^4 + 4*
b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c^2*e^(-b*x - a)/b - 8*(b^4*x^4 + 4*b^3
*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*c*d*e^(-b*x - a)/b^2 - 6*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*d^2*e^(-b*x - a)/b^3 - 2*(b^5*x^5 + 5
*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*c*d*e^(-b*x - a)/b^2 -
4*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*a*d^2*e^(
-b*x - a)/b^3 - (b^6*x^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x
^2 + 720*b*x + 720)*d^2*e^(-b*x - a)/b^3
```

Fricas [A] time = 1.43459, size = 844, normalized size = 1.71

$$-\frac{\left(b^6d^2x^6+2\left(b^6cd+(2\,a+3)b^5d^2\right)x^5+\left(a^4+4\,a^3+12\,a^2+24\,a+24\right)b^2c^2+\left(b^6c^2+2\,(4\,a+5)b^5cd+2\left(3\,a^2+10\,a+1\right.\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="fricas")
```

```
[Out] -(b^6*d^2*x^6 + 2*(b^6*c*d + (2*a + 3)*b^5*d^2)*x^5 + (a^4 + 4*a^3 + 12*a^2
 + 24*a + 24)*b^2*c^2 + (b^6*c^2 + 2*(4*a + 5)*b^5*c*d + 2*(3*a^2 + 10*a +
15)*b^4*d^2)*x^4 + 2*(a^4 + 8*a^3 + 36*a^2 + 96*a + 120)*b*c*d + 4*((a + 1)
*b^5*c^2 + (3*a^2 + 8*a + 10)*b^4*c*d + (a^3 + 6*a^2 + 20*a + 30)*b^3*d^2)*
x^3 + 2*(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*d^2 + (6*(a^2 + 2*a + 2)*b^4*
c^2 + 4*(2*a^3 + 9*a^2 + 24*a + 30)*b^3*c*d + (a^4 + 12*a^3 + 72*a^2 + 240*
a + 360)*b^2*d^2)*x^2 + 2*(2*(a^3 + 3*a^2 + 6*a + 6)*b^3*c^2 + (a^4 + 8*a^3
 + 36*a^2 + 96*a + 120)*b^2*c*d + (a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b*d
```

```
^2)*x)*e^(-b*x - a)/b^3
```

Sympy [A] time = 0.356124, size = 899, normalized size = 1.82

$$\begin{cases} \frac{(-a^4b^2c^2-2a^4b^2cdx-a^4b^2d^2x^2-2a^4bcd-2a^4bd^2x-2a^4d^2-4a^3b^3c^2x-8a^3b^3cdx^2-4a^3b^3d^2x^3-4a^3b^2c^2-16a^3b^2cdx-12a^3b^2d^2x^2-16a^3bcd-24a^3bd^2x-24a^3d^2-6}{} \\ a^4c^2x + \frac{b^4d^2x^7}{7} + x^6\left(\frac{2ab^3d^2}{3} + \frac{b^4cd}{3}\right) + x^5\left(\frac{6a^2b^2d^2}{5} + \frac{8ab^3cd}{5} + \frac{b^4c^2}{5}\right) + x^4\left(a^3bd^2 + 3a^2b^2cd + ab^3c^2\right) + x^3\left(\frac{a^4d^2}{3} + \frac{8a^3bcd}{3} + \right. \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c)**2,x)
```

```
[Out] Piecewise(((-a**4*b**2*c**2 - 2*a**4*b**2*c*d*x - a**4*b**2*d**2*x**2 - 2*a
**4*b*c*d - 2*a**4*b*d**2*x - 2*a**4*d**2 - 4*a**3*b**3*c**2*x - 8*a**3*b**
3*c*d*x**2 - 4*a**3*b**3*d**2*x**3 - 4*a**3*b**2*c**2 - 16*a**3*b**2*c*d*x
- 12*a**3*b**2*d**2*x**2 - 16*a**3*b*c*d - 24*a**3*b*d**2*x - 24*a**3*d**2
- 6*a**2*b**4*c**2*x**2 - 12*a**2*b**4*c*d*x**3 - 6*a**2*b**4*d**2*x**4 - 1
2*a**2*b**3*c**2*x - 36*a**2*b**3*c*d*x**2 - 24*a**2*b**3*d**2*x**3 - 12*a*
*2*b**2*c**2 - 72*a**2*b**2*c*d*x - 72*a**2*b**2*d**2*x**2 - 72*a**2*b*c*d
- 144*a**2*b*d**2*x - 144*a**2*d**2 - 4*a*b**5*c**2*x**3 - 8*a*b**5*c*d*x**
4 - 4*a*b**5*d**2*x**5 - 12*a*b**4*c**2*x**2 - 32*a*b**4*c*d*x**3 - 20*a*b*
*4*d**2*x**4 - 24*a*b**3*c**2*x - 96*a*b**3*c*d*x**2 - 80*a*b**3*d**2*x**3
- 24*a*b**2*c**2 - 192*a*b**2*c*d*x - 240*a*b**2*d**2*x**2 - 192*a*b*c*d -
480*a*b*d**2*x - 480*a*d**2 - b**6*c**2*x**4 - 2*b**6*c*d*x**5 - b**6*d**2*
x**6 - 4*b**5*c**2*x**3 - 10*b**5*c*d*x**4 - 6*b**5*d**2*x**5 - 12*b**4*c**
2*x**2 - 40*b**4*c*d*x**3 - 30*b**4*d**2*x**4 - 24*b**3*c**2*x - 120*b**3*c
*d*x**2 - 120*b**3*d**2*x**3 - 24*b**2*c**2 - 240*b**2*c*d*x - 360*b**2*d**
2*x**2 - 240*b*c*d - 720*b*d**2*x - 720*d**2)*exp(-a - b*x)/b**3, Ne(b**3,
0)), (a**4*c**2*x + b**4*d**2*x**7/7 + x**6*(2*a*b**3*d**2/3 + b**4*c*d/3)
+ x**5*(6*a**2*b**2*d**2/5 + 8*a*b**3*c*d/5 + b**4*c**2/5) + x**4*(a**3*b*d
**2 + 3*a**2*b**2*c*d + a*b**3*c**2) + x**3*(a**4*d**2/3 + 8*a**3*b*c*d/3 +
 2*a**2*b**2*c**2) + x**2*(a**4*c*d + 2*a**3*b*c**2), True))
```

Giac [A] time = 1.25861, size = 910, normalized size = 1.84

$$-\frac{(b^{10}d^2x^6 + 2\,b^{10}cdx^5 + 4\,ab^9d^2x^5 + b^{10}c^2x^4 + 8\,ab^9cdx^4 + 6\,a^2b^8d^2x^4 + 6\,b^9d^2x^5 + 4\,ab^9c^2x^3 + 12\,a^2b^8cdx^3 + 4\,a^3b^7d}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="giac")
```

```
[Out] -(b^10*d^2*x^6 + 2*b^10*c*d*x^5 + 4*a*b^9*d^2*x^5 + b^10*c^2*x^4 + 8*a*b^9*
c*d*x^4 + 6*a^2*b^8*d^2*x^4 + 6*b^9*d^2*x^5 + 4*a*b^9*c^2*x^3 + 12*a^2*b^8*
c*d*x^3 + 4*a^3*b^7*d^2*x^3 + 10*b^9*c*d*x^4 + 20*a*b^8*d^2*x^4 + 6*a^2*b^8
*c^2*x^2 + 8*a^3*b^7*c*d*x^2 + a^4*b^6*d^2*x^2 + 4*b^9*c^2*x^3 + 32*a*b^8*c
*d*x^3 + 24*a^2*b^7*d^2*x^3 + 30*b^8*d^2*x^4 + 4*a^3*b^7*c^2*x + 2*a^4*b^6*
c*d*x + 12*a*b^8*c^2*x^2 + 36*a^2*b^7*c*d*x^2 + 12*a^3*b^6*d^2*x^2 + 40*b^8
*c*d*x^3 + 80*a*b^7*d^2*x^3 + a^4*b^6*c^2 + 12*a^2*b^7*c^2*x + 16*a^3*b^6*c
*d*x + 2*a^4*b^5*d^2*x + 12*b^8*c^2*x^2 + 96*a*b^7*c*d*x^2 + 72*a^2*b^6*d^2
*x^2 + 120*b^7*d^2*x^3 + 4*a^3*b^6*c^2 + 2*a^4*b^5*c*d + 24*a*b^7*c^2*x + 7
2*a^2*b^6*c*d*x + 24*a^3*b^5*d^2*x + 120*b^7*c*d*x^2 + 240*a*b^6*d^2*x^2 +
12*a^2*b^6*c^2 + 16*a^3*b^5*c*d + 2*a^4*b^4*d^2 + 24*b^7*c^2*x + 192*a*b^6*
c*d*x + 144*a^2*b^5*d^2*x + 360*b^6*d^2*x^2 + 24*a*b^6*c^2 + 72*a^2*b^5*c*d
```

```
 + 24*a^3*b^4*d^2 + 240*b^6*c*d*x + 480*a*b^5*d^2*x + 24*b^6*c^2 + 192*a*b^
5*c*d + 144*a^2*b^4*d^2 + 720*b^5*d^2*x + 240*b^5*c*d + 480*a*b^4*d^2 + 720
*b^4*d^2)*e^(-b*x - a)/b^7
```

3.76 $\int e^{-a-bx}(a+bx)^4(c+dx)\,dx$

Optimal. Leaf size=271

$$-\frac{e^{-a-bx}(a+bx)^4(bc-ad)}{b^2}-\frac{4e^{-a-bx}(a+bx)^3(bc-ad)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2(bc-ad)}{b^2}-\frac{24e^{-a-bx}(a+bx)(bc-ad)}{b^2}-24\ldots$$

```
[Out] (-120*d*E^(-a - b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x))/b^2 - (120*d*E^(-
a - b*x)*(a + b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^2 - (60
*d*E^(-a - b*x)*(a + b*x)^2)/b^2 - (12*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2
)/b^2 - (20*d*E^(-a - b*x)*(a + b*x)^3)/b^2 - (4*(b*c - a*d)*E^(-a - b*x)*(
a + b*x)^3)/b^2 - (5*d*E^(-a - b*x)*(a + b*x)^4)/b^2 - ((b*c - a*d)*E^(-a -
 b*x)*(a + b*x)^4)/b^2 - (d*E^(-a - b*x)*(a + b*x)^5)/b^2
```

Rubi [A] time = 0.338639, antiderivative size = 271, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 3, integrand size = 23, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.13, Rules used = {2196, 2176, 2194}

$$-\frac{e^{-a-bx}(a+bx)^4(bc-ad)}{b^2}-\frac{4e^{-a-bx}(a+bx)^3(bc-ad)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2(bc-ad)}{b^2}-\frac{24e^{-a-bx}(a+bx)(bc-ad)}{b^2}-24\ldots$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x),x]
```

```
[Out] (-120*d*E^(-a - b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x))/b^2 - (120*d*E^(-
a - b*x)*(a + b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^2 - (60
*d*E^(-a - b*x)*(a + b*x)^2)/b^2 - (12*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2
)/b^2 - (20*d*E^(-a - b*x)*(a + b*x)^3)/b^2 - (4*(b*c - a*d)*E^(-a - b*x)*(
a + b*x)^3)/b^2 - (5*d*E^(-a - b*x)*(a + b*x)^4)/b^2 - ((b*c - a*d)*E^(-a -
 b*x)*(a + b*x)^4)/b^2 - (d*E^(-a - b*x)*(a + b*x)^5)/b^2
```

Rule 2196

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = \int\left(\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b}+\frac{de^{-a-bx}(a+bx)^5}{b}\right)dx$$
$$= \frac{d\int e^{-a-bx}(a+bx)^5\,dx}{b}+\frac{(bc-ad)\int e^{-a-bx}(a+bx)^4\,dx}{b}$$
$$= -\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2}-\frac{de^{-a-bx}(a+bx)^5}{b^2}+\frac{(5d)\int e^{-a-bx}(a+bx)^4\,dx}{b}+\frac{(4(bc-ad))\int}{}$$
$$= -\frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2}-\frac{5de^{-a-bx}(a+bx)^4}{b^2}-\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2}-\frac{de^{-a-bx}(a+}{b^2}$$
$$= -\frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2}-\frac{20de^{-a-bx}(a+bx)^3}{b^2}-\frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2}-\frac{5de^{-a-bx}}{}$$
$$= -\frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2}-\frac{60de^{-a-bx}(a+bx)^2}{b^2}-\frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2}-\frac{20de^{-a-}}{}$$
$$= -\frac{24(bc-ad)e^{-a-bx}}{b^2}-\frac{120de^{-a-bx}(a+bx)}{b^2}-\frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2}-\frac{60de^{-a-bx}(a+bx}{b^2}$$
$$= -\frac{120de^{-a-bx}}{b^2}-\frac{24(bc-ad)e^{-a-bx}}{b^2}-\frac{120de^{-a-bx}(a+bx)}{b^2}-\frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2}-60$$

Mathematica [A] time = 0.252916, size = 191, normalized size = 0.7

$$e^{-a-bx}\left(-2b^3x^2\left(3\left(a^2+2a+2\right)c+\left(3a^2+8a+10\right)dx\right)-2b^2x\left(2\left(a^3+3a^2+6a+6\right)c+\left(2a^3+9a^2+24a+30\right)dx\right)-b$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x),x]
```

```
[Out] (E^(-a - b*x)*(-((120 + 96*a + 36*a^2 + 8*a^3 + a^4)*d) - b^5*x^4*(c + d*x)
 - b^4*x^3*(4*(1 + a)*c + (5 + 4*a)*d*x) - 2*b^3*x^2*(3*(2 + 2*a + a^2)*c +
 (10 + 8*a + 3*a^2)*d*x) - 2*b^2*x*(2*(6 + 6*a + 3*a^2 + a^3)*c + (30 + 24*
a + 9*a^2 + 2*a^3)*d*x) - b*((24 + 24*a + 12*a^2 + 4*a^3 + a^4)*c + (120 +
96*a + 36*a^2 + 8*a^3 + a^4)*d*x)))/b^2
```

Maple [A] time = 0.005, size = 297, normalized size = 1.1

$$-\frac{\left(b^5dx^5+4\,ab^4dx^4+b^5cx^4+6\,a^2b^3dx^3+4\,ab^4cx^3+5\,b^4dx^4+4\,a^3b^2dx^2+6\,a^2b^3cx^2+16\,ab^3dx^3+4\,b^4cx^3+a^4bdx+4}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x)
```

```
[Out] -(b^5*d*x^5+4*a*b^4*d*x^4+b^5*c*x^4+6*a^2*b^3*d*x^3+4*a*b^4*c*x^3+5*b^4*d*x
^4+4*a^3*b^2*d*x^2+6*a^2*b^3*c*x^2+16*a*b^3*d*x^3+4*b^4*c*x^3+a^4*b*d*x+4*a
^3*b^2*c*x+18*a^2*b^2*d*x^2+12*a*b^3*c*x^2+20*b^3*d*x^3+a^4*b*c+8*a^3*b*d*x
+12*a^2*b^2*c*x+48*a*b^2*d*x^2+12*b^3*c*x^2+a^4*d+4*a^3*b*c+36*a^2*b*d*x+24
*a*b^2*c*x+60*b^2*d*x^2+8*a^3*d+12*a^2*b*c+96*a*b*d*x+24*b^2*c*x+36*a^2*d+2
4*a*b*c+120*b*d*x+96*a*d+24*b*c+120*d)*exp(-b*x-a)/b^2
```

Maxima [A] time = 1.08597, size = 464, normalized size = 1.71

$$-\frac{4\,(bx+1)a^3ce^{(-bx-a)}}{b}-\frac{a^4ce^{(-bx-a)}}{b}-\frac{(bx+1)a^4de^{(-bx-a)}}{b^2}-\frac{6\left(b^2x^2+2\,bx+2\right)a^2ce^{(-bx-a)}}{b}-\frac{4\left(b^2x^2+2\,bx+2\right)a^3de^{(-bx-a}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c*e^(-b*x - a)/b - a^4*c*e^(-b*x - a)/b - (b*x + 1)*a^4*d*
e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c*e^(-b*x - a)/b - 4*(b^2*x^
2 + 2*b*x + 2)*a^3*d*e^(-b*x - a)/b^2 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)
*a*c*e^(-b*x - a)/b - 6*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*d*e^(-b*x - a
)/b^2 - (b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c*e^(-b*x - a)/b -
 4*(b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*d*e^(-b*x - a)/b^2 -
(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*d*e^(-b*x -
 a)/b^2
```

Fricas [A] time = 1.50285, size = 468, normalized size = 1.73

$$-\frac{\left(b^5dx^5 + \left(b^5c + (4a+5)b^4d\right)x^4 + 2\left(2(a+1)b^4c + \left(3a^2+8a+10\right)b^3d\right)x^3 + \left(a^4+4a^3+12a^2+24a+24\right)bc + 2\left(\ldots\right.}{\ldots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="fricas")
```

```
[Out] -(b^5*d*x^5 + (b^5*c + (4*a + 5)*b^4*d)*x^4 + 2*(2*(a + 1)*b^4*c + (3*a^2 +
 8*a + 10)*b^3*d)*x^3 + (a^4 + 4*a^3 + 12*a^2 + 24*a + 24)*b*c + 2*(3*(a^2
+ 2*a + 2)*b^3*c + (2*a^3 + 9*a^2 + 24*a + 30)*b^2*d)*x^2 + (a^4 + 8*a^3 +
36*a^2 + 96*a + 120)*d + (4*(a^3 + 3*a^2 + 6*a + 6)*b^2*c + (a^4 + 8*a^3 +
36*a^2 + 96*a + 120)*b*d)*x)*e^(-b*x - a)/b^2
```

Sympy [A] time = 0.245281, size = 447, normalized size = 1.65

$$\begin{cases} \frac{\left(-a^4bc-a^4bdx-a^4d-4a^3b^2cx-4a^3b^2dx^2-4a^3bc-8a^3bdx-8a^3d-6a^2b^3cx^2-6a^2b^3dx^3-12a^2b^2cx-18a^2b^2dx^2-12a^2bc-36a^2bdx-36a^2d-4ab^4cx^3-4ab^4dx^4-12ab\ldots\right.}{b^{\ldots}} \\ a^4cx + \frac{b^4dx^6}{6} + x^5\left(\frac{4ab^3d}{5} + \frac{b^4c}{5}\right) + x^4\left(\frac{3a^2b^2d}{2} + ab^3c\right) + x^3\left(\frac{4a^3bd}{3} + 2a^2b^2c\right) + x^2\left(\frac{a^4d}{2} + 2a^3bc\right) \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c),x)
```

```
[Out] Piecewise(((-a**4*b*c - a**4*b*d*x - a**4*d - 4*a**3*b**2*c*x - 4*a**3*b**2
*d*x**2 - 4*a**3*b*c - 8*a**3*b*d*x - 8*a**3*d - 6*a**2*b**3*c*x**2 - 6*a**
2*b**3*d*x**3 - 12*a**2*b**2*c*x - 18*a**2*b**2*d*x**2 - 12*a**2*b*c - 36*a
**2*b*d*x - 36*a**2*d - 4*a*b**4*c*x**3 - 4*a*b**4*d*x**4 - 12*a*b**3*c*x**
2 - 16*a*b**3*d*x**3 - 24*a*b**2*c*x - 48*a*b**2*d*x**2 - 24*a*b*c - 96*a*b
*d*x - 96*a*d - b**5*c*x**4 - b**5*d*x**5 - 4*b**4*c*x**3 - 5*b**4*d*x**4 -
 12*b**3*c*x**2 - 20*b**3*d*x**3 - 24*b**2*c*x - 60*b**2*d*x**2 - 24*b*c -
120*b*d*x - 120*d)*exp(-a - b*x)/b**2, Ne(b**2, 0)), (a**4*c*x + b**4*d*x**
6/6 + x**5*(4*a*b**3*d/5 + b**4*c/5) + x**4*(3*a**2*b**2*d/2 + a*b**3*c) +
x**3*(4*a**3*b*d/3 + 2*a**2*b**2*c) + x**2*(a**4*d/2 + 2*a**3*b*c), True))
```

Giac [A] time = 1.24089, size = 447, normalized size = 1.65

$$-\frac{\left(b^9dx^5 + b^9cx^4 + 4ab^8dx^4 + 4ab^8cx^3 + 6a^2b^7dx^3 + 5b^8dx^4 + 6a^2b^7cx^2 + 4a^3b^6dx^2 + 4b^8cx^3 + 16ab^7dx^3 + 4a^3b^6c\ldots\right.}{\ldots}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="giac")
```

```
[Out] -(b^9*d*x^5 + b^9*c*x^4 + 4*a*b^8*d*x^4 + 4*a*b^8*c*x^3 + 6*a^2*b^7*d*x^3 +
 5*b^8*d*x^4 + 6*a^2*b^7*c*x^2 + 4*a^3*b^6*d*x^2 + 4*b^8*c*x^3 + 16*a*b^7*d
*x^3 + 4*a^3*b^6*c*x + a^4*b^5*d*x + 12*a*b^7*c*x^2 + 18*a^2*b^6*d*x^2 + 20
*b^7*d*x^3 + a^4*b^5*c + 12*a^2*b^6*c*x + 8*a^3*b^5*d*x + 12*b^7*c*x^2 + 48
*a*b^6*d*x^2 + 4*a^3*b^5*c + a^4*b^4*d + 24*a*b^6*c*x + 36*a^2*b^5*d*x + 60
*b^6*d*x^2 + 12*a^2*b^5*c + 8*a^3*b^4*d + 24*b^6*c*x + 96*a*b^5*d*x + 24*a*
b^5*c + 36*a^2*b^4*d + 120*b^5*d*x + 24*b^5*c + 96*a*b^4*d + 120*b^4*d)*e^(
-b*x - a)/b^6
```

3.77 $\int e^{-a-bx}(a+bx)^4\,dx$

Optimal. Leaf size=102

$$-\frac{e^{-a-bx}(a+bx)^4}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{24e^{-a-bx}}{b}$$

```
[Out] (-24*E^(-a - b*x))/b - (24*E^(-a - b*x)*(a + b*x))/b - (12*E^(-a - b*x)*(a
+ b*x)^2)/b - (4*E^(-a - b*x)*(a + b*x)^3)/b - (E^(-a - b*x)*(a + b*x)^4)/b
```

Rubi [A] time = 0.0964918, antiderivative size = 102, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 18, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2176, 2194}

$$-\frac{e^{-a-bx}(a+bx)^4}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{24e^{-a-bx}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[E^(-a - b*x)*(a + b*x)^4,x]
```

```
[Out] (-24*E^(-a - b*x))/b - (24*E^(-a - b*x)*(a + b*x))/b - (12*E^(-a - b*x)*(a
+ b*x)^2)/b - (4*E^(-a - b*x)*(a + b*x)^3)/b - (E^(-a - b*x)*(a + b*x)^4)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\int e^{-a-bx}(a+bx)^4\,dx &= -\frac{e^{-a-bx}(a+bx)^4}{b}+4\int e^{-a-bx}(a+bx)^3\,dx\\
&= -\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+12\int e^{-a-bx}(a+bx)^2\,dx\\
&= -\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+24\int e^{-a-bx}(a+bx)\,dx\\
&= -\frac{24e^{-a-bx}(a+bx)}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+24\int e^{-a-bx}\,dx\\
&= -\frac{24e^{-a-bx}}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}
\end{aligned}$$

Mathematica [A] time = 0.061442, size = 50, normalized size = 0.49

$$\frac{e^{-a-bx}\left(-(a+bx)^4-4(a+bx)^3-12(a+bx)^2-24(a+bx)-24\right)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4,x]
```

```
[Out] (E^(-a - b*x)*(-24 - 24*(a + b*x) - 12*(a + b*x)^2 - 4*(a + b*x)^3 - (a + b
*x)^4))/b
```

Maple [A] time = 0.004, size = 108, normalized size = 1.1

$$-\frac{\left(b^4x^4+4\,b^3x^3a+6\,a^2b^2x^2+4\,b^3x^3+4\,a^3bx+12\,ab^2x^2+a^4+12\,a^2bx+12\,b^2x^2+4\,a^3+24\,abx+12\,a^2+24\,bx+24\,a}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4,x)
```

```
[Out] -(b^4*x^4+4*a*b^3*x^3+6*a^2*b^2*x^2+4*b^3*x^3+4*a^3*b*x+12*a*b^2*x^2+a^4+12
*a^2*b*x+12*b^2*x^2+4*a^3+24*a*b*x+12*a^2+24*b*x+24*a+24)*exp(-b*x-a)/b
```

Maxima [A] time = 1.12265, size = 201, normalized size = 1.97

$$-\frac{4\,(bx+1)a^3e^{(-bx-a)}}{b}-\frac{a^4e^{(-bx-a)}}{b}-\frac{6\left(b^2x^2+2\,bx+2\right)a^2e^{(-bx-a)}}{b}-\frac{4\left(b^3x^3+3\,b^2x^2+6\,bx+6\right)ae^{(-bx-a)}}{b}-\frac{\left(b^4x^4+4\,b^3x^3}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*e^(-b*x - a)/b - a^4*e^(-b*x - a)/b - 6*(b^2*x^2 + 2*b*x +
 2)*a^2*e^(-b*x - a)/b - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*e^(-b*x - a)
/b - (b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*e^(-b*x - a)/b
```

Fricas [A] time = 1.42894, size = 192, normalized size = 1.88

$$-\frac{\left(b^4x^4+4\,(a+1)b^3x^3+6\left(a^2+2\,a+2\right)b^2x^2+a^4+4\,a^3+4\left(a^3+3\,a^2+6\,a+6\right)bx+12\,a^2+24\,a+24\right)e^{(-bx-a)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="fricas")
```

```
[Out] -(b^4*x^4 + 4*(a + 1)*b^3*x^3 + 6*(a^2 + 2*a + 2)*b^2*x^2 + a^4 + 4*a^3 + 4
*(a^3 + 3*a^2 + 6*a + 6)*b*x + 12*a^2 + 24*a + 24)*e^(-b*x - a)/b
```

Sympy [A] time = 0.164435, size = 158, normalized size = 1.55

$$\begin{cases} \frac{\left(-a^4-4a^3bx-4a^3-6a^2b^2x^2-12a^2bx-12a^2-4ab^3x^3-12ab^2x^2-24abx-24a-b^4x^4-4b^3x^3-12b^2x^2-24bx-24\right)e^{-a-bx}}{b} & \text{for } b\neq 0 \\ a^4x+2a^3bx^2+2a^2b^2x^3+ab^3x^4+\frac{b^4x^5}{5} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4,x)
```

```
[Out] Piecewise(((-a**4 - 4*a**3*b*x - 4*a**3 - 6*a**2*b**2*x**2 - 12*a**2*b*x -
12*a**2 - 4*a*b**3*x**3 - 12*a*b**2*x**2 - 24*a*b*x - 24*a - b**4*x**4 - 4*
b**3*x**3 - 12*b**2*x**2 - 24*b*x - 24)*exp(-a - b*x)/b, Ne(b, 0)), (a**4*x
 + 2*a**3*b*x**2 + 2*a**2*b**2*x**3 + a*b**3*x**4 + b**4*x**5/5, True))
```

Giac [A] time = 1.20679, size = 178, normalized size = 1.75

$$-\frac{\left(b^8x^4 + 4\,ab^7x^3 + 6\,a^2b^6x^2 + 4\,b^7x^3 + 4\,a^3b^5x + 12\,ab^6x^2 + a^4b^4 + 12\,a^2b^5x + 12\,b^6x^2 + 4\,a^3b^4 + 24\,ab^5x + 12\,a^2b^4 +}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="giac")
```

```
[Out] -(b^8*x^4 + 4*a*b^7*x^3 + 6*a^2*b^6*x^2 + 4*b^7*x^3 + 4*a^3*b^5*x + 12*a*b^
6*x^2 + a^4*b^4 + 12*a^2*b^5*x + 12*b^6*x^2 + 4*a^3*b^4 + 24*a*b^5*x + 12*a
^2*b^4 + 24*b^5*x + 24*a*b^4 + 24*b^4)*e^(-b*x - a)/b^5
```

3.78 $\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx$

Optimal. Leaf size=277

$$\frac{e^{\frac{bc}{d}-a}(bc-ad)^4\mathrm{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{e^{-a-bx}(bc-ad)^3}{d^4}-\frac{e^{-a-bx}(bc-ad)^2}{d^3}-\frac{e^{-a-bx}(a+bx)(bc-ad)^2}{d^3}+\frac{2e^{-a-bx}(bc-ad)}{d^2}+\frac{e^{-a-bx}}{}$$

```
[Out] (-6*E^(-a - b*x))/d + (2*(b*c - a*d)*E^(-a - b*x))/d^2 - ((b*c - a*d)^2*E^(
-a - b*x))/d^3 + ((b*c - a*d)^3*E^(-a - b*x))/d^4 - (6*E^(-a - b*x)*(a + b*
x))/d + (2*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/d^2 - ((b*c - a*d)^2*E^(-a -
 b*x)*(a + b*x))/d^3 - (3*E^(-a - b*x)*(a + b*x)^2)/d + ((b*c - a*d)*E^(-a
- b*x)*(a + b*x)^2)/d^2 - (E^(-a - b*x)*(a + b*x)^3)/d + ((b*c - a*d)^4*E^(
-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5
```

Rubi [A] time = 0.338364, antiderivative size = 277, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 4, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.16, Rules used = {2199, 2194, 2176, 2178}

$$\frac{e^{\frac{bc}{d}-a}(bc-ad)^4\mathrm{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{e^{-a-bx}(bc-ad)^3}{d^4}-\frac{e^{-a-bx}(bc-ad)^2}{d^3}-\frac{e^{-a-bx}(a+bx)(bc-ad)^2}{d^3}+\frac{2e^{-a-bx}(bc-ad)}{d^2}+\frac{e^{-a-bx}}{}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x),x]
```


```
[Out] (-6*E^(-a - b*x))/d + (2*(b*c - a*d)*E^(-a - b*x))/d^2 - ((b*c - a*d)^2*E^(
-a - b*x))/d^3 + ((b*c - a*d)^3*E^(-a - b*x))/d^4 - (6*E^(-a - b*x)*(a + b*
x))/d + (2*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/d^2 - ((b*c - a*d)^2*E^(-a -
 b*x)*(a + b*x))/d^3 - (3*E^(-a - b*x)*(a + b*x)^2)/d + ((b*c - a*d)*E^(-a
- b*x)*(a + b*x)^2)/d^2 - (E^(-a - b*x)*(a + b*x)^3)/d + ((b*c - a*d)^4*E^(
-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
```

```
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = \int \left(-\frac{b(bc-ad)^3e^{-a-bx}}{d^4} + \frac{b(bc-ad)^2e^{-a-bx}(a+bx)}{d^3} - \frac{b(bc-ad)e^{-a-bx}(a+bx)^2}{d^2} + \frac{be^{-a-bx}(a+\cdots}{d}\right.$$

$$= \frac{b\int e^{-a-bx}(a+bx)^3\,dx}{d} - \frac{(b(bc-ad))\int e^{-a-bx}(a+bx)^2\,dx}{d^2} + \frac{\left(b(bc-ad)^2\right)\int e^{-a-bx}(a+bx)\,dx}{d^3}$$

$$= \frac{(bc-ad)^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3} + \frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2} - \frac{e^{-a-bx}(a+bx)^3}{d} + \frac{(b\cdots}{}$$

$$= -\frac{(bc-ad)^2e^{-a-bx}}{d^3} + \frac{(bc-ad)^3e^{-a-bx}}{d^4} + \frac{2(bc-ad)e^{-a-bx}(a+bx)}{d^2} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3} - $$

$$= \frac{2(bc-ad)e^{-a-bx}}{d^2} - \frac{(bc-ad)^2e^{-a-bx}}{d^3} + \frac{(bc-ad)^3e^{-a-bx}}{d^4} - \frac{6e^{-a-bx}(a+bx)}{d} + \frac{2(bc-ad)e^{-a-bx}(a\cdots}{d^2}$$

$$= -\frac{6e^{-a-bx}}{d} + \frac{2(bc-ad)e^{-a-bx}}{d^2} - \frac{(bc-ad)^2e^{-a-bx}}{d^3} + \frac{(bc-ad)^3e^{-a-bx}}{d^4} - \frac{6e^{-a-bx}(a+bx)}{d} + \frac{2(bc-\cdots}{}$$

Mathematica [A] time = 0.298496, size = 175, normalized size = 0.63

$$\frac{e^{-a-bx}\left((bc-ad)^4e^{b\left(\frac{c}{d}+x\right)}\text{Ei}\left(-\frac{b(c+dx)}{d}\right) - d\left(2bd^2\left(\left(3a^2+4a+3\right)dx - \left(3a^2+2a+1\right)c\right) + 2\left(2a^3+3a^2+4a+3\right)d^3 + b\cdots\right.\right.}{d^5}$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x),x]
```

```
[Out] (E^(-a - b*x)*(-(d*(2*(3 + 4*a + 3*a^2 + 2*a^3)*d^3 + 2*b*d^2*(-((1 + 2*a +
 3*a^2)*c) + (3 + 4*a + 3*a^2)*d*x) + b^2*d*((1 + 4*a)*c^2 - 2*(1 + 2*a)*c*
d*x + (3 + 4*a)*d^2*x^2) + b^3*(-c^3 + c^2*d*x - c*d^2*x^2 + d^3*x^3))) + (
b*c - a*d)^4*E^(b*(c/d + x))*ExpIntegralEi[-((b*(c + d*x))/d)]))/d^5
```

Maple [A] time = 0.012, size = 489, normalized size = 1.8

$$-\frac{1}{b}\left(-\frac{b\left((-bx-a)^3\,\mathrm{e}^{-bx-a} - 3\,(-bx-a)^2\,\mathrm{e}^{-bx-a} + 6\,(-bx-a)\,\mathrm{e}^{-bx-a} - 6\,\mathrm{e}^{-bx-a}\right)}{d} + \frac{ab\left((-bx-a)^2\,\mathrm{e}^{-bx-a} - 2\,(-bx-a)\cdots\right.}{d}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x)
```

```
[Out] -1/b*(-b/d*((-b*x-a)^3*exp(-b*x-a)-3*(-b*x-a)^2*exp(-b*x-a)+6*(-b*x-a)*exp(
-b*x-a)-6*exp(-b*x-a))+b/d*a*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*exp(-b*x-a)
+2*exp(-b*x-a))-b^2/d^2*c*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*exp(-b*x-a)+2*
exp(-b*x-a))-b/d*a^2*((-b*x-a)*exp(-b*x-a)-exp(-b*x-a))+2*b^2/d^2*a*c*((-b*
x-a)*exp(-b*x-a)-exp(-b*x-a))-b^3/d^3*c^2*((-b*x-a)*exp(-b*x-a)-exp(-b*x-a)
)+b/d*a^3*exp(-b*x-a)-3*b^2/d^2*a^2*c*exp(-b*x-a)+3*b^3/d^3*a*c^2*exp(-b*x-
a)-b^4/d^4*c^3*exp(-b*x-a)+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^3
*c^3*d+b^4*c^4)*b/d^5*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))
```

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

$$-\frac{a^4e^{\left(-a+\frac{bc}{d}\right)}E_1\left(\frac{(dx+c)b}{d}\right)}{d}-\frac{\left(b^3d^2x^4+\left(4\,ab^2d^2+3\,b^2d^2\right)x^3+\left(6\,a^2bd^2+b^2cd+8\,abd^2+6\,bd^2\right)x^2+\left(4\,a^3d^2-b^2c^2+6\,a^2d^2\right.}{d^3xe^a+cd^2e^a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(1, (d*x + c)*b/d)/d - (b^3*d^2*x^4 + (4*
a*b^2*d^2 + 3*b^2*d^2)*x^3 + (6*a^2*b*d^2 + b^2*c*d + 8*a*b*d^2 + 6*b*d^2)*
x^2 + (4*a^3*d^2 - b^2*c^2 + 6*a^2*d^2 + 4*b*c*d + 4*(b*c*d + 2*d^2)*a + 6*
d^2)*x)*e^(-b*x)/(d^3*x*e^a + c*d^2*e^a) + integrate((4*a^3*c*d^2 - b^2*c^3
 + 6*a^2*c*d^2 + 4*b*c^2*d + 6*c*d^2 + 4*(b*c^2*d + 2*c*d^2)*a + (b^3*c^3 +
 6*a^2*b*c*d^2 - 2*b^2*c^2*d + 6*b*c*d^2 - 4*(b^2*c^2*d - 2*b*c*d^2)*a)*x)*
e^(-b*x)/(d^4*x^2*e^a + 2*c*d^3*x*e^a + c^2*d^2*e^a), x)
```

Fricas [A] time = 1.52102, size = 479, normalized size = 1.73

$$\frac{\left(b^4c^4-4\,ab^3c^3d+6\,a^2b^2c^2d^2-4\,a^3bcd^3+a^4d^4\right)\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(\frac{bc-ad}{d}\right)}-\left(b^3d^4x^3-b^3c^3d+(4\,a+1)b^2c^2d^2-2\left(3\,a^2+2\,a+\right.\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="fricas")
```

```
[Out] ((b^4*c^4 - 4*a*b^3*c^3*d + 6*a^2*b^2*c^2*d^2 - 4*a^3*b*c*d^3 + a^4*d^4)*Ei
(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) - (b^3*d^4*x^3 - b^3*c^3*d + (4*a + 1)
*b^2*c^2*d^2 - 2*(3*a^2 + 2*a + 1)*b*c*d^3 + 2*(2*a^3 + 3*a^2 + 4*a + 3)*d^
4 - (b^3*c*d^3 - (4*a + 3)*b^2*d^4)*x^2 + (b^3*c^2*d^2 - 2*(2*a + 1)*b^2*c*
d^3 + 2*(3*a^2 + 4*a + 3)*b*d^4)*x)*e^(-b*x - a))/d^5
```

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

$$\left(\int\frac{a^4}{ce^{bx}+dxe^{bx}}\,dx+\int\frac{b^4x^4}{ce^{bx}+dxe^{bx}}\,dx+\int\frac{4ab^3x^3}{ce^{bx}+dxe^{bx}}\,dx+\int\frac{6a^2b^2x^2}{ce^{bx}+dxe^{bx}}\,dx+\int\frac{4a^3bx}{ce^{bx}+dxe^{bx}}\,dx\right)e^{-a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c),x)
```

```
[Out] (Integral(a**4/(c*exp(b*x) + d*x*exp(b*x)), x) + Integral(b**4*x**4/(c*exp(
b*x) + d*x*exp(b*x)), x) + Integral(4*a*b**3*x**3/(c*exp(b*x) + d*x*exp(b*x
)), x) + Integral(6*a**2*b**2*x**2/(c*exp(b*x) + d*x*exp(b*x)), x) + Integr
al(4*a**3*b*x/(c*exp(b*x) + d*x*exp(b*x)), x))*exp(-a)
```

Giac [A] time = 1.18869, size = 240, normalized size = 0.87

$$\frac{b^4c^4\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(-a+\frac{bc}{d}\right)}-4\,ab^3c^3d\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(-a+\frac{bc}{d}\right)}+6\,a^2b^2c^2d^2\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(-a+\frac{bc}{d}\right)}-4\,a^3bcd^3\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(-a+\frac{bc}{d}\right)}}{d^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="giac")
```

```
[Out] (b^4*c^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^3*c^3*d*Ei(-(b*d*x + b
*c)/d)*e^(-a + b*c/d) + 6*a^2*b^2*c^2*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/
d) - 4*a^3*b*c*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + a^4*d^4*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d))/d^5
```

3.79 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx$

Optimal. Leaf size=258

$$\frac{4b^2e^{-a-bx}(c+dx)(bc-ad)}{d^4}-\frac{b^3e^{-a-bx}(c+dx)^2}{d^4}-\frac{2b^2e^{-a-bx}(c+dx)}{d^3}-\frac{be^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{4be^{\frac{bc}{d}-a}(bc-ad)^3\text{E}}{d^5}$$

```
[Out] (-2*b*E^(-a - b*x))/d^2 + (4*b*(b*c - a*d)*E^(-a - b*x))/d^3 - (6*b*(b*c -
a*d)^2*E^(-a - b*x))/d^4 - ((b*c - a*d)^4*E^(-a - b*x))/(d^5*(c + d*x)) - (
2*b^2*E^(-a - b*x)*(c + d*x))/d^3 + (4*b^2*(b*c - a*d)*E^(-a - b*x)*(c + d*
x))/d^4 - (b^3*E^(-a - b*x)*(c + d*x)^2)/d^4 - (4*b*(b*c - a*d)^3*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (b*(b*c - a*d)^4*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6
```

Rubi [A] time = 0.378844, antiderivative size = 258, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 5, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.2, Rules used = {2199, 2194, 2177, 2178, 2176}

$$\frac{4b^2e^{-a-bx}(c+dx)(bc-ad)}{d^4}-\frac{b^3e^{-a-bx}(c+dx)^2}{d^4}-\frac{2b^2e^{-a-bx}(c+dx)}{d^3}-\frac{be^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{4be^{\frac{bc}{d}-a}(bc-ad)^3\text{E}}{d^5}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^2,x]
```


```
[Out] (-2*b*E^(-a - b*x))/d^2 + (4*b*(b*c - a*d)*E^(-a - b*x))/d^3 - (6*b*(b*c -
a*d)^2*E^(-a - b*x))/d^4 - ((b*c - a*d)^4*E^(-a - b*x))/(d^5*(c + d*x)) - (
2*b^2*E^(-a - b*x)*(c + d*x))/d^3 + (4*b^2*(b*c - a*d)*E^(-a - b*x)*(c + d*
x))/d^4 - (b^3*E^(-a - b*x)*(c + d*x)^2)/d^4 - (4*b*(b*c - a*d)^3*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (b*(b*c - a*d)^4*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \int \left(\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4} + \frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^2} - \frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)} - \frac{4b^3(bc-ad)e^{-a-bx}(c+dx)}{d^4}\right.$$

$$= \frac{b^4\int e^{-a-bx}(c+dx)^2\,dx}{d^4} - \frac{\left(4b^3(bc-ad)\right)\int e^{-a-bx}(c+dx)\,dx}{d^4} + \frac{\left(6b^2(bc-ad)^2\right)\int e^{-a-bx}\,dx}{d^4} - $$

$$= -\frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} + \frac{4b^2(bc-ad)e^{-a-bx}(c+dx)}{d^4} - \frac{b^3e^{-a-bx}(c+dx)^2}{d^4} - $$

$$= \frac{4b(bc-ad)e^{-a-bx}}{d^3} - \frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2e^{-a-bx}(c+dx)}{d^3} + \frac{4b^2(bc-ad)}{}$$

$$= -\frac{2be^{-a-bx}}{d^2} + \frac{4b(bc-ad)e^{-a-bx}}{d^3} - \frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2e^{-a-bx}(c+dx)}{d^3} + $$

Mathematica [A] time = 0.437347, size = 163, normalized size = 0.63

$$\frac{e^{-a}\left(-\frac{de^{-bx}\left(bd(c+dx)\left(2\left(3a^2+2a+1\right)d^2-2(4a+1)bcd+3b^2c^2\right)-2b^2d^2x(c+dx)(bc-(2a+1)d)+(bc-ad)^4+b^3d^3x^2(c+dx)\right)}{c+dx} - be^{\frac{bc}{d}}(bc-(a-4)d)(bc-ad)\right.}{d^6}$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^2,x]
```

```
[Out] (-((d*((b*c - a*d)^4 + b*d*(3*b^2*c^2 - 2*(1 + 4*a)*b*c*d + 2*(1 + 2*a + 3*
a^2)*d^2)*(c + d*x) - 2*b^2*d^2*(b*c - (1 + 2*a)*d)*x*(c + d*x) + b^3*d^3*x
^2*(c + d*x)))/(E^(b*x)*(c + d*x))) - b*(b*c - (-4 + a)*d)*(b*c - a*d)^3*E^
((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(d^6*E^a)
```

Maple [A] time = 0.015, size = 406, normalized size = 1.6

$$-\frac{1}{b}\left(\frac{b^2\left((-bx-a)^2e^{-bx-a}-2(-bx-a)e^{-bx-a}+2e^{-bx-a}\right)}{d^2} - 2\frac{ab^2\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^2} + 2\frac{b^3c\left((-bx-a)e^{-bx-a}\right.}{d^3}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x)
```

```
[Out] -1/b*(b^2/d^2*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*exp(-b*x-a)+2*exp(-b*x-a))
-2*b^2/d^2*a*((-b*x-a)*exp(-b*x-a)-exp(-b*x-a))+2*b^3/d^3*c*((-b*x-a)*exp(-
b*x-a)-exp(-b*x-a))+3*b^2/d^2*a^2*exp(-b*x-a)-6*b^3/d^3*a*c*exp(-b*x-a)+3*b
^4/d^4*c^2*exp(-b*x-a)+4/d^5*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^3)*
b^2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*
b^2*c^2*d^2-4*a*b^3*c^3*d+b^4*c^4)*b^2/d^6*(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/
d)-exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)))
```

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

$$-\frac{a^4 e^{\left(-a+\frac{bc}{d}\right)} E_2\left(\frac{(dx+c)b}{d}\right)}{(dx+c)d} - \frac{\left(b^3d^2x^4 + 2\left(2\,ab^2d^2 + b^2d^2\right)x^3 + 2\left(3\,a^2bd^2 + b^2cd + 2\,abd^2 + bd^2\right)x^2 + 2\left(2\,a^3d^2 - b^2c^2 + 4\,ab\right.\right.}{d^4x^2e^a + 2\,cd^3xe^a + c^2d^2e^a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(2, (d*x + c)*b/d)/((d*x + c)*d) - (b^3*d
^2*x^4 + 2*(2*a*b^2*d^2 + b^2*d^2)*x^3 + 2*(3*a^2*b*d^2 + b^2*c*d + 2*a*b*d
^2 + b*d^2)*x^2 + 2*(2*a^3*d^2 - b^2*c^2 + 4*a*b*c*d + 2*b*c*d)*x)*e^(-b*x)
/(d^4*x^2*e^a + 2*c*d^3*x*e^a + c^2*d^2*e^a) - integrate(-2*(2*a^3*c*d^2 -
b^2*c^3 + 4*a*b*c^2*d + 2*b*c^2*d + (b^3*c^3 - 4*a*b^2*c^2*d + 6*a^2*b*c*d^
2 - 2*a^3*d^3 + b^2*c^2*d)*x)*e^(-b*x)/(d^5*x^3*e^a + 3*c*d^4*x^2*e^a + 3*c
^2*d^3*x*e^a + c^3*d^2*e^a), x)
```

Fricas [A] time = 1.53417, size = 729, normalized size = 2.83

$$-\frac{\left(b^5c^5 - 4\,(a-1)b^4c^4d + 6\left(a^2 - 2\,a\right)b^3c^3d^2 - 4\left(a^3 - 3\,a^2\right)b^2c^2d^3 + \left(a^4 - 4\,a^3\right)bcd^4 + \left(b^5c^4d - 4\,(a-1)b^4c^3d^2 + 6\left(a^2 - 2\right.\right.\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="fricas")
```

```
[Out] -((b^5*c^5 - 4*(a - 1)*b^4*c^4*d + 6*(a^2 - 2*a)*b^3*c^3*d^2 - 4*(a^3 - 3*a
^2)*b^2*c^2*d^3 + (a^4 - 4*a^3)*b*c*d^4 + (b^5*c^4*d - 4*(a - 1)*b^4*c^3*d^
2 + 6*(a^2 - 2*a)*b^3*c^2*d^3 - 4*(a^3 - 3*a^2)*b^2*c*d^4 + (a^4 - 4*a^3)*b
*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) + (b^3*d^5*x^3 + b^4*c^4*d
- (4*a - 3)*b^3*c^3*d^2 + a^4*d^5 + 2*(3*a^2 - 4*a - 1)*b^2*c^2*d^3 - 2*(2*
a^3 - 3*a^2 - 2*a - 1)*b*c*d^4 - (b^3*c*d^4 - 2*(2*a + 1)*b^2*d^5)*x^2 + (b
^3*c^2*d^3 - 4*a*b^2*c*d^4 + 2*(3*a^2 + 2*a + 1)*b*d^5)*x)*e^(-b*x - a))/(d
^7*x + c*d^6)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**2,x)
```

```
[Out] Timed out
```

Giac [B] time = 1.74218, size = 1037, normalized size = 4.02

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="giac")
```

```
[Out] -(b^5*c^4*d*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^4*c^3*d^2*x*Ei(-(
b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^3*c^2*d^3*x*Ei(-(b*d*x + b*c)/d)*e
^(-a + b*c/d) - 4*a^3*b^2*c*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + a^4
*b*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^5*c^5*Ei(-(b*d*x + b*c)/d)
*e^(-a + b*c/d) - 4*a*b^4*c^4*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2
*b^3*c^3*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^2*c^2*d^3*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + a^4*b*c*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*
c/d) + 4*b^4*c^3*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^3*c^2*d
^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*a^2*b^2*c*d^4*x*Ei(-(b*d*x +
b*c)/d)*e^(-a + b*c/d) - 4*a^3*b*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 4*b^4*c^4*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^3*c^3*d^2*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + 12*a^2*b^2*c^2*d^3*Ei(-(b*d*x + b*c)/d)*e^(
-a + b*c/d) - 4*a^3*b*c*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^4*c^4*d
*e^(-b*x - a) - 4*a*b^3*c^3*d^2*e^(-b*x - a) + 6*a^2*b^2*c^2*d^3*e^(-b*x -
a) - 4*a^3*b*c*d^4*e^(-b*x - a) + a^4*d^5*e^(-b*x - a))/(d^7*x + c*d^6)
```

3.80 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx$

Optimal. Leaf size=294

$$\frac{b^2e^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{2d^7}+\frac{4b^2e^{\frac{bc}{d}-a}(bc-ad)^3\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}+\frac{6b^2e^{\frac{bc}{d}-a}(bc-ad)^2\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{b^2e^{-a-bx}(3bc-4ad}{d^4}$$

```
[Out] -((b^2*E^(-a - b*x))/d^3) + (b^2*(3*b*c - 4*a*d)*E^(-a - b*x))/d^4 - (b^3*E
^(-a - b*x)*x)/d^3 - ((b*c - a*d)^4*E^(-a - b*x))/(2*d^5*(c + d*x)^2) + (4*
b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)) + (b*(b*c - a*d)^4*E^(-a - b*
x))/(2*d^6*(c + d*x)) + (6*b^2*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi
[-((b*(c + d*x))/d)])/d^5 + (4*b^2*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegr
alEi[-((b*(c + d*x))/d)])/d^6 + (b^2*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpInte
gralEi[-((b*(c + d*x))/d)])/(2*d^7)
```

Rubi [A] time = 0.407777, antiderivative size = 294, normalized size of antiderivative = 1., number of steps used = 11, number of rules used = 5, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.2, Rules used = {2199, 2194, 2176, 2177, 2178}

$$\frac{b^2e^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{2d^7}+\frac{4b^2e^{\frac{bc}{d}-a}(bc-ad)^3\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}+\frac{6b^2e^{\frac{bc}{d}-a}(bc-ad)^2\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{b^2e^{-a-bx}(3bc-4ad}{d^4}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^3,x]
```


```
[Out] -((b^2*E^(-a - b*x))/d^3) + (b^2*(3*b*c - 4*a*d)*E^(-a - b*x))/d^4 - (b^3*E
^(-a - b*x)*x)/d^3 - ((b*c - a*d)^4*E^(-a - b*x))/(2*d^5*(c + d*x)^2) + (4*
b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)) + (b*(b*c - a*d)^4*E^(-a - b*
x))/(2*d^6*(c + d*x)) + (6*b^2*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi
[-((b*(c + d*x))/d)])/d^5 + (4*b^2*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegr
alEi[-((b*(c + d*x))/d)])/d^6 + (b^2*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpInte
gralEi[-((b*(c + d*x))/d)])/(2*d^7)
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \int \left(-\frac{b^3(3bc-4ad)e^{-a-bx}}{d^4} + \frac{b^4e^{-a-bx}x}{d^3} + \frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^3} - \frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)^2} + \frac{6b^2(bc-a}{d^4(c+}\right.$$

$$= \frac{b^4\int e^{-a-bx}x\,dx}{d^3} - \frac{\left(b^3(3bc-4ad)\right)\int e^{-a-bx}\,dx}{d^4} + \frac{\left(6b^2(bc-ad)^2\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} - \frac{\left(4b(bc-ad)^3\right)\int}{d^4}$$

$$= \frac{b^2(3bc-4ad)e^{-a-bx}}{d^4} - \frac{b^3e^{-a-bx}x}{d^3} - \frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2} + \frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)} + \frac{6b^2(bc-ad)^2e^{-a+}}{d^5}$$

$$= -\frac{b^2e^{-a-bx}}{d^3} + \frac{b^2(3bc-4ad)e^{-a-bx}}{d^4} - \frac{b^3e^{-a-bx}x}{d^3} - \frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2} + \frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)} + \frac{b(bc}{2a}$$

$$= -\frac{b^2e^{-a-bx}}{d^3} + \frac{b^2(3bc-4ad)e^{-a-bx}}{d^4} - \frac{b^3e^{-a-bx}x}{d^3} - \frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2} + \frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)} + \frac{b(bc}{2a}$$

Mathematica [A] time = 0.652042, size = 267, normalized size = 0.91

$$\frac{e^{-a}\left(b^2e^{\frac{bc}{d}}\left(\left(a^2-8a+12\right)d^2-2(a-4)bcd+b^2c^2\right)(bc-ad)^2\text{Ei}\left(-\frac{b(c+dx)}{d}\right)+\frac{de^{-bx}\left(2b^3d^2\left(\left(3a^2-12a+5\right)c^2dx+\left(3a^2-10a+3\right)c^3+cd^2x^2\right.\right.}{}\right.}{2d^7}$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^3,x]
```

```
[Out] ((d*(-(a^4*d^5) + b^5*c^4*(c + d*x) + a^3*b*d^4*((-4 + a)*c + (-8 + a)*d*x)
 + b^4*c^3*d*((7 - 4*a)*c - 4*(-2 + a)*d*x) - 2*b^2*d^3*((1 + 4*a - 9*a^2 +
 2*a^3)*c^2 + 2*(1 + 4*a - 6*a^2 + a^3)*c*d*x + (1 + 4*a)*d^2*x^2) + 2*b^3*
d^2*((3 - 10*a + 3*a^2)*c^3 + (5 - 12*a + 3*a^2)*c^2*d*x + c*d^2*x^2 - d^3*
x^3)))/(E^(b*x)*(c + d*x)^2) + b^2*(b*c - a*d)^2*(b^2*c^2 - 2*(-4 + a)*b*c*
d + (12 - 8*a + a^2)*d^2)*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(2
*d^7*E^a)
```

Maple [A] time = 0.015, size = 418, normalized size = 1.4

$$-\frac{1}{b}\left(-\frac{b^3\left((-bx-a)\,e^{-bx-a}-e^{-bx-a}\right)}{d^3}+3\,\frac{ab^3e^{-bx-a}}{d^3}-3\,\frac{b^4ce^{-bx-a}}{d^4}-\frac{\left(a^4d^4-4\,a^3bcd^3+6\,a^2b^2c^2d^2-4\,ab^3c^3d+b^4c^4\right)b^3}{d^7}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x)
```

```
[Out] -1/b*(-b^3/d^3*((-b*x-a)*exp(-b*x-a)-exp(-b*x-a))+3*b^3/d^3*a*exp(-b*x-a)-3
*b^4/d^4*c*exp(-b*x-a)-(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^3*c^3
*d+b^4*c^4)*b^3/d^7*(-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/2*exp(-b*x-a
)/(-b*x-a+(a*d-b*c)/d)-1/2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+6/d^5
*(a^2*d^2-2*a*b*c*d+b^2*c^2)*b^3*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)+
4/d^6*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^3)*b^3*(-exp(-b*x-a)/(-b*x
-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)))
```

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

$$-\frac{a^4 e^{\left(-a+\frac{bc}{d}\right)} E_3\left(\frac{(dx+c)b}{d}\right)}{(dx+c)^2 d} - \frac{\left(b^3d^2x^4 + \left(4\,ab^2d^2 + b^2d^2\right)x^3 + 3\left(2\,a^2bd^2 + b^2cd\right)x^2 + \left(4\,a^3d^2 - 3\,b^2c^2 + 12\,abcd - 6\,a^2d^2\right)x\right)e^{(}}{d^5x^3e^a + 3\,cd^4x^2e^a + 3\,c^2d^3xe^a + c^3d^2e^a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(3, (d*x + c)*b/d)/((d*x + c)^2*d) - (b^3
*d^2*x^4 + (4*a*b^2*d^2 + b^2*d^2)*x^3 + 3*(2*a^2*b*d^2 + b^2*c*d)*x^2 + (4
*a^3*d^2 - 3*b^2*c^2 + 12*a*b*c*d - 6*a^2*d^2)*x)*e^(-b*x)/(d^5*x^3*e^a + 3
*c*d^4*x^2*e^a + 3*c^2*d^3*x*e^a + c^3*d^2*e^a) - integrate(-(4*a^3*c*d^2 -
 3*b^2*c^3 + 12*a*b*c^2*d - 6*a^2*c*d^2 + (3*b^3*c^3 - 8*a^3*d^3 + 12*b^2*c
^2*d + 6*(3*b*c*d^2 + 2*d^3)*a^2 - 12*(b^2*c^2*d + 2*b*c*d^2)*a)*x)*e^(-b*x
)/(d^6*x^4*e^a + 4*c*d^5*x^3*e^a + 6*c^2*d^4*x^2*e^a + 4*c^3*d^3*x*e^a + c^
4*d^2*e^a), x)
```

Fricas [A] time = 1.56864, size = 1158, normalized size = 3.94

$$\frac{\left(b^6c^6 - 4\,(a-2)b^5c^5d + 6\left(a^2 - 4\,a + 2\right)b^4c^4d^2 - 4\left(a^3 - 6\,a^2 + 6\,a\right)b^3c^3d^3 + \left(a^4 - 8\,a^3 + 12\,a^2\right)b^2c^2d^4 + \left(b^6c^4d^2 - 4\,(a-2\right.\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="fricas")
```

```
[Out] 1/2*((b^6*c^6 - 4*(a - 2)*b^5*c^5*d + 6*(a^2 - 4*a + 2)*b^4*c^4*d^2 - 4*(a^
3 - 6*a^2 + 6*a)*b^3*c^3*d^3 + (a^4 - 8*a^3 + 12*a^2)*b^2*c^2*d^4 + (b^6*c^
4*d^2 - 4*(a - 2)*b^5*c^3*d^3 + 6*(a^2 - 4*a + 2)*b^4*c^2*d^4 - 4*(a^3 - 6*
a^2 + 6*a)*b^3*c*d^5 + (a^4 - 8*a^3 + 12*a^2)*b^2*d^6)*x^2 + 2*(b^6*c^5*d -
 4*(a - 2)*b^5*c^4*d^2 + 6*(a^2 - 4*a + 2)*b^4*c^3*d^3 - 4*(a^3 - 6*a^2 + 6
*a)*b^3*c^2*d^4 + (a^4 - 8*a^3 + 12*a^2)*b^2*c*d^5)*x)*Ei(-(b*d*x + b*c)/d)
*e^((b*c - a*d)/d) - (2*b^3*d^6*x^3 - b^5*c^5*d + (4*a - 7)*b^4*c^4*d^2 - 2
*(3*a^2 - 10*a + 3)*b^3*c^3*d^3 + a^4*d^6 + 2*(2*a^3 - 9*a^2 + 4*a + 1)*b^2
*c^2*d^4 - (a^4 - 4*a^3)*b*c*d^5 - 2*(b^3*c*d^5 - (4*a + 1)*b^2*d^6)*x^2 -
(b^5*c^4*d^2 - 4*(a - 2)*b^4*c^3*d^3 + 2*(3*a^2 - 12*a + 5)*b^3*c^2*d^4 - 4
*(a^3 - 6*a^2 + 4*a + 1)*b^2*c*d^5 + (a^4 - 8*a^3)*b*d^6)*x)*e^(-b*x - a))/
(d^9*x^2 + 2*c*d^8*x + c^2*d^7)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**3,x)
```

```
[Out] Timed out
```

Giac [B] time = 1.312, size = 2419, normalized size = 8.23

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="giac")
```

```
[Out] 1/2*(b^6*c^4*d^2*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^5*c^3*d^3*
x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^4*c^2*d^4*x^2*Ei(-(b*d*x
+ b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) + a^4*b^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*b^6*c^5*d
*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 8*a*b^5*c^4*d^2*x*Ei(-(b*d*x + b*c
)/d)*e^(-a + b*c/d) + 12*a^2*b^4*c^3*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c
/d) - 8*a^3*b^3*c^2*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*a^4*b^2*c
*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 8*b^5*c^3*d^3*x^2*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) - 24*a*b^4*c^2*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) + 24*a^2*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 8*a^3*
b^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^6*c^6*Ei(-(b*d*x + b*c)
/d)*e^(-a + b*c/d) - 4*a*b^5*c^5*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*
a^2*b^4*c^4*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^3*c^3*d^3*Ei(
-(b*d*x + b*c)/d)*e^(-a + b*c/d) + a^4*b^2*c^2*d^4*Ei(-(b*d*x + b*c)/d)*e^(
-a + b*c/d) + 16*b^5*c^4*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 48*a*b
^4*c^3*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 48*a^2*b^3*c^2*d^4*x*Ei(
-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 16*a^3*b^2*c*d^5*x*Ei(-(b*d*x + b*c)/d)*
e^(-a + b*c/d) + 12*b^4*c^2*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 2
4*a*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*a^2*b^2*d^6*x^2*
Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^5*c^4*d^2*x*e^(-b*x - a) - 4*a*b^4*
c^3*d^3*x*e^(-b*x - a) + 6*a^2*b^3*c^2*d^4*x*e^(-b*x - a) - 4*a^3*b^2*c*d^5
*x*e^(-b*x - a) + a^4*b*d^6*x*e^(-b*x - a) + 8*b^5*c^5*d*Ei(-(b*d*x + b*c)/
d)*e^(-a + b*c/d) - 24*a*b^4*c^4*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) +
24*a^2*b^3*c^3*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 8*a^3*b^2*c^2*d^4*
Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 24*b^4*c^3*d^3*x*Ei(-(b*d*x + b*c)/d)
*e^(-a + b*c/d) - 48*a*b^3*c^2*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) +
24*a^2*b^2*c*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^5*c^5*d*e^(-b*x
- a) - 4*a*b^4*c^4*d^2*e^(-b*x - a) + 6*a^2*b^3*c^3*d^3*e^(-b*x - a) - 4*a^
3*b^2*c^2*d^4*e^(-b*x - a) + a^4*b*c*d^5*e^(-b*x - a) + 8*b^4*c^3*d^3*x*e^(
-b*x - a) - 24*a*b^3*c^2*d^4*x*e^(-b*x - a) + 24*a^2*b^2*c*d^5*x*e^(-b*x -
a) - 8*a^3*b*d^6*x*e^(-b*x - a) + 12*b^4*c^4*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a
 + b*c/d) - 24*a*b^3*c^3*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*a^2*b
^2*c^2*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 7*b^4*c^4*d^2*e^(-b*x - a)
 - 20*a*b^3*c^3*d^3*e^(-b*x - a) + 18*a^2*b^2*c^2*d^4*e^(-b*x - a) - 4*a^3*
b*c*d^5*e^(-b*x - a) - a^4*d^6*e^(-b*x - a))/(d^9*x^2 + 2*c*d^8*x + c^2*d^7
)
```

3.81 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4} dx$

Optimal. Leaf size=396

$$-\frac{b^3e^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{6d^8}-\frac{2b^3e^{\frac{bc}{d}-a}(bc-ad)^3\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7}-\frac{6b^3e^{\frac{bc}{d}-a}(bc-ad)^2\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{4b^3e^{\frac{bc}{d}-a}(bc-ad)\text{I}}{d^5}$$

```
[Out] -((b^3*E^(-a - b*x))/d^4) - ((b*c - a*d)^4*E^(-a - b*x))/(3*d^5*(c + d*x)^3
) + (2*b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)^2) + (b*(b*c - a*d)^4*E
^(-a - b*x))/(6*d^6*(c + d*x)^2) - (6*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*
(c + d*x)) - (2*b^2*(b*c - a*d)^3*E^(-a - b*x))/(d^6*(c + d*x)) - (b^2*(b*c
 - a*d)^4*E^(-a - b*x))/(6*d^7*(c + d*x)) - (4*b^3*(b*c - a*d)*E^(-a + (b*c
)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (6*b^3*(b*c - a*d)^2*E^(-a +
(b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6 - (2*b^3*(b*c - a*d)^3*E^(-
a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^7 - (b^3*(b*c - a*d)^4*E^
(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(6*d^8)
```

Rubi [A] time = 0.520858, antiderivative size = 396, normalized size of antiderivative = 1., number of steps used = 13, number of rules used = 4, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.16, Rules used = {2199, 2194, 2177, 2178}

$$-\frac{b^3e^{\frac{bc}{d}-a}(bc-ad)^4\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{6d^8}-\frac{2b^3e^{\frac{bc}{d}-a}(bc-ad)^3\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7}-\frac{6b^3e^{\frac{bc}{d}-a}(bc-ad)^2\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{4b^3e^{\frac{bc}{d}-a}(bc-ad)\text{I}}{d^5}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^4,x]
```


```
[Out] -((b^3*E^(-a - b*x))/d^4) - ((b*c - a*d)^4*E^(-a - b*x))/(3*d^5*(c + d*x)^3
) + (2*b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)^2) + (b*(b*c - a*d)^4*E
^(-a - b*x))/(6*d^6*(c + d*x)^2) - (6*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*
(c + d*x)) - (2*b^2*(b*c - a*d)^3*E^(-a - b*x))/(d^6*(c + d*x)) - (b^2*(b*c
 - a*d)^4*E^(-a - b*x))/(6*d^7*(c + d*x)) - (4*b^3*(b*c - a*d)*E^(-a + (b*c
)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (6*b^3*(b*c - a*d)^2*E^(-a +
(b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6 - (2*b^3*(b*c - a*d)^3*E^(-
a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^7 - (b^3*(b*c - a*d)^4*E^
(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(6*d^8)
```


Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
```

```
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = \int \left(\frac{b^4e^{-a-bx}}{d^4} + \frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^4} - \frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)^3} + \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4(c+dx)^2} - \frac{4b^3(bc-ad)e}{d^4(c+dx}\right.$$

$$= \frac{b^4\int e^{-a-bx}\,dx}{d^4} - \frac{\left(4b^3(bc-ad)\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} + \frac{\left(6b^2(bc-ad)^2\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4} - \frac{\left(4b(bc-ad)^3\right)\int \frac{}{(}}{d^4}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)} - \frac{4b^3(bc-ad)e^{-a+\frac{b}{a}}}{d^5}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} + \frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} + \frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} + \frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}$$

Mathematica [A] time = 0.807385, size = 389, normalized size = 0.98

$$e^{-a}\left(b^3e^{\frac{bc}{d}}\left(-\left(6\left(a^2-6a+6\right)b^2c^2d^2-4\left(a^3-9a^2+18a-6\right)bcd^3+a\left(a^3-12a^2+36a-24\right)d^4-4(a-3)b^3c^3d+b^4c\right.\right.\right.$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^4,x]
```

```
[Out] (-((d*(2*a^4*d^6 + b^6*c^4*(c + d*x)^2 - a^3*b*d^5*((-4 + a)*c + (-12 + a)*
d*x) - b^5*c^3*d*(c + d*x)*((-11 + 4*a)*c + 4*(-3 + a)*d*x) + a^2*b^2*d^4*(
(12 - 8*a + a^2)*c^2 + 2*(18 - 10*a + a^2)*c*d*x + (-6 + a)^2*d^2*x^2) + 2*
b^4*c^2*d^2*((13 - 16*a + 3*a^2)*c^2 + 2*(15 - 17*a + 3*a^2)*c*d*x + 3*(6 -
 6*a + a^2)*d^2*x^2) + 2*b^3*d^3*((3 - 22*a + 15*a^2 - 2*a^3)*c^3 + (9 - 54
*a + 33*a^2 - 4*a^3)*c^2*d*x + (9 - 36*a + 18*a^2 - 2*a^3)*c*d^2*x^2 + 3*d^
3*x^3)))/(E^(b*x)*(c + d*x)^3)) - b^3*(b^4*c^4 - 4*(-3 + a)*b^3*c^3*d + 6*(
6 - 6*a + a^2)*b^2*c^2*d^2 - 4*(-6 + 18*a - 9*a^2 + a^3)*b*c*d^3 + a*(-24 +
 36*a - 12*a^2 + a^3)*d^4)*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(
6*d^8*E^a)
```

Maple [A] time = 0.013, size = 511, normalized size = 1.3

$$-\frac{1}{b}\left(\frac{b^4\mathrm{e}^{-bx-a}}{d^4} - 4\,\frac{\left(a^3d^3-3\,a^2bcd^2+3\,ab^2c^2d-b^3c^3\right)b^4}{d^7}\left(-1/2\,\mathrm{e}^{-bx-a}\left(-bx-a+\frac{ad-bc}{d}\right)^{-2} - 1/2\,\mathrm{e}^{-bx-a}\left(-bx-a+\frac{a}{}\right.\right.\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x)
```

```
[Out] -1/b*(b^4/d^4*exp(-b*x-a)-4/d^7*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^
3)*b^4*(-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/2*exp(-b*x-a)/(-b*x-a+(a*
d-b*c)/d)-1/2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+4/d^5*(a*d-b*c)*b^
4*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^
2*c^2*d^2-4*a*b^3*c^3*d+b^4*c^4)*b^4/d^8*(-1/3*exp(-b*x-a)/(-b*x-a+(a*d-b*c
)/d)^3-1/6*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/6*exp(-b*x-a)/(-b*x-a+(a*d-
b*c)/d)-1/6*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+6/d^6*(a^2*d^2-2*a*b
*c*d+b^2*c^2)*b^4*(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*Ei(1
,b*x+a-(a*d-b*c)/d)))
```

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

$$-\frac{a^4 e^{\left(-a+\frac{bc}{d}\right)} E_4\left(\frac{(dx+c)b}{d}\right)}{(dx+c)^3 d} - \frac{\left(b^3d^2x^4 + 4\,ab^2d^2x^3 + 2\left(3\,a^2bd^2 + 2\,b^2cd - 2\,abd^2\right)x^2 + 4\left(a^3d^2 - b^2c^2 - 3\,a^2d^2 - 2\,bcd + 2\left(2\,b \cdots\right.\right.\right.}{d^6x^4e^a + 4\,cd^5x^3e^a + 6\,c^2d^4x^2e^a + 4\,c^3d^3xe^a + c^4d^2e^a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(4, (d*x + c)*b/d)/((d*x + c)^3*d) - (b^3
*d^2*x^4 + 4*a*b^2*d^2*x^3 + 2*(3*a^2*b*d^2 + 2*b^2*c*d - 2*a*b*d^2)*x^2 +
4*(a^3*d^2 - b^2*c^2 - 3*a^2*d^2 - 2*b*c*d + 2*(2*b*c*d + d^2)*a)*x)*e^(-b*
x)/(d^6*x^4*e^a + 4*c*d^5*x^3*e^a + 6*c^2*d^4*x^2*e^a + 4*c^3*d^3*x*e^a + c
^4*d^2*e^a) - integrate(-4*(a^3*c*d^2 - b^2*c^3 - 3*a^2*c*d^2 - 2*b*c^2*d +
 2*(2*b*c^2*d + c*d^2)*a + (b^3*c^3 - 3*a^3*d^3 + 7*b^2*c^2*d + 6*b*c*d^2 +
 3*(2*b*c*d^2 + 3*d^3)*a^2 - 2*(2*b^2*c^2*d + 8*b*c*d^2 + 3*d^3)*a)*x)*e^(-
b*x)/(d^7*x^5*e^a + 5*c*d^6*x^4*e^a + 10*c^2*d^5*x^3*e^a + 10*c^3*d^4*x^2*e
^a + 5*c^4*d^3*x*e^a + c^5*d^2*e^a), x)
```

Fricas [B] time = 1.59546, size = 1733, normalized size = 4.38

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="fricas")
```

```
[Out] -1/6*((b^7*c^7 - 4*(a - 3)*b^6*c^6*d + 6*(a^2 - 6*a + 6)*b^5*c^5*d^2 - 4*(a
^3 - 9*a^2 + 18*a - 6)*b^4*c^4*d^3 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^3*c^3
*d^4 + (b^7*c^4*d^3 - 4*(a - 3)*b^6*c^3*d^4 + 6*(a^2 - 6*a + 6)*b^5*c^2*d^5
 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c*d^6 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^
3*d^7)*x^3 + 3*(b^7*c^5*d^2 - 4*(a - 3)*b^6*c^4*d^3 + 6*(a^2 - 6*a + 6)*b^5
*c^3*d^4 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c^2*d^5 + (a^4 - 12*a^3 + 36*a^2
- 24*a)*b^3*c*d^6)*x^2 + 3*(b^7*c^6*d - 4*(a - 3)*b^6*c^5*d^2 + 6*(a^2 - 6*
a + 6)*b^5*c^4*d^3 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c^3*d^4 + (a^4 - 12*a^3
 + 36*a^2 - 24*a)*b^3*c^2*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) +
(b^6*c^6*d - (4*a - 11)*b^5*c^5*d^2 + 6*b^3*d^7*x^3 + 2*(3*a^2 - 16*a + 13)
*b^4*c^4*d^3 - 2*(2*a^3 - 15*a^2 + 22*a - 3)*b^3*c^3*d^4 + 2*a^4*d^7 + (a^4
 - 8*a^3 + 12*a^2)*b^2*c^2*d^5 - (a^4 - 4*a^3)*b*c*d^6 + (b^6*c^4*d^3 - 4*(
```

```
a - 3)*b^5*c^3*d^4 + 6*(a^2 - 6*a + 6)*b^4*c^2*d^5 - 2*(2*a^3 - 18*a^2 + 36
*a - 9)*b^3*c*d^6 + (a^4 - 12*a^3 + 36*a^2)*b^2*d^7)*x^2 + (2*b^6*c^5*d^2 -
 (8*a - 23)*b^5*c^4*d^3 + 4*(3*a^2 - 17*a + 15)*b^4*c^3*d^4 - 2*(4*a^3 - 33
*a^2 + 54*a - 9)*b^3*c^2*d^5 + 2*(a^4 - 10*a^3 + 18*a^2)*b^2*c*d^6 - (a^4 -
 12*a^3)*b*d^7)*x)*e^(-b*x - a))/(d^11*x^3 + 3*c*d^10*x^2 + 3*c^2*d^9*x + c
^3*d^8)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**4,x)
```

```
[Out] Timed out
```

Giac [B] time = 1.29438, size = 4180, normalized size = 10.56

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="giac")
```

```
[Out] -1/6*(b^7*c^4*d^3*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^6*c^3*d^4
*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^5*c^2*d^5*x^3*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + a^4*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^7*c^5*
d^2*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^6*c^4*d^3*x^2*Ei(-(b*d
*x + b*c)/d)*e^(-a + b*c/d) + 18*a^2*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e
^(-a + b*c/d) - 12*a^3*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 3*a^4*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*b^6*c^3*d^4*
x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 36*a*b^5*c^2*d^5*x^3*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 12*a^3*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^7*c^
6*d*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^6*c^5*d^2*x*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) + 18*a^2*b^5*c^4*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 12*a^3*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*a^4*
b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^6*c^4*d^3*x^2*Ei(-
(b*d*x + b*c)/d)*e^(-a + b*c/d) - 108*a*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d
)*e^(-a + b*c/d) + 108*a^2*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c
/d) - 36*a^3*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^5*c^2
*d^5*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^4*c*d^6*x^3*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + b^6*c^4*d^3*x^2*e^(-b*x - a) - 4*a*b^5*c^3*d^4*x^2*e^(-b*x - a)
+ 6*a^2*b^4*c^2*d^5*x^2*e^(-b*x - a) - 4*a^3*b^3*c*d^6*x^2*e^(-b*x - a) + a
^4*b^2*d^7*x^2*e^(-b*x - a) + b^7*c^7*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) -
 4*a*b^6*c^6*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^5*c^5*d^2*Ei(-
(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^
(-a + b*c/d) + a^4*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^6
*c^5*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 108*a*b^5*c^4*d^3*x*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*
e^(-a + b*c/d) - 36*a^3*b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) +
```

108*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 216*a*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 24*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 24*a*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*b^6*c^5*d^2*x*e^(-b*x - a) - 8*a*b^5*c^4*d^3*x*e^(-b*x - a) + 12*a^2*b^4*c^3*d^4*x*e^(-b*x - a) - 8*a^3*b^3*c^2*d^5*x*e^(-b*x - a) + 2*a^4*b^2*c*d^6*x*e^(-b*x - a) + 12*b^5*c^3*d^4*x^2*e^(-b*x - a) - 36*a*b^4*c^2*d^5*x^2*e^(-b*x - a) + 36*a^2*b^3*c*d^6*x^2*e^(-b*x - a) - 12*a^3*b^2*d^7*x^2*e^(-b*x - a) + 12*b^6*c^6*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 36*a*b^5*c^5*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a^3*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 108*b^5*c^4*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 216*a*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 72*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^6*c^6*d*e^(-b*x - a) - 4*a*b^5*c^5*d^2*e^(-b*x - a) + 6*a^2*b^4*c^4*d^3*e^(-b*x - a) - 4*a^3*b^3*c^3*d^4*e^(-b*x - a) + a^4*b^2*c^2*d^5*e^(-b*x - a) + 23*b^5*c^4*d^3*x*e^(-b*x - a) - 68*a*b^4*c^3*d^4*x*e^(-b*x - a) + 66*a^2*b^3*c^2*d^5*x*e^(-b*x - a) - 20*a^3*b^2*c*d^6*x*e^(-b*x - a) - a^4*b*d^7*x*e^(-b*x - a) + 36*b^4*c^2*d^5*x^2*e^(-b*x - a) - 72*a*b^3*c*d^6*x^2*e^(-b*x - a) + 36*a^2*b^2*d^7*x^2*e^(-b*x - a) + 36*b^5*c^5*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 72*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 11*b^5*c^5*d^2*e^(-b*x - a) - 32*a*b^4*c^4*d^3*e^(-b*x - a) + 30*a^2*b^3*c^3*d^4*e^(-b*x - a) - 8*a^3*b^2*c^2*d^5*e^(-b*x - a) - a^4*b*c*d^6*e^(-b*x - a) + 60*b^4*c^3*d^4*x*e^(-b*x - a) - 108*a*b^3*c^2*d^5*x*e^(-b*x - a) + 36*a^2*b^2*c*d^6*x*e^(-b*x - a) + 12*a^3*b*d^7*x*e^(-b*x - a) + 24*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 24*a*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 26*b^4*c^4*d^3*e^(-b*x - a) - 44*a*b^3*c^3*d^4*e^(-b*x - a) + 12*a^2*b^2*c^2*d^5*e^(-b*x - a) + 4*a^3*b*c*d^6*e^(-b*x - a) + 2*a^4*d^7*e^(-b*x - a))/(d^11*x^3 + 3*c*d^10*x^2 + 3*c^2*d^9*x + c^3*d^8)

3.82 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx$

Optimal. Leaf size=557

$$\frac{b^4(bc-ad)^4e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{24d^9}+\frac{2b^4(bc-ad)^3e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{3d^8}+\frac{3b^4(bc-ad)^2e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7}+\frac{4b^4(bc-ad)e^{\frac{bc}{d}}}{d^6}$$

```
[Out] -((b*c - a*d)^4*E^(-a - b*x))/(4*d^5*(c + d*x)^4) + (4*b*(b*c - a*d)^3*E^(-
a - b*x))/(3*d^5*(c + d*x)^3) + (b*(b*c - a*d)^4*E^(-a - b*x))/(12*d^6*(c +
 d*x)^3) - (3*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*(c + d*x)^2) - (2*b^2*(b
*c - a*d)^3*E^(-a - b*x))/(3*d^6*(c + d*x)^2) - (b^2*(b*c - a*d)^4*E^(-a -
b*x))/(24*d^7*(c + d*x)^2) + (4*b^3*(b*c - a*d)*E^(-a - b*x))/(d^5*(c + d*x
)) + (3*b^3*(b*c - a*d)^2*E^(-a - b*x))/(d^6*(c + d*x)) + (2*b^3*(b*c - a*d
)^3*E^(-a - b*x))/(3*d^7*(c + d*x)) + (b^3*(b*c - a*d)^4*E^(-a - b*x))/(24*
d^8*(c + d*x)) + (b^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d
^5 + (4*b^4*(b*c - a*d)*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])
/d^6 + (3*b^4*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/
d)])/d^7 + (2*b^4*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*
x))/d)])/(3*d^8) + (b^4*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(
c + d*x))/d)])/(24*d^9)
```

Rubi [A] time = 0.684236, antiderivative size = 557, normalized size of antiderivative = 1., number of steps used = 17, number of rules used = 3, integrand size = 25, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.12, Rules used = {2199, 2177, 2178}

$$\frac{b^4(bc-ad)^4e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{24d^9}+\frac{2b^4(bc-ad)^3e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{3d^8}+\frac{3b^4(bc-ad)^2e^{\frac{bc}{d}-a}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7}+\frac{4b^4(bc-ad)e^{\frac{bc}{d}}}{d^6}$$

Antiderivative was successfully verified.

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^5,x]
```

```
[Out] -((b*c - a*d)^4*E^(-a - b*x))/(4*d^5*(c + d*x)^4) + (4*b*(b*c - a*d)^3*E^(-
a - b*x))/(3*d^5*(c + d*x)^3) + (b*(b*c - a*d)^4*E^(-a - b*x))/(12*d^6*(c +
 d*x)^3) - (3*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*(c + d*x)^2) - (2*b^2*(b
*c - a*d)^3*E^(-a - b*x))/(3*d^6*(c + d*x)^2) - (b^2*(b*c - a*d)^4*E^(-a -
b*x))/(24*d^7*(c + d*x)^2) + (4*b^3*(b*c - a*d)*E^(-a - b*x))/(d^5*(c + d*x
)) + (3*b^3*(b*c - a*d)^2*E^(-a - b*x))/(d^6*(c + d*x)) + (2*b^3*(b*c - a*d
)^3*E^(-a - b*x))/(3*d^7*(c + d*x)) + (b^3*(b*c - a*d)^4*E^(-a - b*x))/(24*
d^8*(c + d*x)) + (b^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d
^5 + (4*b^4*(b*c - a*d)*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])
/d^6 + (3*b^4*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/
d)])/d^7 + (2*b^4*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*
x))/d)])/(3*d^8) + (b^4*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(
c + d*x))/d)])/(24*d^9)
```

Rule 2199

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !$UseGamma === True
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \int \left(\frac{(-bc+ad)^4 e^{-a-bx}}{d^4(c+dx)^5} - \frac{4b(bc-ad)^3 e^{-a-bx}}{d^4(c+dx)^4} + \frac{6b^2(bc-ad)^2 e^{-a-bx}}{d^4(c+dx)^3} - \frac{4b^3(bc-ad)e^{-a-bx}}{d^4(c+dx)^2} + \frac{b^4 e^{-a}}{d^4(c+}\right.$$

$$= \frac{b^4\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} - \frac{\left(4b^3(bc-ad)\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4} + \frac{\left(6b^2(bc-ad)^2\right)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{d^4} - \frac{\left(4b(bc-ad)^3\right)\int \frac{e^{-a-}}{(c+d}}{d^4}$$

$$= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} + \frac{b^4 e^{-a+\frac{bc}{d}}\,\mathrm{Ei}}{d}$$

$$= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad}{3d^6(c+}$$

$$= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad}{3d^6(c+}$$

$$= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad}{3d^6(c+}$$

$$= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad}{3d^6(c+}$$

Mathematica [A] time = 0.725518, size = 669, normalized size = 1.2

$$e^{-a}\left(6a^2b^6c^2d^2e^{\frac{bc}{d}}\,\mathrm{Ei}\left(-\frac{b(c+dx)}{d}\right) + \frac{de^{-bx}\left(-b^2d(c+dx)^2\left(\left(a^2-16a+72\right)d^2-2(a-8)bcd+b^2c^2\right)(bc-ad)^2+b^3(c+dx)^3\left(6\left(a^2-8a+12\right)b^2c^2d^2-4\left(a^3-12a^2+36a-24\right)\right.\right.}{(c+dx)^4}\right.$$

Antiderivative was successfully verified.

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^5,x]
```

```
[Out] ((d*(-6*d^3*(b*c - a*d)^4 + 2*b*d^2*(b*c - (-16 + a)*d)*(b*c - a*d)^3*(c +
d*x) - b^2*d*(b*c - a*d)^2*(b^2*c^2 - 2*(-8 + a)*b*c*d + (72 - 16*a + a^2)*
d^2)*(c + d*x)^2 + b^3*(b^4*c^4 - 4*(-4 + a)*b^3*c^3*d + 6*(12 - 8*a + a^2)
*b^2*c^2*d^2 - 4*(-24 + 36*a - 12*a^2 + a^3)*b*c*d^3 + a*(-96 + 72*a - 16*a
^2 + a^3)*d^4)*(c + d*x)^3))/(E^(b*x)*(c + d*x)^4) + b^8*c^4*E^((b*c)/d)*Ex
pIntegralEi[-((b*(c + d*x))/d)] + 16*b^7*c^3*d*E^((b*c)/d)*ExpIntegralEi[-(
(b*(c + d*x))/d)] - 4*a*b^7*c^3*d*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))
/d)] + 72*b^6*c^2*d^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] - 48*a*
b^6*c^2*d^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 6*a^2*b^6*c^2*d
^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 96*b^5*c*d^3*E^((b*c)/d)
*ExpIntegralEi[-((b*(c + d*x))/d)] - 144*a*b^5*c*d^3*E^((b*c)/d)*ExpIntegra
lEi[-((b*(c + d*x))/d)] + 48*a^2*b^5*c*d^3*E^((b*c)/d)*ExpIntegralEi[-((b*(
```

```
c + d*x))/d)] - 4*a^3*b^5*c*d^3*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d
)] + 24*b^4*d^4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] - 96*a*b^4*d^
4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 72*a^2*b^4*d^4*E^((b*c)/d
)*ExpIntegralEi[-((b*(c + d*x))/d)] - 16*a^3*b^4*d^4*E^((b*c)/d)*ExpIntegra
lEi[-((b*(c + d*x))/d)] + a^4*b^4*d^4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d
*x))/d)])/(24*d^9*E^a)
```

Maple [A] time = 0.013, size = 596, normalized size = 1.1

$$-\frac{1}{b}\left(-6\,\frac{(ad-bc)^2\,b^5}{d^7}\left(-1/2\,\mathrm{e}^{-bx-a}\left(-bx-a+\frac{ad-bc}{d}\right)^{-2}-1/2\,\mathrm{e}^{-bx-a}\left(-bx-a+\frac{ad-bc}{d}\right)^{-1}-1/2\,\mathrm{e}^{-\frac{ad-bc}{d}}\,\mathrm{Ei}\left(1,bx+a\right.\right.\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x)
```

```
[Out] -1/b*(-6*(a*d-b*c)^2/d^7*b^5*(-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/2*e
xp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/
d))+b^5/d^5*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)-(a*d-b*c)^4/d^9*b^5*(
-1/4*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^4-1/12*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/
d)^3-1/24*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/24*exp(-b*x-a)/(-b*x-a+(a*d-
b*c)/d)-1/24*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+4*(a*d-b*c)^3/d^8*b
^5*(-1/3*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^3-1/6*exp(-b*x-a)/(-b*x-a+(a*d-b*
c)/d)^2-1/6*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/6*exp(-(a*d-b*c)/d)*Ei(1,b*x
+a-(a*d-b*c)/d))+4*(a*d-b*c)/d^6*b^5*(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-exp
(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d)))
```

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

$$-\frac{\left(b^3d^2x^4+\left(4\,ab^2d^2-b^2d^2\right)x^3+\left(6\,a^2bd^2+5\,b^2cd-8\,abd^2+2\,bd^2\right)x^2+\left(4\,a^3d^2-5\,b^2c^2-18\,a^2d^2-20\,bcd+4\left(5\,bc\right.\right.\right.}{d^7x^5e^a+5\,cd^6x^4e^a+10\,c^2d^5x^3e^a+10\,c^3d^4x^2e^a+5\,c^4d^3xe^a+c^5d^2e^a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="maxima")
```

```
[Out] -(b^3*d^2*x^4 + (4*a*b^2*d^2 - b^2*d^2)*x^3 + (6*a^2*b*d^2 + 5*b^2*c*d - 8*
a*b*d^2 + 2*b*d^2)*x^2 + (4*a^3*d^2 - 5*b^2*c^2 - 18*a^2*d^2 - 20*b*c*d + 4
*(5*b*c*d + 6*d^2)*a - 6*d^2)*x)*e^(-b*x)/(d^7*x^5*e^a + 5*c*d^6*x^4*e^a +
10*c^2*d^5*x^3*e^a + 10*c^3*d^4*x^2*e^a + 5*c^4*d^3*x*e^a + c^5*d^2*e^a) -
a^4*e^(-a + b*c/d)*exp_integral_e(5, (d*x + c)*b/d)/((d*x + c)^4*d) - integ
rate(-(4*a^3*c*d^2 - 5*b^2*c^3 - 18*a^2*c*d^2 - 20*b*c^2*d - 6*c*d^2 + 4*(5
*b*c^2*d + 6*c*d^2)*a + (5*b^3*c^3 - 16*a^3*d^3 + 50*b^2*c^2*d + 90*b*c*d^2
 + 6*(5*b*c*d^2 + 12*d^3)*a^2 + 24*d^3 - 4*(5*b^2*c^2*d + 30*b*c*d^2 + 24*d
^3)*a)*x)*e^(-b*x)/(d^8*x^6*e^a + 6*c*d^7*x^5*e^a + 15*c^2*d^6*x^4*e^a + 20
*c^3*d^5*x^3*e^a + 15*c^4*d^4*x^2*e^a + 6*c^5*d^3*x*e^a + c^6*d^2*e^a), x)
```

Fricas [B] time = 1.64307, size = 2442, normalized size = 4.38

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="fricas")
```

```
[Out] 1/24*((b^8*c^8 - 4*(a - 4)*b^7*c^7*d + 6*(a^2 - 8*a + 12)*b^6*c^6*d^2 - 4*(
a^3 - 12*a^2 + 36*a - 24)*b^5*c^5*d^3 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)
*b^4*c^4*d^4 + (b^8*c^4*d^4 - 4*(a - 4)*b^7*c^3*d^5 + 6*(a^2 - 8*a + 12)*b^
6*c^2*d^6 - 4*(a^3 - 12*a^2 + 36*a - 24)*b^5*c*d^7 + (a^4 - 16*a^3 + 72*a^2
 - 96*a + 24)*b^4*d^8)*x^4 + 4*(b^8*c^5*d^3 - 4*(a - 4)*b^7*c^4*d^4 + 6*(a^
2 - 8*a + 12)*b^6*c^3*d^5 - 4*(a^3 - 12*a^2 + 36*a - 24)*b^5*c^2*d^6 + (a^4
 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4*c*d^7)*x^3 + 6*(b^8*c^6*d^2 - 4*(a - 4)
*b^7*c^5*d^3 + 6*(a^2 - 8*a + 12)*b^6*c^4*d^4 - 4*(a^3 - 12*a^2 + 36*a - 24
)*b^5*c^3*d^5 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4*c^2*d^6)*x^2 + 4*(b
^8*c^7*d - 4*(a - 4)*b^7*c^6*d^2 + 6*(a^2 - 8*a + 12)*b^6*c^5*d^3 - 4*(a^3
- 12*a^2 + 36*a - 24)*b^5*c^4*d^4 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4
*c^3*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) + (b^7*c^7*d - (4*a - 1
5)*b^6*c^6*d^2 + 2*(3*a^2 - 22*a + 29)*b^5*c^5*d^3 - 2*(2*a^3 - 21*a^2 + 52
*a - 25)*b^4*c^4*d^4 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^3*c^3*d^5 - 6*a^4*d
^8 - (a^4 - 8*a^3 + 12*a^2)*b^2*c^2*d^6 + 2*(a^4 - 4*a^3)*b*c*d^7 + (b^7*c^
4*d^4 - 4*(a - 4)*b^6*c^3*d^5 + 6*(a^2 - 8*a + 12)*b^5*c^2*d^6 - 4*(a^3 - 1
2*a^2 + 36*a - 24)*b^4*c*d^7 + (a^4 - 16*a^3 + 72*a^2 - 96*a)*b^3*d^8)*x^3
+ (3*b^7*c^5*d^3 - (12*a - 47)*b^6*c^4*d^4 + 2*(9*a^2 - 70*a + 100)*b^5*c^3
*d^5 - 6*(2*a^3 - 23*a^2 + 64*a - 36)*b^4*c^2*d^6 + (3*a^4 - 44*a^3 + 168*a
^2 - 144*a)*b^3*c*d^7 - (a^4 - 16*a^3 + 72*a^2)*b^2*d^8)*x^2 + (3*b^7*c^6*d
^2 - 2*(6*a - 23)*b^6*c^5*d^3 + 2*(9*a^2 - 68*a + 93)*b^5*c^4*d^4 - 4*(3*a^
3 - 33*a^2 + 86*a - 44)*b^4*c^3*d^5 + (3*a^4 - 40*a^3 + 132*a^2 - 96*a)*b^3
*c^2*d^6 - 2*(a^4 - 12*a^3 + 24*a^2)*b^2*c*d^7 + 2*(a^4 - 16*a^3)*b*d^8)*x)
*e^(-b*x - a))/(d^13*x^4 + 4*c*d^12*x^3 + 6*c^2*d^11*x^2 + 4*c^3*d^10*x + c
^4*d^9)
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**5,x)
```

```
[Out] Timed out
```

Giac [B] time = 1.51575, size = 6118, normalized size = 10.98

result too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="giac")
```

```
[Out] 1/24*(b^8*c^4*d^4*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^7*c^3*d^5
*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^6*c^2*d^6*x^4*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^5*c*d^7*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + a^4*b^4*d^8*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 4*b^8*c^5*
d^3*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 16*a*b^7*c^4*d^4*x^3*Ei(-(b*d
*x + b*c)/d)*e^(-a + b*c/d) + 24*a^2*b^6*c^3*d^5*x^3*Ei(-(b*d*x + b*c)/d)*e
^(-a + b*c/d) - 16*a^3*b^5*c^2*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 4*a^4*b^4*c*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 16*b^7*c^3*d^5*
```

```
x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 48*a*b^6*c^2*d^6*x^4*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) + 48*a^2*b^5*c*d^7*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 16*a^3*b^4*d^8*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*b^8*c^
6*d^2*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 24*a*b^7*c^5*d^3*x^2*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^6*c^4*d^4*x^2*Ei(-(b*d*x + b*c)/d)
*e^(-a + b*c/d) - 24*a^3*b^5*c^3*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d
) + 6*a^4*b^4*c^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 64*b^7*c^4*
d^4*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 192*a*b^6*c^3*d^5*x^3*Ei(-(b*
d*x + b*c)/d)*e^(-a + b*c/d) + 192*a^2*b^5*c^2*d^6*x^3*Ei(-(b*d*x + b*c)/d)
*e^(-a + b*c/d) - 64*a^3*b^4*c*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 72*b^6*c^2*d^6*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 144*a*b^5*c*d^7*
x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 72*a^2*b^4*d^8*x^4*Ei(-(b*d*x + b
*c)/d)*e^(-a + b*c/d) + b^7*c^4*d^4*x^3*e^(-b*x - a) - 4*a*b^6*c^3*d^5*x^3*
e^(-b*x - a) + 6*a^2*b^5*c^2*d^6*x^3*e^(-b*x - a) - 4*a^3*b^4*c*d^7*x^3*e^(
-b*x - a) + a^4*b^3*d^8*x^3*e^(-b*x - a) + 4*b^8*c^7*d*x*Ei(-(b*d*x + b*c)/
d)*e^(-a + b*c/d) - 16*a*b^7*c^6*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 24*a^2*b^6*c^5*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 16*a^3*b^5*c^4
*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 4*a^4*b^4*c^3*d^5*x*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d) + 96*b^7*c^5*d^3*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 288*a*b^6*c^4*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 288*a
^2*b^5*c^3*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 96*a^3*b^4*c^2*d^6
*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 288*b^6*c^3*d^5*x^3*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) - 576*a*b^5*c^2*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + 288*a^2*b^4*c*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 96*b
^5*c*d^7*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 96*a*b^4*d^8*x^4*Ei(-(b*
d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^7*c^5*d^3*x^2*e^(-b*x - a) - 12*a*b^6*c^
4*d^4*x^2*e^(-b*x - a) + 18*a^2*b^5*c^3*d^5*x^2*e^(-b*x - a) - 12*a^3*b^4*c
^2*d^6*x^2*e^(-b*x - a) + 3*a^4*b^3*c*d^7*x^2*e^(-b*x - a) + 16*b^6*c^3*d^5
*x^3*e^(-b*x - a) - 48*a*b^5*c^2*d^6*x^3*e^(-b*x - a) + 48*a^2*b^4*c*d^7*x^
3*e^(-b*x - a) - 16*a^3*b^3*d^8*x^3*e^(-b*x - a) + b^8*c^8*Ei(-(b*d*x + b*c
)/d)*e^(-a + b*c/d) - 4*a*b^7*c^7*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6
*a^2*b^6*c^6*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^5*c^5*d^3*Ei
(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + a^4*b^4*c^4*d^4*Ei(-(b*d*x + b*c)/d)*e^
(-a + b*c/d) + 64*b^7*c^6*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 192*a
*b^6*c^5*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 192*a^2*b^5*c^4*d^4*x*
Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 64*a^3*b^4*c^3*d^5*x*Ei(-(b*d*x + b*c
)/d)*e^(-a + b*c/d) + 432*b^6*c^4*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/
d) - 864*a*b^5*c^3*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 432*a^2*b^
4*c^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 384*b^5*c^2*d^6*x^3*Ei(
-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 384*a*b^4*c*d^7*x^3*Ei(-(b*d*x + b*c)/d)
*e^(-a + b*c/d) + 24*b^4*d^8*x^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^
7*c^6*d^2*x*e^(-b*x - a) - 12*a*b^6*c^5*d^3*x*e^(-b*x - a) + 18*a^2*b^5*c^4
*d^4*x*e^(-b*x - a) - 12*a^3*b^4*c^3*d^5*x*e^(-b*x - a) + 3*a^4*b^3*c^2*d^6
*x*e^(-b*x - a) + 47*b^6*c^4*d^4*x^2*e^(-b*x - a) - 140*a*b^5*c^3*d^5*x^2*e
^(-b*x - a) + 138*a^2*b^4*c^2*d^6*x^2*e^(-b*x - a) - 44*a^3*b^3*c*d^7*x^2*e
^(-b*x - a) - a^4*b^2*d^8*x^2*e^(-b*x - a) + 72*b^5*c^2*d^6*x^3*e^(-b*x - a
) - 144*a*b^4*c*d^7*x^3*e^(-b*x - a) + 72*a^2*b^3*d^8*x^3*e^(-b*x - a) + 16
*b^7*c^7*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 48*a*b^6*c^6*d^2*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 48*a^2*b^5*c^5*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) - 16*a^3*b^4*c^4*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 288*b^6
*c^5*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 576*a*b^5*c^4*d^4*x*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + 288*a^2*b^4*c^3*d^5*x*Ei(-(b*d*x + b*c)/d)*
e^(-a + b*c/d) + 576*b^5*c^3*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) -
576*a*b^4*c^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 96*b^4*c*d^7*x^
3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^7*c^7*d*e^(-b*x - a) - 4*a*b^6*c^
6*d^2*e^(-b*x - a) + 6*a^2*b^5*c^5*d^3*e^(-b*x - a) - 4*a^3*b^4*c^4*d^4*e^(
-b*x - a) + a^4*b^3*c^3*d^5*e^(-b*x - a) + 46*b^6*c^5*d^3*x*e^(-b*x - a) -
136*a*b^5*c^4*d^4*x*e^(-b*x - a) + 132*a^2*b^4*c^3*d^5*x*e^(-b*x - a) - 40*
a^3*b^3*c^2*d^6*x*e^(-b*x - a) - 2*a^4*b^2*c*d^7*x*e^(-b*x - a) + 200*b^5*c
```

^3*d^5*x^2*e^(-b*x - a) - 384*a*b^4*c^2*d^6*x^2*e^(-b*x - a) + 168*a^2*b^3*c*d^7*x^2*e^(-b*x - a) + 16*a^3*b^2*d^8*x^2*e^(-b*x - a) + 96*b^4*c*d^7*x^3*e^(-b*x - a) - 96*a*b^3*d^8*x^3*e^(-b*x - a) + 72*b^6*c^6*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 144*a*b^5*c^5*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 72*a^2*b^4*c^4*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 384*b^5*c^4*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 384*a*b^4*c^3*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 144*b^4*c^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 15*b^6*c^6*d^2*e^(-b*x - a) - 44*a*b^5*c^5*d^3*e^(-b*x - a) + 42*a^2*b^4*c^4*d^4*e^(-b*x - a) - 12*a^3*b^3*c^3*d^5*e^(-b*x - a) - a^4*b^2*c^2*d^6*e^(-b*x - a) + 186*b^5*c^4*d^4*x*e^(-b*x - a) - 344*a*b^4*c^3*d^5*x*e^(-b*x - a) + 132*a^2*b^3*c^2*d^6*x*e^(-b*x - a) + 24*a^3*b^2*c*d^7*x*e^(-b*x - a) + 2*a^4*b*d^8*x*e^(-b*x - a) + 216*b^4*c^2*d^6*x^2*e^(-b*x - a) - 144*a*b^3*c*d^7*x^2*e^(-b*x - a) - 72*a^2*b^2*d^8*x^2*e^(-b*x - a) + 96*b^5*c^5*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 96*a*b^4*c^4*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 96*b^4*c^3*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 58*b^5*c^5*d^3*e^(-b*x - a) - 104*a*b^4*c^4*d^4*e^(-b*x - a) + 36*a^2*b^3*c^3*d^5*e^(-b*x - a) + 8*a^3*b^2*c^2*d^6*e^(-b*x - a) + 2*a^4*b*c*d^7*e^(-b*x - a) + 176*b^4*c^3*d^5*x*e^(-b*x - a) - 96*a*b^3*c^2*d^6*x*e^(-b*x - a) - 48*a^2*b^2*c*d^7*x*e^(-b*x - a) - 32*a^3*b*d^8*x*e^(-b*x - a) + 24*b^4*c^4*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 50*b^4*c^4*d^4*e^(-b*x - a) - 24*a*b^3*c^3*d^5*e^(-b*x - a) - 12*a^2*b^2*c^2*d^6*e^(-b*x - a) - 8*a^3*b*c*d^7*e^(-b*x - a) - 6*a^4*d^8*e^(-b*x - a))/(d^13*x^4 + 4*c*d^12*x^3 + 6*c^2*d^11*x^2 + 4*c^3*d^10*x + c^4*d^9)

3.83 $\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx$

Optimal. Leaf size=24

$$ex^{m+1}\log^{n+1}(dx)F^{c(a+bx)}$$

```
[Out] e*F^(c*(a + b*x))*x^(1 + m)*Log[d*x]^(1 + n)
```

Rubi [A] time = 0.145645, antiderivative size = 24, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 39, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2202}

$$ex^{m+1}\log^{n+1}(dx)F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*x^m*Log[d*x]^n*(e + e*n + e*(1 + m + b*c*x*Log[F])*Log[
d*x]),x]
```

```
[Out] e*F^(c*(a + b*x))*x^(1 + m)*Log[d*x]^(1 + n)
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int F^{c(a+bx)}x^m\log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x^{1+m}\log^{1+n}(dx)$$

Mathematica [A] time = 0.366007, size = 24, normalized size = 1.

$$ex^{m+1}\log^{n+1}(dx)F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*x^m*Log[d*x]^n*(e + e*n + e*(1 + m + b*c*x*Log[F]
)*Log[d*x]),x]
```

```
[Out] e*F^(c*(a + b*x))*x^(1 + m)*Log[d*x]^(1 + n)
```

Maple [C] time = 0.2, size = 192, normalized size = 8.

$$\frac{\left(2\,exF^{c(bx+a)}\ln(x) - ixF^{c(bx+a)}e\pi\,\mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx) + ixF^{c(bx+a)}e\pi\,\mathrm{csgn}(id)\left(\mathrm{csgn}(idx)\right)^2 + ixF^{c(bx+a)}e\pi\,\mathrm{csg}\right.}{}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*x^m*ln(d*x)^n*(e+e*n+e*(1+m+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] 1/2*(2*e*x*F^(c*(b*x+a))*ln(x)-I*x*F^(c*(b*x+a))*e*Pi*csgn(I*d)*csgn(I*x)*c
sgn(I*d*x)+I*x*F^(c*(b*x+a))*e*Pi*csgn(I*d)*csgn(I*d*x)^2+I*x*F^(c*(b*x+a))
*e*Pi*csgn(I*x)*csgn(I*d*x)^2+2*x*F^(c*(b*x+a))*e*ln(d)-I*x*F^(c*(b*x+a))*e
*Pi*csgn(I*d*x)^3)*x^m*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(-csgn(I*d*x)+csgn
(I*d))*(-csgn(I*d*x)+csgn(I*x)))^n
```

Maxima [A] time = 1.44309, size = 57, normalized size = 2.38

$$(F^{ac}ex\log(d) + F^{ac}ex\log(x))e^{(bcx\log(F)+m\log(x)+n\log(\log(d)+\log(x)))}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*x*log(d) + F^(a*c)*e*x*log(x))*e^(b*c*x*log(F) + m*log(x) + n*lo
g(log(d) + log(x)))
```

Fricas [A] time = 1.55793, size = 90, normalized size = 3.75

$$(ex\log(d) + ex\log(x))F^{bcx+ac}x^m(\log(d) + \log(x))^n$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="fricas")
```

```
[Out] (e*x*log(d) + e*x*log(x))*F^(b*c*x + a*c)*x^m*(log(d) + log(x))^n
```

Sympy [F(-1)] time = 0., size = 0, normalized size = 0.

Timed out

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F**(c*(b*x+a))*x**m*ln(d*x)**n*(e+e*n+e*(1+m+b*c*x*ln(F))*ln(d*x)
),x)
```

```
[Out] Timed out
```

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

$$\int ((bcx\log(F) + m + 1)e\log(dx) + en + e)F^{(bx+a)c}x^m\log(dx)^n\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="giac")
```

```
[Out] integrate(((b*c*x*log(F) + m + 1)*e*log(d*x) + e*n + e)*F^((b*x + a)*c)*x^m
*log(d*x)^n, x)
```

3.84 $\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx$

Optimal. Leaf size=22

$$ex^3\log^{n+1}(dx)F^{c(a+bx)}$$

```
[Out] e*F^(c*(a + b*x))*x^3*Log[d*x]^(1 + n)
```

Rubi [A] time = 0.130544, antiderivative size = 22, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 38, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2202}

$$ex^3\log^{n+1}(dx)F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*x^2*Log[d*x]^n*(e + e*n + e*(3 + b*c*x*Log[F])*Log[d*x]
),x]
```

```
[Out] e*F^(c*(a + b*x))*x^3*Log[d*x]^(1 + n)
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x^3\log^{1+n}(dx)$$

Mathematica [A] time = 0.298562, size = 23, normalized size = 1.05

$$ex^3\log^{n+1}(dx)F^{ac+bcx}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*x^2*Log[d*x]^n*(e + e*n + e*(3 + b*c*x*Log[F])*Lo
g[d*x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x^3*Log[d*x]^(1 + n)
```

Maple [C] time = 0.098, size = 198, normalized size = 9.

$$\left(-\frac{i}{2}\pi ex^3\mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)\,F^{c(bx+a)}+\frac{i}{2}\pi ex^3\mathrm{csgn}(id)\,(\mathrm{csgn}(idx))^2F^{c(bx+a)}+\frac{i}{2}\pi ex^3\mathrm{csgn}(ix)\,(\mathrm{csgn}(idx))^2F^{c}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*x^2*ln(d*x)^n*(e+e*n+e*(3+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] (-1/2*I*Pi*e*x^3*csgn(I*d)*csgn(I*x)*csgn(I*d*x)*F^(c*(b*x+a))+1/2*I*Pi*e*x
^3*csgn(I*d)*csgn(I*d*x)^2*F^(c*(b*x+a))+1/2*I*Pi*e*x^3*csgn(I*x)*csgn(I*d*
x)^2*F^(c*(b*x+a))-1/2*I*Pi*e*x^3*csgn(I*d*x)^3*F^(c*(b*x+a))+ln(d)*e*x^3*F
^(c*(b*x+a))+e*x^3*F^(c*(b*x+a))*ln(x))*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(
-csgn(I*d*x)+csgn(I*d))*(-csgn(I*d*x)+csgn(I*x)))^n
```

Maxima [A] time = 1.37368, size = 57, normalized size = 2.59

$$\left(F^{ac}ex^3\log\left(d\right)+F^{ac}ex^3\log\left(x\right)\right)e^{\left(bcx\log(F)+n\log(\log(d)+\log(x))\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*x)),
x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*x^3*log(d) + F^(a*c)*e*x^3*log(x))*e^(b*c*x*log(F) + n*log(log(d
) + log(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(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*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(F**(c*(b*x+a))*x**2*ln(d*x)**n*(e+e*n+e*(3+b*c*x*ln(F))*ln(d*x)),
x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*x)),
x, algorithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.85 $\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx$

Optimal. Leaf size=22

$$ex^2\log^{n+1}(dx)F^{c(a+bx)}$$

```
[Out] e*F^(c*(a + b*x))*x^2*Log[d*x]^(1 + n)
```

Rubi [A] time = 0.0901636, antiderivative size = 22, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 36, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.028, Rules used = {2202}

$$ex^2\log^{n+1}(dx)F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*x*Log[d*x]^n*(e + e*n + e*(2 + b*c*x*Log[F])*Log[d*x]),
x]
```

```
[Out] e*F^(c*(a + b*x))*x^2*Log[d*x]^(1 + n)
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x^2\log^{1+n}(dx)$$

Mathematica [A] time = 0.269473, size = 23, normalized size = 1.05

$$ex^2\log^{n+1}(dx)F^{ac+bcx}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*x*Log[d*x]^n*(e + e*n + e*(2 + b*c*x*Log[F])*Log[
d*x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x^2*Log[d*x]^(1 + n)
```

Maple [C] time = 0.097, size = 198, normalized size = 9.

$$\left(-\frac{i}{2}\pi ex^2\text{csgn}(id)\,\text{csgn}(ix)\,\text{csgn}(idx)\,F^{c(bx+a)}+\frac{i}{2}\pi ex^2\text{csgn}(id)\,(\text{csgn}(idx))^2\,F^{c(bx+a)}+\frac{i}{2}\pi ex^2\text{csgn}(ix)\,(\text{csgn}(idx))^2\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*x*ln(d*x)^n*(e+e*n+e*(2+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] (-1/2*I*Pi*e*x^2*csgn(I*d)*csgn(I*x)*csgn(I*d*x)*F^(c*(b*x+a))+1/2*I*Pi*e*x
^2*csgn(I*d)*csgn(I*d*x)^2*F^(c*(b*x+a))+1/2*I*Pi*e*x^2*csgn(I*x)*csgn(I*d*
x)^2*F^(c*(b*x+a))-1/2*I*Pi*e*x^2*csgn(I*d*x)^3*F^(c*(b*x+a))+ln(d)*e*x^2*F
^(c*(b*x+a))+e*x^2*F^(c*(b*x+a))*ln(x))*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(
-csgn(I*d*x)+csgn(I*d))*(-csgn(I*d*x)+csgn(I*x)))^n
```

Maxima [A] time = 1.40364, size = 57, normalized size = 2.59

$$\left(F^{ac}ex^2\log(d) + F^{ac}ex^2\log(x)\right)e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*x)),x,
 algorithm="maxima")
```

```
[Out] (F^(a*c)*e*x^2*log(d) + F^(a*c)*e*x^2*log(x))*e^(b*c*x*log(F) + n*log(log(d
) + log(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(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*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(F**(c*(b*x+a))*x*ln(d*x)**n*(e+e*n+e*(2+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*x)),x,
 algorithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.86 $\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx$

Optimal. Leaf size=20

$$ex\log^{n+1}(dx)F^{c(a+bx)}$$

```
[Out] e*F^(c*(a + b*x))*x*Log[d*x]^(1 + n)
```

Rubi [A] time = 0.0464877, antiderivative size = 20, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 35, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.029, Rules used = {2201}

$$ex\log^{n+1}(dx)F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Int[F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(1 + b*c*x*Log[F])*Log[d*x]),x]
```

```
[Out] e*F^(c*(a + b*x))*x*Log[d*x]^(1 + n)
```

Rule 2201

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

Rubi steps

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x\log^{1+n}(dx)$$

Mathematica [A] time = 0.17145, size = 21, normalized size = 1.05

$$ex\log^{n+1}(dx)F^{ac+bcx}$$

Antiderivative was successfully verified.

```
[In] Integrate[F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(1 + b*c*x*Log[F])*Log[d*
x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x*Log[d*x]^(1 + n)
```

Maple [C] time = 0.108, size = 186, normalized size = 9.3

$$\left(-\frac{i}{2}xF^{c(bx+a)}e\pi\,\text{csgn}\,(id)\,\text{csgn}\,(ix)\,\text{csgn}\,(idx)+\frac{i}{2}xF^{c(bx+a)}e\pi\,\text{csgn}\,(id)\,(\text{csgn}\,(idx))^2+\frac{i}{2}xF^{c(bx+a)}e\pi\,\text{csgn}\,(ix)\,(\text{csgn}\,(id$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(1+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] (-1/2*I*x*F^(c*(b*x+a))*e*Pi*csgn(I*d)*csgn(I*x)*csgn(I*d*x)+1/2*I*x*F^(c*(
b*x+a))*e*Pi*csgn(I*d)*csgn(I*d*x)^2+1/2*I*x*F^(c*(b*x+a))*e*Pi*csgn(I*x)*c
sgn(I*d*x)^2-1/2*I*x*F^(c*(b*x+a))*e*Pi*csgn(I*d*x)^3+x*F^(c*(b*x+a))*e*ln(
d)+e*x*F^(c*(b*x+a))*ln(x))*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(-csgn(I*d*x)
+csgn(I*d))*(-csgn(I*d*x)+csgn(I*x)))^n
```

Maxima [A] time = 1.3577, size = 51, normalized size = 2.55

$$(F^{ac}ex\log{(d)} + F^{ac}ex\log{(x)})e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="maxima")
```

```
[Out] (F^(a*c)*e*x*log(d) + F^(a*c)*e*x*log(x))*e^(b*c*x*log(F) + n*log(log(d) +
log(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(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="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(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(1+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.87 $\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex \log(F) \log(dx))}{x} \, dx$

Optimal. Leaf size=19

$$e \log^{n+1}(dx) F^{c(a+bx)}$$

```
[Out] e*F^(c*(a + b*x))*Log[d*x]^(1 + n)
```

Rubi [A] time = 0.129157, antiderivative size = 19, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 35, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.029, Rules used = {2202}

$$e \log^{n+1}(dx) F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + b*c*e*x*Log[F]*Log[d*x]))/x,x]
```

```
[Out] e*F^(c*(a + b*x))*Log[d*x]^(1 + n)
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e + en + bcex \log(F) \log(dx))}{x} \, dx = eF^{c(a+bx)} \log^{1+n}(dx)$$

Mathematica [A] time = 0.032266, size = 19, normalized size = 1.

$$e \log^{n+1}(dx) F^{c(a+bx)}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + b*c*e*x*Log[F]*Log[d*x]))/
x,x]
```

```
[Out] e*F^(c*(a + b*x))*Log[d*x]^(1 + n)
```

Maple [C] time = 0.088, size = 180, normalized size = 9.5

$$\left(-\frac{i}{2}\pi\, e \,\mathrm{csgn}\,(id)\,\mathrm{csgn}\,(ix)\,\mathrm{csgn}\,(idx)\,F^{c(bx+a)} + \frac{i}{2}\pi\, e \,\mathrm{csgn}\,(id)\,(\mathrm{csgn}\,(idx))^2\,F^{c(bx+a)} + \frac{i}{2}\pi\, e \,\mathrm{csgn}\,(ix)\,(\mathrm{csgn}\,(idx))^2\,F^{c(bx+}\right.$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+b*c*e*x*ln(F)*ln(d*x))/x,x)
```

```
[Out] (-1/2*I*Pi*e*csgn(I*d)*csgn(I*x)*csgn(I*d*x)*F^(c*(b*x+a))+1/2*I*Pi*e*csgn(
I*d)*csgn(I*d*x)^2*F^(c*(b*x+a))+1/2*I*Pi*e*csgn(I*x)*csgn(I*d*x)^2*F^(c*(b
*x+a))-1/2*I*Pi*e*csgn(I*d*x)^3*F^(c*(b*x+a))+ln(d)*e*F^(c*(b*x+a))+e*F^(c*
(b*x+a))*ln(x))*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(-csgn(I*d*x)+csgn(I*d))*
(-csgn(I*d*x)+csgn(I*x)))^n
```

Maximà [A] time = 1.38625, size = 49, normalized size = 2.58

$$(F^{ac}e\log(d) + F^{ac}e\log(x))e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="maxima")
```

```
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
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(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="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(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+b*c*e*x*ln(F)*ln(d*x))/x,x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.88 $\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx$

Optimal. Leaf size=22

$$\frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x}$$

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x
```

Rubi [A] time = 0.131073, antiderivative size = 22, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 38, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2202}

$$\frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-1 + b*c*x*Log[F])*Log[d*x]))
/x^2,x]
```

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x}$$

Mathematica [A] time = 0.327632, size = 23, normalized size = 1.05

$$\frac{e\log^{n+1}(dx)F^{ac+bcx}}{x}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-1 + b*c*x*Log[F])*Log[
d*x]))/x^2,x]
```

```
[Out] (e*F^(a*c + b*c*x)*Log[d*x]^(1 + n))/x
```

Maple [C] time = 0.105, size = 136, normalized size = 6.2

$$\frac{F^{c(bx+a)}e\left(-i\left(\operatorname{csgn}(idx)\right)^3\pi+i\left(\operatorname{csgn}(idx)\right)^2\operatorname{csgn}(id)\pi+i\left(\operatorname{csgn}(idx)\right)^2\operatorname{csgn}(ix)\pi-i\operatorname{csgn}(idx)\operatorname{csgn}(id)\operatorname{csgn}(ix)\pi}{2x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(-1+b*c*x*ln(F))*ln(d*x))/x^2,x)
```

```
[Out] 1/2*F^(c*(b*x+a))*e*(-I*csgn(I*d*x)^3*Pi+I*csgn(I*d*x)^2*csgn(I*d)*Pi+I*csg
n(I*d*x)^2*csgn(I*x)*Pi-I*csgn(I*d*x)*csgn(I*d)*csgn(I*x)*Pi+2*ln(x)+2*ln(d
))/x*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(-csgn(I*d*x)+csgn(I*d))*(-csgn(I*d*
x)+csgn(I*x)))^n
```

Maxima [A] time = 1.42827, size = 53, normalized size = 2.41

$$\frac{\left(F^{ac}e\log\left(d\right)+F^{ac}e\log\left(x\right)\right)e^{\left(bcx\log\left(F\right)+n\log\left(\log\left(d\right)+\log\left(x\right)\right)\right)}}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^2
,x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
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(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^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(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(-1+b*c*x*ln(F))*ln(d*x))/x**2
,x)
```

```
[Out] Timed out
```

Giac [F(-2)] time = 0., size = 0, normalized size = 0.

Exception raised: RuntimeError

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^2
,x, algorithm="giac")
```

```
[Out] Exception raised: RuntimeError
```

3.89 $\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx$

Optimal. Leaf size=22

$$\frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x^2}$$

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x^2
```

Rubi [A] time = 0.131368, antiderivative size = 22, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 38, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2202}

$$\frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x^2}$$

Antiderivative was successfully verified.

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-2 + b*c*x*Log[F])*Log[d*x]))
/x^3,x]
```

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x^2
```

Rule 2202

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[(e*x^(m
+ 1)*F^(c*(a + b*x))*Log[d*x]^(n + 1))/(n + 1), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx=\frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x^2}$$

Mathematica [A] time = 0.322739, size = 23, normalized size = 1.05

$$\frac{e\log^{n+1}(dx)F^{ac+bcx}}{x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-2 + b*c*x*Log[F])*Log[
d*x]))/x^3,x]
```

```
[Out] (e*F^(a*c + b*c*x)*Log[d*x]^(1 + n))/x^2
```

Maple [C] time = 0.102, size = 136, normalized size = 6.2

$$\frac{F^{c(bx+a)}e\left(-i\left(\mathrm{csgn}\left(idx\right)\right)^3\pi+i\left(\mathrm{csgn}\left(idx\right)\right)^2\mathrm{csgn}\left(id\right)\pi+i\left(\mathrm{csgn}\left(idx\right)\right)^2\mathrm{csgn}\left(ix\right)\pi-i\mathrm{csgn}\left(idx\right)\mathrm{csgn}\left(id\right)\mathrm{csgn}\left(ix\right)\pi+\right.}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(-2+b*c*x*ln(F))*ln(d*x))/x^3,x)
```

```
[Out] 1/2*F^(c*(b*x+a))*e*(-I*csgn(I*d*x)^3*Pi+I*csgn(I*d*x)^2*csgn(I*d)*Pi+I*csg
n(I*d*x)^2*csgn(I*x)*Pi-I*csgn(I*d*x)*csgn(I*d)*csgn(I*x)*Pi+2*ln(x)+2*ln(d
))/x^2*(ln(d)+ln(x)-1/2*I*Pi*csgn(I*d*x)*(-csgn(I*d*x)+csgn(I*d))*(-csgn(I*
d*x)+csgn(I*x)))^n
```

Maxima [A] time = 1.38074, size = 53, normalized size = 2.41

$$\frac{\left(F^{ac}e\log\left(d\right) + F^{ac}e\log\left(x\right)\right)e^{\left(bcx\log\left(F\right) + n\log\left(\log\left(d\right) + \log\left(x\right)\right)\right)}}{x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
x)))/x^2
```

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(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,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(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(-2+b*c*x*ln(F))*ln(d*x))/x**3
,x)
```

```
[Out] Timed out
```

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

$$\int \frac{\left(\left(bcx\log\left(F\right) - 2\right)e\log\left(dx\right) + en + e\right)F^{\left(bx+a\right)c}\log\left(dx\right)^{n}}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,x, algorithm="giac")
```

```
[Out] integrate(((b*c*x*log(F) - 2)*e*log(d*x) + e*n + e)*F^((b*x + a)*c)*log(d*x
)^n/x^3, x)
```

3.90 $\int \sqrt{e^{a+bx}}x^4\,dx$

Optimal. Leaf size=91

$$-\frac{16x^3\sqrt{e^{a+bx}}}{b^2}+\frac{96x^2\sqrt{e^{a+bx}}}{b^3}-\frac{384x\sqrt{e^{a+bx}}}{b^4}+\frac{768\sqrt{e^{a+bx}}}{b^5}+\frac{2x^4\sqrt{e^{a+bx}}}{b}$$

```
[Out] (768*Sqrt[E^(a + b*x)])/b^5 - (384*Sqrt[E^(a + b*x)]*x)/b^4 + (96*Sqrt[E^(a
 + b*x)]*x^2)/b^3 - (16*Sqrt[E^(a + b*x)]*x^3)/b^2 + (2*Sqrt[E^(a + b*x)]*x
^4)/b
```

Rubi [A] time = 0.143393, antiderivative size = 91, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2176, 2194}

$$-\frac{16x^3\sqrt{e^{a+bx}}}{b^2}+\frac{96x^2\sqrt{e^{a+bx}}}{b^3}-\frac{384x\sqrt{e^{a+bx}}}{b^4}+\frac{768\sqrt{e^{a+bx}}}{b^5}+\frac{2x^4\sqrt{e^{a+bx}}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]*x^4,x]
```

```
[Out] (768*Sqrt[E^(a + b*x)])/b^5 - (384*Sqrt[E^(a + b*x)]*x)/b^4 + (96*Sqrt[E^(a
 + b*x)]*x^2)/b^3 - (16*Sqrt[E^(a + b*x)]*x^3)/b^2 + (2*Sqrt[E^(a + b*x)]*x
^4)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\int \sqrt{e^{a+bx}}x^4\,dx &= \frac{2\sqrt{e^{a+bx}}x^4}{b}-\frac{8\int \sqrt{e^{a+bx}}x^3\,dx}{b}\\
&= -\frac{16\sqrt{e^{a+bx}}x^3}{b^2}+\frac{2\sqrt{e^{a+bx}}x^4}{b}+\frac{48\int \sqrt{e^{a+bx}}x^2\,dx}{b^2}\\
&= \frac{96\sqrt{e^{a+bx}}x^2}{b^3}-\frac{16\sqrt{e^{a+bx}}x^3}{b^2}+\frac{2\sqrt{e^{a+bx}}x^4}{b}-\frac{192\int \sqrt{e^{a+bx}}x\,dx}{b^3}\\
&= -\frac{384\sqrt{e^{a+bx}}x}{b^4}+\frac{96\sqrt{e^{a+bx}}x^2}{b^3}-\frac{16\sqrt{e^{a+bx}}x^3}{b^2}+\frac{2\sqrt{e^{a+bx}}x^4}{b}+\frac{384\int \sqrt{e^{a+bx}}\,dx}{b^4}\\
&= \frac{768\sqrt{e^{a+bx}}}{b^5}-\frac{384\sqrt{e^{a+bx}}x}{b^4}+\frac{96\sqrt{e^{a+bx}}x^2}{b^3}-\frac{16\sqrt{e^{a+bx}}x^3}{b^2}+\frac{2\sqrt{e^{a+bx}}x^4}{b}
\end{aligned}$$

Mathematica [A] time = 0.0206717, size = 45, normalized size = 0.49

$$\frac{2\left(b^4x^4-8b^3x^3+48b^2x^2-192bx+384\right)\sqrt{e^{a+bx}}}{b^5}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^4,x]
```

```
[Out] (2*Sqrt[E^(a + b*x)]*(384 - 192*b*x + 48*b^2*x^2 - 8*b^3*x^3 + b^4*x^4))/b^
5
```

Maple [A] time = 0.003, size = 43, normalized size = 0.5

$$2\,\frac{\left(x^4b^4-8\,x^3b^3+48\,x^2b^2-192\,bx+384\right)\sqrt{e^{bx+a}}}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^4*exp(b*x+a)^(1/2),x)
```

```
[Out] 2*(b^4*x^4-8*b^3*x^3+48*b^2*x^2-192*b*x+384)*exp(b*x+a)^(1/2)/b^5
```

Maxima [A] time = 1.027, size = 81, normalized size = 0.89

$$\frac{2\left(b^4x^4e^{\left(\frac{1}{2}a\right)}-8\,b^3x^3e^{\left(\frac{1}{2}a\right)}+48\,b^2x^2e^{\left(\frac{1}{2}a\right)}-192\,bxe^{\left(\frac{1}{2}a\right)}+384\,e^{\left(\frac{1}{2}a\right)}\right)e^{\left(\frac{1}{2}bx\right)}}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b^4*x^4*e^(1/2*a) - 8*b^3*x^3*e^(1/2*a) + 48*b^2*x^2*e^(1/2*a) - 192*b*x
*e^(1/2*a) + 384*e^(1/2*a))*e^(1/2*b*x)/b^5
```

Fricas [A] time = 1.44212, size = 105, normalized size = 1.15

$$\frac{2\left(b^4x^4-8\,b^3x^3+48\,b^2x^2-192\,bx+384\right)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b^4*x^4 - 8*b^3*x^3 + 48*b^2*x^2 - 192*b*x + 384)*e^(1/2*b*x + 1/2*a)/b^
5
```

Sympy [A] time = 0.114484, size = 51, normalized size = 0.56

$$\begin{cases} \frac{(2b^4x^4-16b^3x^3+96b^2x^2-384bx+768)\sqrt{e^{a+bx}}}{b^5} & \text{for } b^5 \neq 0 \\ \frac{x^5}{5} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**4*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b**4*x**4 - 16*b**3*x**3 + 96*b**2*x**2 - 384*b*x + 768)*sqrt
(exp(a + b*x))/b**5, Ne(b**5, 0)), (x**5/5, True))
```

Giac [A] time = 1.31474, size = 58, normalized size = 0.64

$$\frac{2\left(b^4x^4 - 8\,b^3x^3 + 48\,b^2x^2 - 192\,bx + 384\right)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*(b^4*x^4 - 8*b^3*x^3 + 48*b^2*x^2 - 192*b*x + 384)*e^(1/2*b*x + 1/2*a)/b^
5
```

3.91 $\int \sqrt{e^{a+bx}} x^3 \, dx$

Optimal. Leaf size=72

$$-\frac{12x^2\sqrt{e^{a+bx}}}{b^2}+\frac{48x\sqrt{e^{a+bx}}}{b^3}-\frac{96\sqrt{e^{a+bx}}}{b^4}+\frac{2x^3\sqrt{e^{a+bx}}}{b}$$

```
[Out] (-96*Sqrt[E^(a + b*x)])/b^4 + (48*Sqrt[E^(a + b*x)]*x)/b^3 - (12*Sqrt[E^(a
+ b*x)]*x^2)/b^2 + (2*Sqrt[E^(a + b*x)]*x^3)/b
```

Rubi [A] time = 0.101391, antiderivative size = 72, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2176, 2194}

$$-\frac{12x^2\sqrt{e^{a+bx}}}{b^2}+\frac{48x\sqrt{e^{a+bx}}}{b^3}-\frac{96\sqrt{e^{a+bx}}}{b^4}+\frac{2x^3\sqrt{e^{a+bx}}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]*x^3,x]
```

```
[Out] (-96*Sqrt[E^(a + b*x)])/b^4 + (48*Sqrt[E^(a + b*x)]*x)/b^3 - (12*Sqrt[E^(a
+ b*x)]*x^2)/b^2 + (2*Sqrt[E^(a + b*x)]*x^3)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\int \sqrt{e^{a+bx}} x^3 \, dx &= \frac{2\sqrt{e^{a+bx}}x^3}{b}-\frac{6\int \sqrt{e^{a+bx}}x^2 \, dx}{b}\\
&= -\frac{12\sqrt{e^{a+bx}}x^2}{b^2}+\frac{2\sqrt{e^{a+bx}}x^3}{b}+\frac{24\int \sqrt{e^{a+bx}}x \, dx}{b^2}\\
&= \frac{48\sqrt{e^{a+bx}}x}{b^3}-\frac{12\sqrt{e^{a+bx}}x^2}{b^2}+\frac{2\sqrt{e^{a+bx}}x^3}{b}-\frac{48\int \sqrt{e^{a+bx}} \, dx}{b^3}\\
&= -\frac{96\sqrt{e^{a+bx}}}{b^4}+\frac{48\sqrt{e^{a+bx}}x}{b^3}-\frac{12\sqrt{e^{a+bx}}x^2}{b^2}+\frac{2\sqrt{e^{a+bx}}x^3}{b}
\end{aligned}$$

Mathematica [A] time = 0.0134152, size = 37, normalized size = 0.51

$$\frac{2\left(b^3x^3-6b^2x^2+24bx-48\right)\sqrt{e^{a+bx}}}{b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^3,x]
```

```
[Out] (2*Sqrt[E^(a + b*x)]*(-48 + 24*b*x - 6*b^2*x^2 + b^3*x^3))/b^4
```

Maple [A] time = 0.003, size = 35, normalized size = 0.5

$$2\,\frac{\left(x^3b^3-6\,x^2b^2+24\,bx-48\right)\sqrt{e^{bx+a}}}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*exp(b*x+a)^(1/2),x)
```

```
[Out] 2*(b^3*x^3-6*b^2*x^2+24*b*x-48)*exp(b*x+a)^(1/2)/b^4
```

Maxima [A] time = 1.09332, size = 65, normalized size = 0.9

$$\frac{2\left(b^3x^3e^{\left(\frac{1}{2}\,a\right)}-6\,b^2x^2e^{\left(\frac{1}{2}\,a\right)}+24\,bxe^{\left(\frac{1}{2}\,a\right)}-48\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b^3*x^3*e^(1/2*a) - 6*b^2*x^2*e^(1/2*a) + 24*b*x*e^(1/2*a) - 48*e^(1/2*a
))*e^(1/2*b*x)/b^4
```

Fricas [A] time = 1.45923, size = 85, normalized size = 1.18

$$\frac{2\left(b^3x^3-6\,b^2x^2+24\,bx-48\right)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b^3*x^3 - 6*b^2*x^2 + 24*b*x - 48)*e^(1/2*b*x + 1/2*a)/b^4
```

Sympy [A] time = 0.108289, size = 42, normalized size = 0.58

$$\begin{cases} \frac{\left(2b^3x^3-12b^2x^2+48bx-96\right)\sqrt{e^{a+bx}}}{b^4} & \text{for}\ b^4\neq 0 \\ \frac{x^4}{4} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b**3*x**3 - 12*b**2*x**2 + 48*b*x - 96)*sqrt(exp(a + b*x))/b*
*4, Ne(b**4, 0)), (x**4/4, True))
```

Giac [A] time = 1.25374, size = 47, normalized size = 0.65

$$\frac{2\left(b^3x^3 - 6\,b^2x^2 + 24\,bx - 48\right)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*(b^3*x^3 - 6*b^2*x^2 + 24*b*x - 48)*e^(1/2*b*x + 1/2*a)/b^4
```

3.92 $\int \sqrt{e^{a+bx}} x^2 \, dx$

Optimal. Leaf size=53

$$-\frac{8x\sqrt{e^{a+bx}}}{b^2}+\frac{16\sqrt{e^{a+bx}}}{b^3}+\frac{2x^2\sqrt{e^{a+bx}}}{b}$$

```
[Out] (16*Sqrt[E^(a + b*x)])/b^3 - (8*Sqrt[E^(a + b*x)]*x)/b^2 + (2*Sqrt[E^(a + b
*x)]*x^2)/b
```

Rubi [A] time = 0.0635734, antiderivative size = 53, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2176, 2194}

$$-\frac{8x\sqrt{e^{a+bx}}}{b^2}+\frac{16\sqrt{e^{a+bx}}}{b^3}+\frac{2x^2\sqrt{e^{a+bx}}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]*x^2,x]
```

```
[Out] (16*Sqrt[E^(a + b*x)])/b^3 - (8*Sqrt[E^(a + b*x)]*x)/b^2 + (2*Sqrt[E^(a + b
*x)]*x^2)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\int \sqrt{e^{a+bx}} x^2 \, dx &= \frac{2\sqrt{e^{a+bx}}x^2}{b}-\frac{4\int \sqrt{e^{a+bx}}x \, dx}{b}\\ &= -\frac{8\sqrt{e^{a+bx}}x}{b^2}+\frac{2\sqrt{e^{a+bx}}x^2}{b}+\frac{8\int \sqrt{e^{a+bx}} \, dx}{b^2}\\ &= \frac{16\sqrt{e^{a+bx}}}{b^3}-\frac{8\sqrt{e^{a+bx}}x}{b^2}+\frac{2\sqrt{e^{a+bx}}x^2}{b}\end{aligned}$$

Mathematica [A] time = 0.0126865, size = 29, normalized size = 0.55

$$\frac{2\left(b^2x^2-4bx+8\right)\sqrt{e^{a+bx}}}{b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^2,x]
```

```
[Out] (2*Sqrt[E^(a + b*x)]*(8 - 4*b*x + b^2*x^2))/b^3
```

Maple [A] time = 0.001, size = 27, normalized size = 0.5

$$2\,{\frac { \left({x}^{2}{b}^{2}-4\,bx+8 \right) \sqrt {{{\rm e}^{bx+a}}}}{{b}^{3}}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*exp(b*x+a)^(1/2),x)
```

```
[Out] 2*(b^2*x^2-4*b*x+8)*exp(b*x+a)^(1/2)/b^3
```

Maxima [A] time = 1.02316, size = 49, normalized size = 0.92

$$\frac{2 \, {\left(b^{2} x^{2} e^{\left(\frac{1}{2} \, a\right)} - 4 \, b x e^{\left(\frac{1}{2} \, a\right)} + 8 \, e^{\left(\frac{1}{2} \, a\right)}\right)} e^{\left(\frac{1}{2} \, b x\right)}}{b^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b^2*x^2*e^(1/2*a) - 4*b*x*e^(1/2*a) + 8*e^(1/2*a))*e^(1/2*b*x)/b^3
```

Fricas [A] time = 1.47572, size = 66, normalized size = 1.25

$$\frac{2 \, {\left(b^{2} x^{2} - 4 \, b x + 8\right)} e^{\left(\frac{1}{2} \, b x + \frac{1}{2} \, a\right)}}{b^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b^2*x^2 - 4*b*x + 8)*e^(1/2*b*x + 1/2*a)/b^3
```

Sympy [A] time = 0.103519, size = 34, normalized size = 0.64

$$\begin{cases} \frac{\left(2 b^{2} x^{2} - 8 b x + 16\right) \sqrt{e^{a + b x}}}{b^{3}} & \text{for}\: b^{3} \neq 0 \\ \frac{x^{3}}{3} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b**2*x**2 - 8*b*x + 16)*sqrt(exp(a + b*x))/b**3, Ne(b**3, 0))
, (x**3/3, True))
```

Giac [A] time = 1.22556, size = 36, normalized size = 0.68

$$\frac{2\left(b^2x^2 - 4\,bx + 8\right)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*(b^2*x^2 - 4*b*x + 8)*e^(1/2*b*x + 1/2*a)/b^3
```

3.93 $\int \sqrt{e^{a+bx}} x \, dx$

Optimal. Leaf size=34

$$\frac{2x\sqrt{e^{a+bx}}}{b} - \frac{4\sqrt{e^{a+bx}}}{b^2}$$

```
[Out] (-4*Sqrt[E^(a + b*x)])/b^2 + (2*Sqrt[E^(a + b*x)]*x)/b
```

Rubi [A] time = 0.0285417, antiderivative size = 34, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.154, Rules used = {2176, 2194}

$$\frac{2x\sqrt{e^{a+bx}}}{b} - \frac{4\sqrt{e^{a+bx}}}{b^2}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]*x,x]

[Out] (-4*Sqrt[E^(a + b*x)])/b^2 + (2*Sqrt[E^(a + b*x)]*x)/b
```

Rule 2176

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[((c + d*x)^m*(b*F^(g*(e + f*x)))^n)/(f*g*n*Log[F]),
x] - Dist[(d*m)/(f*g*n*Log[F]), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !$UseGamma === True
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned} \int \sqrt{e^{a+bx}} x \, dx &= \frac{2\sqrt{e^{a+bx}}x}{b} - \frac{2\int \sqrt{e^{a+bx}} \, dx}{b} \\ &= -\frac{4\sqrt{e^{a+bx}}}{b^2} + \frac{2\sqrt{e^{a+bx}}x}{b} \end{aligned}$$

Mathematica [A] time = 0.0101217, size = 21, normalized size = 0.62

$$\frac{2(bx-2)\sqrt{e^{a+bx}}}{b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]*x,x]

[Out] (2*Sqrt[E^(a + b*x)]*(-2 + b*x))/b^2
```

Maple [A] time = 0.001, size = 19, normalized size = 0.6

$$2\,\frac{(bx-2)\,\sqrt{\mathrm{e}^{bx+a}}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*exp(b*x+a)^(1/2),x)
```

```
[Out] 2*(b*x-2)*exp(b*x+a)^(1/2)/b^2
```

Maxima [A] time = 1.0455, size = 32, normalized size = 0.94

$$\frac{2\left(bxe^{\left(\frac{1}{2}\,a\right)}-2\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b*x*e^(1/2*a) - 2*e^(1/2*a))*e^(1/2*b*x)/b^2
```

Fricas [A] time = 1.5013, size = 50, normalized size = 1.47

$$\frac{2\,(bx-2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b*x - 2)*e^(1/2*b*x + 1/2*a)/b^2
```

Sympy [A] time = 0.094429, size = 26, normalized size = 0.76

$$\begin{cases} \frac{(2bx-4)\sqrt{e^{a+bx}}}{b^2} & \text{for } b^2 \neq 0 \\ \frac{x^2}{2} & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b*x - 4)*sqrt(exp(a + b*x))/b**2, Ne(b**2, 0)), (x**2/2, True
))
```

<u>Giac</u> [A] time = 1.2432, size = 26, normalized size = 0.76

$$\frac{2\,(bx-2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*(b*x - 2)*e^(1/2*b*x + 1/2*a)/b^2
```

3.94 $\int \sqrt{e^{a+bx}}\,dx$

Optimal. Leaf size=16

$$\frac{2\sqrt{e^{a+bx}}}{b}$$

```
[Out] (2*Sqrt[E^(a + b*x)])/b
```

Rubi [A] time = 0.0065371, antiderivative size = 16, normalized size of antiderivative = 1., number of steps used = 1, number of rules used = 1, integrand size = 11, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.091, Rules used = {2194}

$$\frac{2\sqrt{e^{a+bx}}}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)],x]

[Out] (2*Sqrt[E^(a + b*x)])/b
```

Rule 2194

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\sqrt{e^{a+bx}}}{b}$$

Mathematica [A] time = 0.0050288, size = 16, normalized size = 1.

$$\frac{2\sqrt{e^{a+bx}}}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)],x]

[Out] (2*Sqrt[E^(a + b*x)])/b
```

Maple [A] time = 0.001, size = 14, normalized size = 0.9

$$2\,\frac{\sqrt{e^{bx+a}}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(b*x+a)^(1/2),x)
```

```
[Out] 2*exp(b*x+a)^(1/2)/b
```

Maxima [A] time = 1.04315, size = 19, normalized size = 1.19

$$\frac{2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

Fricas [A] time = 1.46732, size = 34, normalized size = 2.12

$$\frac{2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

Sympy [A] time = 0.082823, size = 14, normalized size = 0.88

$$\begin{cases} \frac{2\sqrt{e^{a+bx}}}{b} & \text{for}\ b \neq 0 \\ x & \text{otherwise} \end{cases}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise((2*sqrt(exp(a + b*x))/b, Ne(b, 0)), (x, True))
```

Giac [A] time = 1.24524, size = 19, normalized size = 1.19

$$\frac{2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

3.95 $\int \frac{\sqrt{e^{a+bx}}}{x}\,dx$

Optimal. Leaf size=27

$$e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)$$

```
[Out] (Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/E^((b*x)/2)
```

Rubi [A] time = 0.0583287, antiderivative size = 27, normalized size of antiderivative = 1., number of steps used = 2, number of rules used = 2, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2182, 2178}

$$e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]/x,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/E^((b*x)/2)
```

Rule 2182

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] && !$UseGamma === True
```

Rubi steps

$$\begin{aligned}\int \frac{\sqrt{e^{a+bx}}}{x}\,dx &= \left(e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int \frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx\\ &= e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)\end{aligned}$$

Mathematica [A] time = 0.0156963, size = 27, normalized size = 1.

$$e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]/x,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/E^((b*x)/2)
```

Maple [B] time = 0.039, size = 57, normalized size = 2.1

$$\sqrt{e^{bx+a}}\,e^{-\frac{bx}{2}e^{\frac{a}{2}}}\left(\ln(x)-\ln(2)+\ln\left(-b e^{\frac{a}{2}}\right)-\ln\left(-\frac{bx}{2}e^{\frac{a}{2}}\right)-\mathrm{Ei}\left(1,-\frac{bx}{2}e^{\frac{a}{2}}\right)\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(b*x+a)^(1/2)/x,x)
```

```
[Out] exp(b*x+a)^(1/2)*exp(-1/2*b*x*exp(1/2*a))*(ln(x)-ln(2)+ln(-b*exp(1/2*a))-ln
(-1/2*b*x*exp(1/2*a))-Ei(1,-1/2*b*x*exp(1/2*a)))
```

Maxima [A] time = 1.17256, size = 14, normalized size = 0.52

$$\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="maxima")
```

```
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

Fricas [A] time = 1.49306, size = 31, normalized size = 1.15

$$\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="fricas")
```

```
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

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

$$\int \frac{\sqrt{e^{a}e^{bx}}}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)**(1/2)/x,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x, x)
```

Giac [A] time = 1.36466, size = 14, normalized size = 0.52

$$\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="giac")
```

```
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

3.96 $\int \frac{\sqrt{e^{a+bx}}}{x^2} \, dx$

Optimal. Leaf size=48

$$\frac{1}{2} b e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \text{Ei}\left(\frac{bx}{2}\right) - \frac{\sqrt{e^{a+bx}}}{x}$$

```
[Out] -(Sqrt[E^(a + b*x)]/x) + (b*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(2*E^
((b*x)/2))
```

Rubi [A] time = 0.0864004, antiderivative size = 48, normalized size of antiderivative = 1., number of steps used = 3, number of rules used = 3, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.2, Rules used = {2177, 2182, 2178}

$$\frac{1}{2} b e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \text{Ei}\left(\frac{bx}{2}\right) - \frac{\sqrt{e^{a+bx}}}{x}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]/x^2,x]
```

```
[Out] -(Sqrt[E^(a + b*x)]/x) + (b*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(2*E^
((b*x)/2))
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2182

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\begin{aligned}
\int \frac{\sqrt{e^{a+bx}}}{x^2} \, dx &= -\frac{\sqrt{e^{a+bx}}}{x} + \frac{1}{2} b \int \frac{\sqrt{e^{a+bx}}}{x} \, dx \\
&= -\frac{\sqrt{e^{a+bx}}}{x} + \frac{1}{2} \left(b e^{\frac{1}{2}(-a-bx)} \sqrt{e^{a+bx}}\right) \int \frac{e^{\frac{1}{2}(a+bx)}}{x} \, dx \\
&= -\frac{\sqrt{e^{a+bx}}}{x} + \frac{1}{2} b e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \text{Ei}\left(\frac{bx}{2}\right)
\end{aligned}$$

Mathematica [A] time = 0.0269809, size = 47, normalized size = 0.98

$$\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(bx\text{Ei}\left(\frac{bx}{2}\right)-2e^{\frac{bx}{2}}\right)}{2x}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^2,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2) + b*x*ExpIntegralEi[(b*x)/2]))/(2*E^((b*
x)/2)*x)
```

Maple [B] time = 0.021, size = 116, normalized size = 2.4

$$-\frac{b}{2}\sqrt{e^{bx+a}}e^{\frac{a}{2}-\frac{bx}{2}e^{\frac{a}{2}}}\left(2\frac{e^{-a/2}}{bx}+1-\ln(x)+\ln(2)-\ln\left(-be^{\frac{a}{2}}\right)-\frac{1}{bx}e^{-\frac{a}{2}}\left(2+bxe^{\frac{a}{2}}\right)+2\frac{e^{-a/2+1/2\,bxe^{a/2}}}{bx}+\ln\left(-\frac{bx}{2}e^{\frac{a}{2}}\right)+\text{Ei}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(b*x+a)^(1/2)/x^2,x)
```

```
[Out] -1/2*exp(b*x+a)^(1/2)*exp(1/2*a-1/2*b*x*exp(1/2*a))*b*(2/x/b*exp(-1/2*a)+1-
ln(x)+ln(2)-ln(-b*exp(1/2*a))-1/b/x*exp(-1/2*a)*(2+b*x*exp(1/2*a))+2/b/x*ex
p(-1/2*a+1/2*b*x*exp(1/2*a))+ln(-1/2*b*x*exp(1/2*a))+Ei(1,-1/2*b*x*exp(1/2*
a)))
```

Maxima [A] time = 1.17219, size = 18, normalized size = 0.38

$$\frac{1}{2}\,be^{\left(\frac{1}{2}\,a\right)}\Gamma\left(-1,-\frac{1}{2}\,bx\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="maxima")
```

```
[Out] 1/2*b*e^(1/2*a)*gamma(-1, -1/2*b*x)
```

Fricas [A] time = 1.43129, size = 80, normalized size = 1.67

$$\frac{bx\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}-2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="fricas")
```

```
[Out] 1/2*(b*x*Ei(1/2*b*x)*e^(1/2*a) - 2*e^(1/2*b*x + 1/2*a))/x
```

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

$$\int \frac{\sqrt{e^a e^{bx}}}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)**(1/2)/x**2,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**2, x)
```

Giac [A] time = 1.25625, size = 39, normalized size = 0.81

$$\frac{bx\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="giac")
```

```
[Out] 1/2*(b*x*Ei(1/2*b*x)*e^(1/2*a) - 2*e^(1/2*b*x + 1/2*a))/x
```

3.97 $\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx$

Optimal. Leaf size=71

$$\frac{1}{8}b^2e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\mathrm{Ei}\left(\frac{bx}{2}\right)-\frac{\sqrt{e^{a+bx}}}{2x^2}-\frac{b\sqrt{e^{a+bx}}}{4x}$$

```
[Out] -Sqrt[E^(a + b*x)]/(2*x^2) - (b*Sqrt[E^(a + b*x)])/(4*x) + (b^2*Sqrt[E^(a +
 b*x)]*ExpIntegralEi[(b*x)/2])/(8*E^((b*x)/2))
```

Rubi [A] time = 0.119316, antiderivative size = 71, normalized size of antiderivative = 1., number of steps used = 4, number of rules used = 3, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.2, Rules used = {2177, 2182, 2178}

$$\frac{1}{8}b^2e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\mathrm{Ei}\left(\frac{bx}{2}\right)-\frac{\sqrt{e^{a+bx}}}{2x^2}-\frac{b\sqrt{e^{a+bx}}}{4x}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]/x^3,x]
```

```
[Out] -Sqrt[E^(a + b*x)]/(2*x^2) - (b*Sqrt[E^(a + b*x)])/(4*x) + (b^2*Sqrt[E^(a +
 b*x)]*ExpIntegralEi[(b*x)/2])/(8*E^((b*x)/2))
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2182

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = -\frac{\sqrt{e^{a+bx}}}{2x^2} + \frac{1}{4}b\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx$$
$$= -\frac{\sqrt{e^{a+bx}}}{2x^2} - \frac{b\sqrt{e^{a+bx}}}{4x} + \frac{1}{8}b^2\int \frac{\sqrt{e^{a+bx}}}{x}\,dx$$
$$= -\frac{\sqrt{e^{a+bx}}}{2x^2} - \frac{b\sqrt{e^{a+bx}}}{4x} + \frac{1}{8}\left(b^2 e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int \frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx$$
$$= -\frac{\sqrt{e^{a+bx}}}{2x^2} - \frac{b\sqrt{e^{a+bx}}}{4x} + \frac{1}{8}b^2 e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\mathrm{Ei}\left(\frac{bx}{2}\right)$$

Mathematica [A] time = 0.0423023, size = 56, normalized size = 0.79

$$\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(b^2x^2\mathrm{Ei}\left(\frac{bx}{2}\right) - 2e^{\frac{bx}{2}}(bx+2)\right)}{8x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^3,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2)*(2 + b*x) + b^2*x^2*ExpIntegralEi[(b*x)/
2]))/(8*E^((b*x)/2)*x^2)
```

Maple [B] time = 0.028, size = 155, normalized size = 2.2

$$\frac{b^2}{4}\sqrt{e^{bx+a}}e^{a-\frac{bx}{2}e^{\frac{a}{2}}}\left(-2\frac{e^{-a}}{x^2b^2} - 2\frac{e^{-a/2}}{bx} - \frac{3}{4} + \frac{\ln(x)}{2} - \frac{\ln(2)}{2} + \frac{1}{2}\ln\left(-be^{\frac{a}{2}}\right) + \frac{e^{-a}}{3x^2b^2}\left(\frac{9b^2x^2e^a}{4} + 6bxe^{a/2} + 6\right) - \frac{2}{3x^2b^2}e^{-a}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(b*x+a)^(1/2)/x^3,x)
```

```
[Out] 1/4*exp(b*x+a)^(1/2)*exp(a-1/2*b*x*exp(1/2*a))*b^2*(-2/x^2/b^2*exp(-a)-2/x/
b*exp(-1/2*a)-3/4+1/2*ln(x)-1/2*ln(2)+1/2*ln(-b*exp(1/2*a))+1/3/b^2/x^2*exp
(-a)*(9/4*b^2*x^2*exp(a)+6*b*x*exp(1/2*a)+6)-2/3/b^2/x^2*exp(-a+1/2*b*x*exp
(1/2*a))*(3/2*b*x*exp(1/2*a)+3)-1/2*ln(-1/2*b*x*exp(1/2*a))-1/2*Ei(1,-1/2*b
*x*exp(1/2*a)))
```

Maxima [A] time = 1.14584, size = 20, normalized size = 0.28

$$-\frac{1}{4}b^2e^{\left(\frac{1}{2}a\right)}\Gamma\left(-2, -\frac{1}{2}bx\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="maxima")
```

```
[Out] -1/4*b^2*e^(1/2*a)*gamma(-2, -1/2*b*x)
```

Fricas [A] time = 1.50765, size = 101, normalized size = 1.42

$$\frac{b^2x^2\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,(bx+2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{8\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="fricas")
```

```
[Out] 1/8*(b^2*x^2*Ei(1/2*b*x)*e^(1/2*a) - 2*(b*x + 2)*e^(1/2*b*x + 1/2*a))/x^2
```

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

$$\int \frac{\sqrt{e^a e^{bx}}}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)**(1/2)/x**3,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**3, x)
```

Giac [A] time = 1.28556, size = 62, normalized size = 0.87

$$\frac{b^2x^2\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,bxe^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)} - 4\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{8\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="giac")
```

```
[Out] 1/8*(b^2*x^2*Ei(1/2*b*x)*e^(1/2*a) - 2*b*x*e^(1/2*b*x + 1/2*a) - 4*e^(1/2*b
*x + 1/2*a))/x^2
```

3.98 $\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx$

Optimal. Leaf size=92

$$\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\text{Ei}\left(\frac{bx}{2}\right)-\frac{b^2\sqrt{e^{a+bx}}}{24x}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{\sqrt{e^{a+bx}}}{3x^3}$$

```
[Out] -Sqrt[E^(a + b*x)]/(3*x^3) - (b*Sqrt[E^(a + b*x)])/(12*x^2) - (b^2*Sqrt[E^(
a + b*x)])/(24*x) + (b^3*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(48*E^((
b*x)/2))
```

Rubi [A] time = 0.154713, antiderivative size = 92, normalized size of antiderivative = 1., number of steps used = 5, number of rules used = 3, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.2, Rules used = {2177, 2182, 2178}

$$\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\text{Ei}\left(\frac{bx}{2}\right)-\frac{b^2\sqrt{e^{a+bx}}}{24x}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{\sqrt{e^{a+bx}}}{3x^3}$$

Antiderivative was successfully verified.

```
[In] Int[Sqrt[E^(a + b*x)]/x^4,x]
```

```
[Out] -Sqrt[E^(a + b*x)]/(3*x^3) - (b*Sqrt[E^(a + b*x)])/(12*x^2) - (b^2*Sqrt[E^(
a + b*x)])/(24*x) + (b^3*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(48*E^((
b*x)/2))
```

Rule 2177

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[((c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n)/(d*(m + 1))
, x] - Dist[(f*g*n*Log[F])/(d*(m + 1)), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !$UseGamma === True
```

Rule 2182

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rule 2178

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] :> Si
mp[(F^(g*(e - (c*f)/d))*ExpIntegralEi[(f*g*(c + d*x)*Log[F])/d])/d, x] /; F
reeQ[{F, c, d, e, f, g}, x] &&  !$UseGamma === True
```

Rubi steps

$$
\begin{aligned}
\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx &= -\frac{\sqrt{e^{a+bx}}}{3x^3}+\frac{1}{6}b\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx \\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}+\frac{1}{24}b^2\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx \\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}b^3\int \frac{\sqrt{e^{a+bx}}}{x}\,dx \\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}\left(b^3e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int \frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx \\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\text{Ei}\left(\frac{bx}{2}\right)
\end{aligned}
$$

Mathematica [A] time = 0.0529866, size = 64, normalized size = 0.7

$$
\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(b^3x^3\text{Ei}\left(\frac{bx}{2}\right)-2e^{\frac{bx}{2}}\left(b^2x^2+2bx+8\right)\right)}{48x^3}
$$

Antiderivative was successfully verified.

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^4,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2)*(8 + 2*b*x + b^2*x^2) + b^3*x^3*ExpInteg
ralEi[(b*x)/2]))/(48*E^((b*x)/2)*x^3)
```

Maple [B] time = 0.03, size = 189, normalized size = 2.1

$$
-\frac{b^3}{8}\sqrt{e^{bx+a}}e^{\frac{3a}{2}-\frac{bx}{2}e^{\frac{a}{2}}}\left(\frac{8}{3x^3b^3}e^{-\frac{3a}{2}}+2\frac{e^{-a}}{x^2b^2}+\frac{1}{bx}e^{-\frac{a}{2}}+\frac{11}{36}-\frac{\ln(x)}{6}+\frac{\ln(2)}{6}-\frac{1}{6}\ln\left(-be^{\frac{a}{2}}\right)-\frac{1}{9x^3b^3}e^{-\frac{3a}{2}}\left(\frac{11x^3b^3}{4}e^{\frac{3a}{2}}+\right.\right.
$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(exp(b*x+a)^(1/2)/x^4,x)
```

```
[Out] -1/8*exp(b*x+a)^(1/2)*exp(3/2*a-1/2*b*x*exp(1/2*a))*b^3*(8/3/x^3/b^3*exp(-3
/2*a)+2/x^2/b^2*exp(-a)+1/x/b*exp(-1/2*a)+11/36-1/6*ln(x)+1/6*ln(2)-1/6*ln(
-b*exp(1/2*a))-1/9/b^3/x^3*exp(-3/2*a)*(11/4*b^3*x^3*exp(3/2*a)+9*b^2*x^2*e
xp(a)+18*b*x*exp(1/2*a)+24)+1/3/b^3/x^3*exp(-3/2*a+1/2*b*x*exp(1/2*a))*(b^2
*x^2*exp(a)+2*b*x*exp(1/2*a)+8)+1/6*ln(-1/2*b*x*exp(1/2*a))+1/6*Ei(1,-1/2*b
*x*exp(1/2*a)))
```

Maxima [A] time = 1.13943, size = 20, normalized size = 0.22

$$
\frac{1}{8}b^3e^{\left(\frac{1}{2}a\right)}\Gamma\left(-3,-\frac{1}{2}bx\right)
$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="maxima")
```

```
[Out] 1/8*b^3*e^(1/2*a)*gamma(-3, -1/2*b*x)
```

Fricas [A] time = 1.46683, size = 119, normalized size = 1.29

$$\frac{b^3x^3\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}-2\left(b^2x^2+2\,bx+8\right)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{48\,x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="fricas")
```

```
[Out] 1/48*(b^3*x^3*Ei(1/2*b*x)*e^(1/2*a) - 2*(b^2*x^2 + 2*b*x + 8)*e^(1/2*b*x +
1/2*a))/x^3
```

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

$$\int\frac{\sqrt{e^ae^{bx}}}{x^4}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)**(1/2)/x**4,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**4, x)
```

Giac [A] time = 1.30918, size = 85, normalized size = 0.92

$$\frac{b^3x^3\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}-2\,b^2x^2e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}-4\,bxe^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}-16\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{48\,x^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="giac")
```

```
[Out] 1/48*(b^3*x^3*Ei(1/2*b*x)*e^(1/2*a) - 2*b^2*x^2*e^(1/2*b*x + 1/2*a) - 4*b*x
*e^(1/2*b*x + 1/2*a) - 16*e^(1/2*b*x + 1/2*a))/x^3
```

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

```
(* Original version thanks to Albert Rich emailed on 03/21/2017 *)
(* ::Package:: *)

(* ::Subsection:: *)
(*GradeAntiderivative[result,optimal]*)


(* ::Text:: *)
(*If result and optimal are mathematical expressions, *)
(*         GradeAntiderivative[result,optimal] returns*)
(*  "F" if the result fails to integrate an expression that*)
(*      is integrable*)
(*  "C" if result involves higher level functions than necessary*)
(*  "B" if result is more than twice the size of the optimal*)
(*      antiderivative*)
(*  "A" if result can be considered optimal*)


GradeAntiderivative[result_,optimal_] :=
  If[ExpnType[result]<=ExpnType[optimal],
    If[FreeQ[result,Complex] || Not[FreeQ[optimal,Complex]],
      If[LeafCount[result]<=2*LeafCount[optimal],
        "A",
      "B"],
    "C"],
  If[FreeQ[result,Integrate] && FreeQ[result,Int],
    "C",
  "F"]]


(* ::Text:: *)
(*The following summarizes the type number assigned an *)
(*expression based on the functions it involves*)
(*1 = rational function*)
(*2 = algebraic function*)
(*3 = elementary function*)
(*4 = special function*)
```

```
(*5 = hyperpergeometric function*)
(*6 = appell function*)
(*7 = rootsum function*)
(*8 = integrate function*)
(*9 = unknown function*)


ExpnType[expn_] :=
  If[AtomQ[expn],
    1,
  If[ListQ[expn],
    Max[Map[ExpnType,expn]],
  If[Head[expn]===Power,
    If[IntegerQ[expn[[2]]],
      ExpnType[expn[[1]]],
    If[Head[expn[[2]]]===Rational,
      If[IntegerQ[expn[[1]]] || Head[expn[[1]]]===Rational,
        1,
      Max[ExpnType[expn[[1]]],2]],
    Max[ExpnType[expn[[1]]],ExpnType[expn[[2]]],3]]],
  If[Head[expn]===Plus || Head[expn]===Times,
    Max[ExpnType[First[expn]],ExpnType[Rest[expn]]],
  If[ElementaryFunctionQ[Head[expn]],
    Max[3,ExpnType[expn[[1]]]],
  If[SpecialFunctionQ[Head[expn]],
    Apply[Max,Append[Map[ExpnType,Apply[List,expn]],4]],
  If[HypergeometricFunctionQ[Head[expn]],
    Apply[Max,Append[Map[ExpnType,Apply[List,expn]],5]],
  If[AppellFunctionQ[Head[expn]],
    Apply[Max,Append[Map[ExpnType,Apply[List,expn]],6]],
  If[Head[expn]===RootSum,
    Apply[Max,Append[Map[ExpnType,Apply[List,expn]],7]],
  If[Head[expn]===Integrate || Head[expn]===Int,
    Apply[Max,Append[Map[ExpnType,Apply[List,expn]],8]],
  9]]]]]]]]]]


ElementaryFunctionQ[func_] :=
  MemberQ[{
        Exp,Log,
        Sin,Cos,Tan,Cot,Sec,Csc,
        ArcSin,ArcCos,ArcTan,ArcCot,ArcSec,ArcCsc,
        Sinh,Cosh,Tanh,Coth,Sech,Csch,
        ArcSinh,ArcCosh,ArcTanh,ArcCoth,ArcSech,ArcCsch
},func]


SpecialFunctionQ[func_] :=
  MemberQ[{
        Erf, Erfc, Erfi,
        FresnelS, FresnelC,
        ExpIntegralE, ExpIntegralEi, LogIntegral,
        SinIntegral, CosIntegral, SinhIntegral, CoshIntegral,
        Gamma, LogGamma, PolyGamma,
        Zeta, PolyLog, ProductLog,
        EllipticF, EllipticE, EllipticPi
},func]


HypergeometricFunctionQ[func_] :=
  MemberQ[{Hypergeometric1F1,Hypergeometric2F1,HypergeometricPFQ},func]
```

```
AppellFunctionQ[func_] :=
  MemberQ[{AppellF1},func]
```

4.0.2 Maple grading function

```
# File: GradeAntiderivative.mpl
# Original version thanks to Albert Rich emailed on 03/21/2017

#Nasser 03/22/2017  Use Maple leaf count instead since buildin
#Nasser 03/23/2017  missing 'ln' for ElementaryFunctionQ added
#Nasser 03/24/2017  corrected the check for complex result
#Nasser 10/27/2017  check for leafsize and do not call ExpnType()
#                   if leaf size is "too large". Set at 500,000
#Nasser 12/22/2019  Added debug flag, added 'dilog' to special functions
#                   see problem 156, file Apostol_Problems

GradeAntiderivative := proc(result,optimal)
local leaf_count_result, leaf_count_optimal,ExpnType_result,ExpnType_optimal,
    debug:=false;

      leaf_count_result:=leafcount(result);
      #do NOT call ExpnType() if leaf size is too large. Recursion problem
      if leaf_count_result > 500000 then
          return "B";
      fi;

      leaf_count_optimal:=leafcount(optimal);

      ExpnType_result:=ExpnType(result);
      ExpnType_optimal:=ExpnType(optimal);

      if debug then
         print("ExpnType_result",ExpnType_result," ExpnType_optimal=",
    ExpnType_optimal);
      fi;

# If result and optimal are mathematical expressions,
#  GradeAntiderivative[result,optimal] returns
#   "F" if the result fails to integrate an expression that
#       is integrable
#   "C" if result involves higher level functions than necessary
#   "B" if result is more than twice the size of the optimal
#       antiderivative
#   "A" if result can be considered optimal

  #This check below actually is not needed, since I only
  #call this grading only for passed integrals. i.e. I check
  #for "F" before calling this. But no harm of keeping it here.
  #just in case.


  if not type(result,freeof('int')) then
     return "F";
  end if;


  if ExpnType_result<=ExpnType_optimal then
      if debug then
           print("ExpnType_result<=ExpnType_optimal");
      fi;
      if is_contains_complex(result) then
         if is_contains_complex(optimal) then
            if debug then
```

```
               print("both result and optimal complex");
            fi;
            #both result and optimal complex
            if leaf_count_result<=2*leaf_count_optimal then
               return "A";
            else
               return "B";
            end if
         else #result contains complex but optimal is not
            if debug then
               print("result contains complex but optimal is not");
            fi;
            return "C";
         end if
      else # result do not contain complex
           # this assumes optimal do not as well
           if debug then
               print("result do not contain complex, this assumes optimal do not as well");
           fi;
           if leaf_count_result<=2*leaf_count_optimal then
              if debug then
                 print("leaf_count_result<=2*leaf_count_optimal");
              fi;
              return "A";
           else
              if debug then
                 print("leaf_count_result>2*leaf_count_optimal");
              fi;
              return "B";
           end if
      end if
  else #ExpnType(result) > ExpnType(optimal)
      if debug then
         print("ExpnType(result) > ExpnType(optimal)");
      fi;
      return "C";
  end if

end proc:

#
# is_contains_complex(result)
# takes expressions and returns true if it contains "I" else false
#
#Nasser 032417
is_contains_complex:= proc(expression)
  return (has(expression,I));
end proc:

# The following summarizes the type number assigned an expression
# based on the functions it involves
# 1 = rational function
# 2 = algebraic function
# 3 = elementary function
# 4 = special function
# 5 = hyperpergeometric function
# 6 = appell function
# 7 = rootsum function
# 8 = integrate function
# 9 = unknown function

ExpnType := proc(expn)
```

```
  if type(expn,'atomic') then
    1
  elif type(expn,'list') then
    apply(max,map(ExpnType,expn))
  elif type(expn,'sqrt') then
    if type(op(1,expn),'rational') then
       1
    else
       max(2,ExpnType(op(1,expn)))
    end if
  elif type(expn,'`^`') then
    if type(op(2,expn),'integer') then
      ExpnType(op(1,expn))
    elif type(op(2,expn),'rational') then
      if type(op(1,expn),'rational') then
         1
      else
         max(2,ExpnType(op(1,expn)))
      end if
    else
         max(3,ExpnType(op(1,expn)),ExpnType(op(2,expn)))
    end if
  elif type(expn,'`+`') or type(expn,'`*`') then
    max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
  elif ElementaryFunctionQ(op(0,expn)) then
    max(3,ExpnType(op(1,expn)))
  elif SpecialFunctionQ(op(0,expn)) then
    max(4,apply(max,map(ExpnType,[op(expn)])))
  elif HypergeometricFunctionQ(op(0,expn)) then
    max(5,apply(max,map(ExpnType,[op(expn)])))
  elif AppellFunctionQ(op(0,expn)) then
    max(6,apply(max,map(ExpnType,[op(expn)])))
  elif op(0,expn)='int' then
    max(8,apply(max,map(ExpnType,[op(expn)]))) else
  9
  end if
end proc:


ElementaryFunctionQ := proc(func)
  member(func,[
        exp,log,ln,
        sin,cos,tan,cot,sec,csc,
        arcsin,arccos,arctan,arccot,arcsec,arccsc,
        sinh,cosh,tanh,coth,sech,csch,
        arcsinh,arccosh,arctanh,arccoth,arcsech,arccsch])
end proc:

SpecialFunctionQ := proc(func)
  member(func,[
        erf,erfc,erfi,
        FresnelS,FresnelC,
        Ei,Ei,Li,Si,Ci,Shi,Chi,
        GAMMA,lnGAMMA,Psi,Zeta,polylog,dilog,LambertW,
        EllipticF,EllipticE,EllipticPi])
end proc:

HypergeometricFunctionQ := proc(func)
  member(func,[Hypergeometric1F1,hypergeom,HypergeometricPFQ])
end proc:

AppellFunctionQ := proc(func)
  member(func,[AppellF1])
```

```
end proc:

# u is a sum or product.  rest(u) returns all but the
# first term or factor of u.
rest := proc(u) local v;
  if nops(u)=2 then
     op(2,u)
  else
     apply(op(0,u),op(2..nops(u),u))
  end if
end proc:

#leafcount(u) returns the number of nodes in u.
#Nasser 3/23/17  Replaced by build-in leafCount from package in Maple
leafcount := proc(u)
   MmaTranslator[Mma][LeafCount](u);
end proc:
```

4.0.3 Sympy grading function

```
#Dec 24, 2019. Nasser M. Abbasi:
#              Port of original Maple grading function by
#              Albert Rich to use with Sympy/Python
#Dec 27, 2019  Nasser. Added `RootSum`. See problem 177, Timofeev file
#              added 'exp_polar'
from sympy import *

def leaf_count(expr):
    #sympy do not have leaf count function. This is approximation
    return round(1.7*count_ops(expr))

def is_sqrt(expr):
    if isinstance(expr,Pow):
        if expr.args[1] == Rational(1,2):
            return True
        else:
            return False
    else:
        return False

def is_elementary_function(func):
    return func in [exp,log,ln,sin,cos,tan,cot,sec,csc,
            asin,acos,atan,acot,asec,acsc,sinh,cosh,tanh,coth,sech,csch,
            asinh,acosh,atanh,acoth,asech,acsch
        ]

def is_special_function(func):
    return func in [ erf,erfc,erfi,
             fresnels,fresnelc,Ei,Ei,Li,Si,Ci,Shi,Chi,
             gamma,loggamma,digamma,zeta,polylog,LambertW,
             elliptic_f,elliptic_e,elliptic_pi,exp_polar
         ]

def is_hypergeometric_function(func):
    return func in [hyper]

def is_appell_function(func):
    return func in [appellf1]

def is_atom(expn):
    try:
        if expn.isAtom or isinstance(expn,int) or isinstance(expn,float):
           return True
```

```
        else:
           return False

    except AttributeError as error:
        return False

def expnType(expn):
    debug=False
    if debug:
        print("expn=",expn,"type(expn)=",type(expn))

    if is_atom(expn):
       return 1
    elif isinstance(expn,list):
        return max(map(expnType, expn))   #apply(max,map(ExpnType,expn))
    elif  is_sqrt(expn):
        if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
            return 1
        else:
            return max(2,expnType(expn.args[0]))  #max(2,ExpnType(op(1,expn)))
    elif isinstance(expn,Pow):   #type(expn,'`^`')
        if isinstance(expn.args[1],Integer):  #type(op(2,expn),'integer')
            return expnType(expn.args[0])   #ExpnType(op(1,expn))
        elif isinstance(expn.args[1],Rational):  #type(op(2,expn),'rational')
            if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
                return 1
            else:
                return max(2,expnType(expn.args[0]))  #max(2,ExpnType(op(1,expn)))
        else:
            return max(3,expnType(expn.args[0]),expnType(expn.args[1])) #max(3,ExpnType(op(1,expn)),ExpnType(op(2,expn)))
    elif isinstance(expn,Add) or isinstance(expn,Mul): #type(expn,'`+`') or type(expn,'`*`')
        m1 = expnType(expn.args[0])
        m2 = expnType(list(expn.args[1:]))
        return max(m1,m2)  #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
    elif is_elementary_function(expn.func):  #ElementaryFunctionQ(op(0,expn))
        return max(3,expnType(expn.args[0]))  #max(3,ExpnType(op(1,expn)))
    elif is_special_function(expn.func): #SpecialFunctionQ(op(0,expn))
        m1 = max(map(expnType, list(expn.args)))
        return max(4,m1)   #max(4,apply(max,map(ExpnType,[op(expn)])))
    elif is_hypergeometric_function(expn.func): #HypergeometricFunctionQ(op(0,expn))
        m1 = max(map(expnType, list(expn.args)))
        return max(5,m1)   #max(5,apply(max,map(ExpnType,[op(expn)])))
    elif is_appell_function(expn.func):
        m1 = max(map(expnType, list(expn.args)))
        return max(6,m1)   #max(5,apply(max,map(ExpnType,[op(expn)])))
    elif isinstance(expn,RootSum):
        m1 = max(map(expnType, list(expn.args))) #Apply[Max,Append[Map[ExpnType,Apply[List,expn]],7]],
        return max(7,m1)
    elif str(expn).find("Integral") != -1:
        m1 = max(map(expnType, list(expn.args)))
        return max(8,m1)   #max(5,apply(max,map(ExpnType,[op(expn)])))
    else:
        return 9

#main function
def grade_antiderivative(result,optimal):

    leaf_count_result  = leaf_count(result)
```

```
    leaf_count_optimal = leaf_count(optimal)

    expnType_result  = expnType(result)
    expnType_optimal = expnType(optimal)

    if str(result).find("Integral") != -1:
        return "F"

    if expnType_result <= expnType_optimal:
        if result.has(I):
            if optimal.has(I): #both result and optimal complex
                if leaf_count_result <= 2*leaf_count_optimal:
                    return "A"
                else:
                    return "B"
            else: #result contains complex but optimal is not
                return "C"
        else: # result do not contain complex, this assumes optimal do not as well
            if leaf_count_result <= 2*leaf_count_optimal:
                return "A"
            else:
                return "B"
    else:
        return "C"
```

4.0.4 SageMath grading function

```
#Dec 24, 2019. Nasser: Ported original Maple grading function by
#              Albert Rich to use with Sagemath. This is used to
#              grade Fricas, Giac and Maxima results.
#Dec 24, 2019. Nasser: Added 'exp_integral_e' and 'sng', 'sin_integral'
#              'arctan2','floor','abs','log_integral'

from sage.all import *
from sage.symbolic.operators import add_vararg, mul_vararg

def tree(expr):
    debug=False;
    if debug:
         print ("Enter tree(expr), expr=",expr)
         print ("expr.operator()=",expr.operator())
         print ("expr.operands()=",expr.operands())
         print ("map(tree, expr.operands()=",map(tree, expr.operands()))

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

def leaf_count(anti):
    debug=False;

    if debug: print ("Enter leaf_count, anti=", anti, " len(anti)=", len(anti))

    if len(anti) == 0: #special check for optimal being 0 for some test cases.
       if debug: print ("len(anti) == 0")
       return 1
    else:
        if debug: print ("round(1.35*len(flatten(tree(anti))))=",round(1.35*len(flatten(tree(anti)))))
        return round(1.35*len(flatten(tree(anti)))) #fudge factor
                     #since this estimate of leaf count is bit lower than
```

```
                     #what it should be compared to Mathematica's

def is_sqrt(expr):
    debug=False;
    if expr.operator() == operator.pow:   #isinstance(expr,Pow):
        if expr.operands()[1]==1/2: #expr.args[1] == Rational(1,2):
            if debug: print ("expr is sqrt")
            return True
        else:
            return False
    else:
        return False

def is_elementary_function(func):
    debug = False

    m = func.name() in ['exp','log','ln',
            'sin','cos','tan','cot','sec','csc',
            'arcsin','arccos','arctan','arccot','arcsec','arccsc',
            'sinh','cosh','tanh','coth','sech','csch',
            'arcsinh','arccosh','arctanh','arccoth','arcsech','arccsch','sgn',
        'arctan2','floor','abs'
        ]
    if debug:
        if m:
            print ("func ", func , " is elementary_function")
        else:
            print ("func ", func , " is NOT elementary_function")


    return m

def is_special_function(func):
    debug = False

    if debug: print ("type(func)=", type(func))

    m= func.name() in ['erf','erfc','erfi','fresnel_sin','fresnel_cos','Ei',
           'Ei','Li','Si','sin_integral','Ci','cos_integral','Shi','
    sinh_integral'
           'Chi','cosh_integral','gamma','log_gamma','psi,zeta',
           'polylog','lambert_w','elliptic_f','elliptic_e',
           'elliptic_pi','exp_integral_e','log_integral']

    if debug:
        print ("m=",m)
        if m:
            print ("func ", func ," is special_function")
        else:
            print ("func ", func ," is NOT special_function")


    return m


def is_hypergeometric_function(func):
    return func.name() in ['hypergeometric','hypergeometric_M','
    hypergeometric_U']

def is_appell_function(func):
    return func.name() in ['hypergeometric']   #[appellf1] can't find this in
    sagemath

```

```
def is_atom(expn):

    #thanks to answer at https://ask.sagemath.org/question/49179/what-is-sagemath-equivalent-to-atomic-type-in-maple/
    try:
        if expn.parent() is SR:
            return expn.operator() is None
        if expn.parent() in (ZZ, QQ, AA, QQbar):
            return expn in expn.parent() # Should always return True
        if hasattr(expn.parent(),"base_ring") and hasattr(expn.parent(),"gens"):
            return expn in expn.parent().base_ring() or expn in expn.parent().gens()
        return False

    except AttributeError as error:
        return False


def expnType(expn):
    debug=False

    if debug:
        print (">>>>>Enter expnType, expn=", expn)
        print (">>>>>is_atom(expn)=", is_atom(expn))

    if is_atom(expn):
        return 1
    elif type(expn)==list:   #isinstance(expn,list):
        return max(map(expnType, expn))   #apply(max,map(ExpnType,expn))
    elif  is_sqrt(expn):
        if  type(expn.operands()[0])==Rational: #type(isinstance(expn.args[0],Rational):
            return 1
        else:
            return max(2,expnType(expn.operands()[0]))  #max(2,expnType(expn.args[0]))
    elif expn.operator() == operator.pow:   #isinstance(expn,Pow)
        if type(expn.operands()[1])==Integer:  #isinstance(expn.args[1],Integer)
            return expnType(expn.operands()[0])   #expnType(expn.args[0])
        elif type(expn.operands()[1])==Rational:  #isinstance(expn.args[1],Rational)
            if type(expn.operands()[0])==Rational: #isinstance(expn.args[0],Rational)
                return 1
            else:
                return max(2,expnType(expn.operands()[0]))  #max(2,expnType(expn.args[0]))
        else:
            return max(3,expnType(expn.operands()[0]),expnType(expn.operands()[1])) #max(3,expnType(expn.operands()[0]),expnType(expn.operands()[1]))
    elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #isinstance(expn,Add) or isinstance(expn,Mul)
        m1 = expnType(expn.operands()[0]) #expnType(expn.args[0])
        m2 = expnType(expn.operands()[1:]) #expnType(list(expn.args[1:]))
        return max(m1,m2)  #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
    elif is_elementary_function(expn.operator()):  #is_elementary_function(expn.func)
        return max(3,expnType(expn.operands()[0]))
    elif is_special_function(expn.operator()): #is_special_function(expn.func)
        m1 = max(map(expnType, expn.operands()))      #max(map(expnType, list(expn.args)))
```

```
        return max(4,m1)   #max(4,m1)
    elif is_hypergeometric_function(expn.operator()): # is_hypergeometric_function(expn.func)
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(5,m1)   #max(5,m1)
    elif is_appell_function(expn.operator()):
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(6,m1)   #max(6,m1)
    elif str(expn).find("Integral") != -1: #this will never happen, since it
                #is checked before calling the grading function that is passed.
                #but kept it here.
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(8,m1)   #max(5,apply(max,map(ExpnType,[op(expn)])))
    else:
        return 9

#main function
def grade_antiderivative(result,optimal):
    debug = False;

    if debug: print ("Enter grade_antiderivative for sagemath")

    leaf_count_result  = leaf_count(result)
    leaf_count_optimal = leaf_count(optimal)

    if debug: print ("leaf_count_result=", leaf_count_result, " leaf_count_optimal=",leaf_count_optimal)


    expnType_result  = expnType(result)
    expnType_optimal = expnType(optimal)

    if debug: print ("expnType_result=", expnType_result, "expnType_optimal=", expnType_optimal)

    if expnType_result <= expnType_optimal:
        if result.has(I):
            if optimal.has(I): #both result and optimal complex
                if leaf_count_result <= 2*leaf_count_optimal:
                    return "A"
                else:
                    return "B"
            else: #result contains complex but optimal is not
                return "C"
        else: # result do not contain complex, this assumes optimal do not as well
            if leaf_count_result <= 2*leaf_count_optimal:
                return "A"
            else:
                return "B"
    else:
        return "C"
```