Computer algebra independent integration tests

Summer 2022 edition

8-Special-functions/206-8.4-Trig-integral-functions

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Chapter 1

Introduction

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This report gives the result of running the computer algebra independent integration test.

The download section in the appendix contains links to download the problems in plain text format used for all CAS systems.

The number of integrals in this report is [136]. This is test number [206].

1.1 Listing of CAS systems tested

The following are the CAS systems tested:

1. Mathematica 13.1 (June 29, 2022) on windows 10.
2. Rubi 4.16.1 (Dec 19, 2018) on Mathematica 13.0.1 on windows 10.
3. Maple 2022.1 (June 1, 2022) on windows 10.
4. Maxima 5.46 (April 13, 2022) using Lisp SBCL 2.1.11.debian on Linux via sagemath 9.6.
5. Fricas 1.3.8 (June 21, 2022) based on sbcl 2.1.11.debian on Linux via sagemath 9.6.
6. Giac/Xcas 1.9.0-13 (July 3, 2022) on Linux via sagemath 9.6.
7. Sympy 1.10.1 (March 20, 2022) Using Python 3.10.4 on Linux.
8. Mupad using Matlab 2021a with Symbolic Math Toolbox Version 8.7 on windows 10.

Maxima and Fricas and Giac are called using 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 from 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	100.00 (136)	0.00 (0)
Mathematica	98.53 (134)	1.47 (2)
Fricas	92.65 (126)	7.35 (10)
Maple	86.76 (118)	13.24 (18)
Giac	52.21 (71)	47.79 (65)
Maxima	41.91 (57)	58.09 (79)
Sympy	38.24 (52)	61.76 (84)
Mupad	25.00 (34)	75.00 (102)

Table 1.1: Percentage solved for each CAS

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.

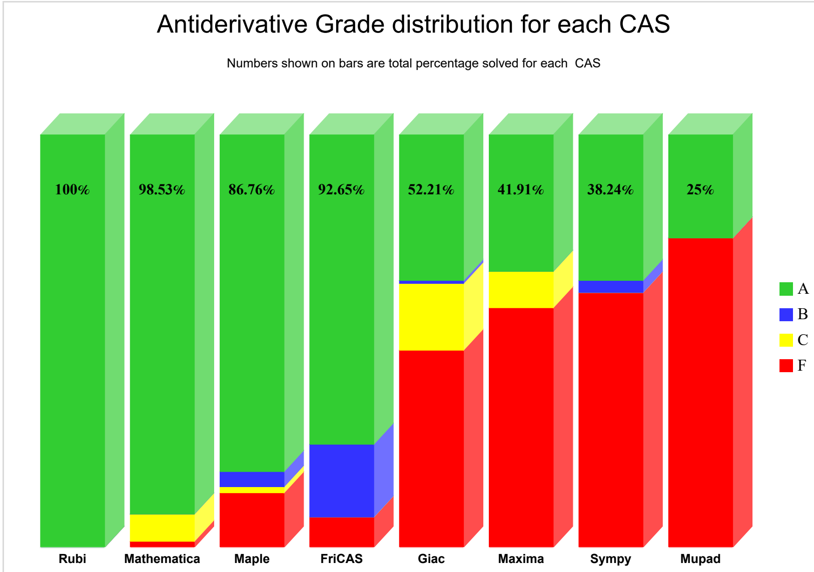
Table 1.2: Description of grading applied to integration result

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

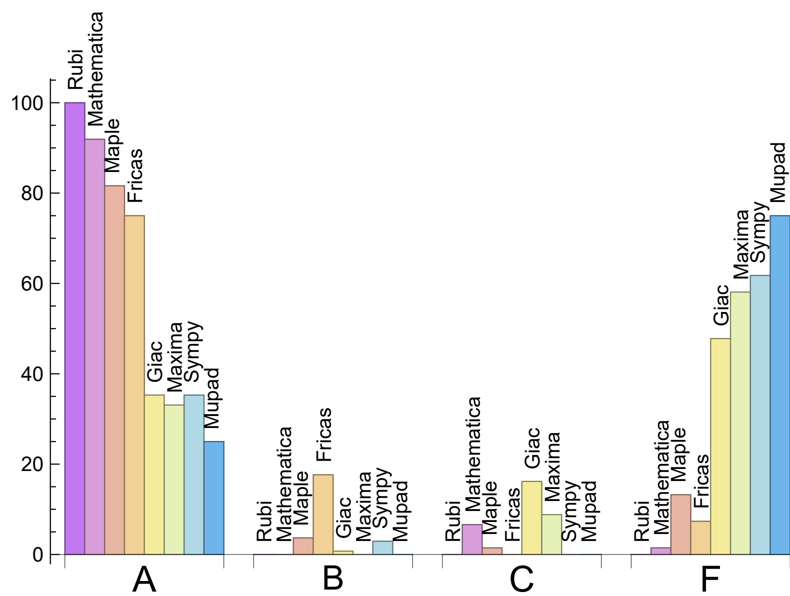
System	% A grade	% B grade	% C grade	% F grade
Rubi	100.00	0.00	0.00	0.00
Mathematica	91.91	0.00	6.62	1.47
Maple	81.62	3.68	1.47	13.24
Fricas	75.00	17.65	0.00	7.35
Giac	35.29	0.74	16.18	47.79
Sympy	35.29	2.94	0.00	61.76
Maxima	33.09	0.00	8.82	58.09
Mupad	N/A	0.00	0.00	75.00

Table 1.3: Antiderivative Grade distribution of each CAS

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.



The following table shows the distribution of the different types of failure for each CAS. There are 3 types of reasons why it can fail. The first is when CAS returns back the input within the time limit, which means it could not solve it. This the typical normal failure **F** .

The second is due to time out. CAS could not solve the integral within the 3 minutes time limit which is assigned **F(-1)**.

The third is due to an exception generated. Assigned **F(-2)**. This most likely indicates an interface problem between sagemath and the CAS (applicable only to FriCAS, Maxima and

Giac) or it could be an indication of an internal error in CAS. This type of error requires more investigations to determine the cause.

System	Number failed	Percentage normal failure	Percentage timeout failure	Percentage exception failure
Rubi	0	0.00 %	0.00 %	0.00 %
Mathematica	2	100.00 %	0.00 %	0.00 %
Maple	18	100.00 %	0.00 %	0.00 %
Fricas	10	100.00 %	0.00 %	0.00 %
Giac	65	90.77 %	9.23 %	0.00 %
Maxima	79	100.00 %	0.00 %	0.00 %
Sympy	84	100.00 %	0.00 %	0.00 %
Mupad	102	100.00 %	0.00 %	0.00 %

Table 1.4: Failure statistics for each CAS

1.3 Time and leaf size Performance

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

Mean size is the average leaf size produced by the CAS (before any normalization). The Normalized mean is relative to the mean size of the optimal anti-derivative given in the input files.

For example, if CAS has **Normalized mean** of 3, then the mean size of its leaf size is 3 times as large as the mean size of the optimal leaf size.

Median size is value of leaf size where half the values are larger than this and half are smaller (before any normalization). i.e. The Middle value.

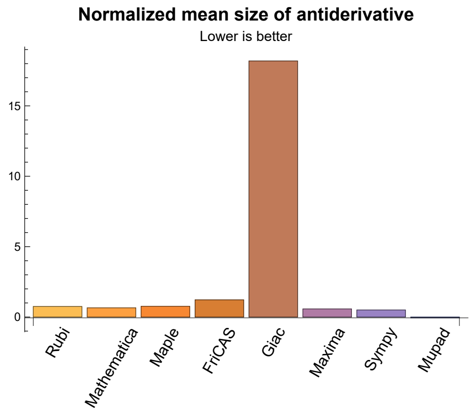
Similarly the **Normalized median** is relative to the median leaf size of the optimal.

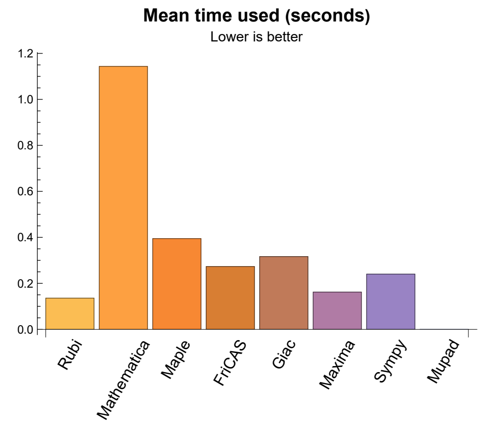
For example, if a CAS has Normalized median of 1.2, then its median is 1.2 as large as the median leaf size of the optimal.

System	Mean time (sec)	Mean size	Normalized mean	Median size	Normalized median
Rubi	0.14	78.26	0.75	49.00	1.00
Mathematica	1.14	62.95	0.65	44.00	0.73
Maple	0.39	96.56	0.76	38.50	0.83
Maxima	0.16	39.46	0.58	0.00	0.00
Fricas	0.27	116.24	1.22	59.00	0.91
Sympy	0.24	26.40	0.50	0.00	0.00
Giac	0.32	6066.49	18.19	23.00	0.78
Mupad	0.00	-1.00	-0.06	-1.00	-0.07

Table 1.5: Time and leaf size performance for each CAS

The following are bar charts for the normalized leafsize and time used from the above table.


Normalized mean size of antiderivative
Lower is better
0
5
10
15
Rubi
Mathematica
Maple
FriCAS
Giac
Maxima
Sympy
Mupad


Mean time used (seconds)
Lower is better
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Rubi
Mathematica
Maple
FriCAS
Giac
Maxima
Sympy
Mupad

1.4 list of integrals that has no closed form antiderivative

$\{9, 14, 15, 16, 17, 22, 25, 29, 30, 31, 40, 46, 48, 58, 62, 65, 68, 77, 82, 83, 84, 85, 90, 93, 97, 98, 99, 107, 109, 115, 126, 130, 133, 136\}$

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

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {16}

Sympy {}

Giac {}

Mupad {}

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.

Mupad Verification phase not implemented yet.

1.7 Timing

The command `AbsoluteTiming[]` 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 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 CPU 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 was 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 was correct.

Verification phase also had 3 minutes time out. An integral whose result was not verified could still be correct, but further investigation is needed on those integrals. These integrals were 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 tests were run in a batch mode, and using an automated script, then any integral where Maxima needed an interactive response from the user to answer a question during the evaluation of the integral will fail.

The exception raised is `ValueError`. Therefore Maxima results is lower than what would result if Maxima was run directly and each question 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 14 such integrals out of total 705, or about 2 percent. This percentage can be higher or lower depending on the specific input test file.

Such integrals can be identified by looking at the output of the integration in each section for Maxima. The exception message will indicate the cause of error.

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 automatic loading of Maxima `abs_integrate` was found to cause some problems. 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 result

There were few integrals which failed due to SageMath interface and not because FriCAS system could not do the integration.

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. These can be identified by looking at the exception message given in the result.

1.9.3 Important note about finding leaf size of antiderivative

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

The other CAS systems (SageMath and Sympy) do not have special builtin function for this purpose at this time. Therefore the leaf size for Fricas and Sympy antiderivative was determined using the following function, thanks to user `slelievre` at `https://ask.sagemath.org/question/57123/could-we-have-a-leaf_count-function-in-base-sagemath/`

```
def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)
```

For Sympy, which was called directly from Python, the following code was used to obtain the leafsize of its result

```
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
```

1.9.4 Important note about Mupad results

Matlab's symbolic toolbox does not have a leaf count function to measure the size of the antiderivative. Maple was used to determine the leaf size of Mupad output by post processing Mupad result.

Currently no grading of the antiderivative for Mupad is implemented. If it can integrate the problem, it was assigned a B grade automatically as a placeholder. In the future, when grading function is implemented for Mupad, the tests will be rerun again.

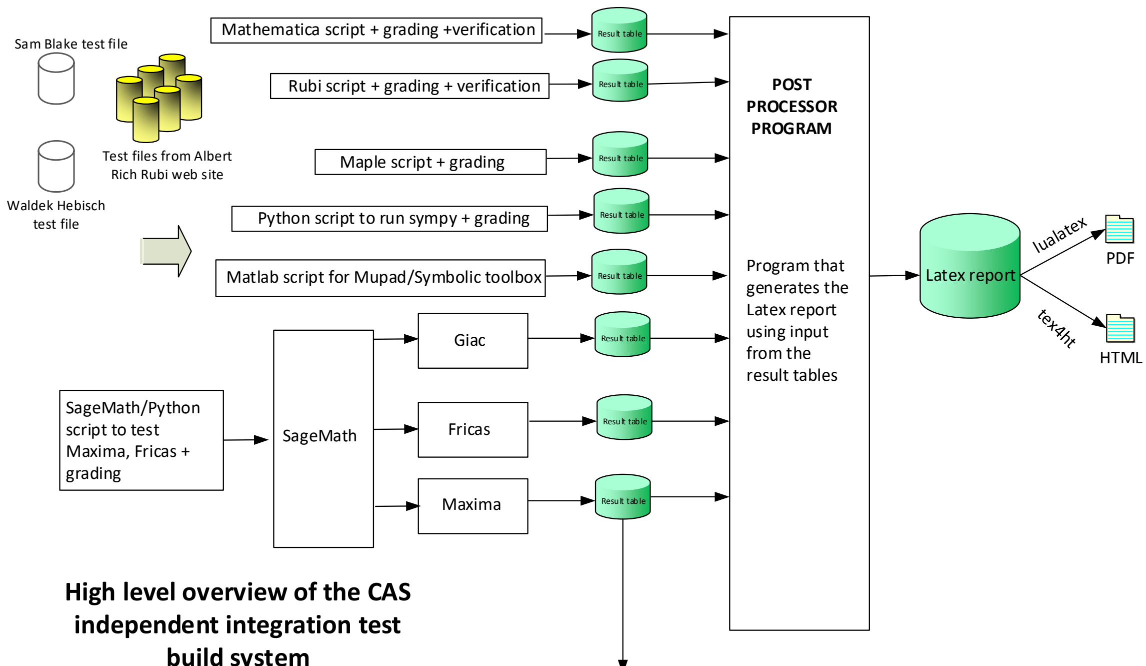
The following is an example of using Matlab's symbolic toolbox (Mupad) to solve an integral

```
integrand = evalin(symengine,'cos(x)*sin(x)')
the_variable = evalin(symengine,'x')
anti = int(integrand,the_variable)
```

Which gives `sin(x)^2/2`

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. This is description of each record

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

*The following fields are present only in **Rubi** Table file*

15. integer. Number of steps used.
16. integer. Number of rules used.
17. integer. Integrand leaf size.
18. real number. Ratio. Field 16 over field 17
19. String of form "{n,n,..}" which is list of the rules used by Rubi
20. String. The optimal antiderivative in Mathematica syntx

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August 26, 2022

Chapter 2

detailed summary tables of results

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2.1 List of integrals sorted by grade for each CAS

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2.1.1 Rubi

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

B grade: { }

C grade: { }

F grade: { }

2.1.2 Mathematica

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 65, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 133, 136 }

B grade: { }

C grade: { 41, 63, 64, 66, 67, 131, 132, 134, 135 }

F grade: { 39, 47 }

2.1.3 Maple

A grade: { 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 35, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 67, 68, 70, 71, 72, 73, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 95, 96, 97, 98, 99, 103, 107, 109, 110, 111, 112, 113, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 132, 133, 135, 136 }

B grade: { 63, 66, 74, 131, 134 }

C grade: { 1, 69 }

F grade: { 26, 32, 33, 34, 36, 37, 38, 39, 47, 94, 100, 101, 102, 104, 105, 106, 108, 114 }

2.1.4 Maxima

A grade: { 2, 3, 4, 5, 9, 14, 15, 16, 17, 21, 22, 25, 29, 30, 31, 35, 40, 41, 46, 48, 58, 62, 65, 68, 71, 73, 77, 82, 83, 84, 85, 89, 90, 93, 97, 98, 99, 103, 107, 109, 115, 126, 130, 133, 136 }

B grade: { }

C grade: { 7, 8, 18, 19, 20, 70, 72, 75, 76, 86, 87, 88 }

F grade: { 1, 6, 10, 11, 12, 13, 23, 24, 26, 27, 28, 32, 33, 34, 36, 37, 38, 39, 42, 43, 44, 45, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 63, 64, 66, 67, 69, 74, 78, 79, 80, 81, 91, 92, 94, 95, 96, 100, 101, 102, 104, 105, 106, 108, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 131, 132, 134, 135 }

2.1.5 FriCAS

A grade: { 1, 2, 3, 4, 5, 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, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 93, 96, 97, 98, 99, 107, 109, 115, 126, 130, 131, 132, 133, 134, 135, 136 }

B grade: { 54, 100, 101, 102, 103, 104, 105, 106, 110, 111, 112, 113, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129 }

C grade: { }

F grade: { 6, 74, 80, 91, 92, 94, 95, 108, 114, 116 }

2.1.6 Sympy

A grade: { 1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 17, 22, 25, 29, 30, 31, 40, 41, 46, 48, 58, 62, 65, 68, 70, 71, 72, 74, 77, 82, 83, 84, 85, 90, 93, 97, 98, 99, 107, 109, 115, 116, 126, 130, 133, 136 }

B grade: { 69, 73, 75, 76 }

C grade: { }

F grade: { 10, 11, 12, 13, 18, 19, 20, 21, 23, 24, 26, 27, 28, 32, 33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 63, 64, 66, 67, 78, 79, 80, 81, 86, 87, 88, 89, 91, 92, 94, 95, 96, 100, 101, 102, 103, 104, 105, 106, 108, 110, 111, 112, 113, 114, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 131, 132, 134, 135 }

2.1.7 Giac

A grade: { 2, 3, 4, 5, 7, 9, 10, 12, 14, 15, 16, 17, 22, 25, 29, 30, 31, 35, 40, 43, 45, 46, 48, 49, 51, 53, 54, 58, 62, 65, 68, 77, 82, 83, 84, 85, 90, 93, 97, 98, 99, 107, 109, 115, 126, 130, 133, 136 }

B grade: { 61 }

C grade: { 8, 11, 13, 18, 19, 20, 21, 23, 24, 42, 44, 50, 52, 55, 56, 57, 59, 60, 63, 64, 66, 67 }

F grade: { 1, 6, 26, 27, 28, 32, 33, 34, 36, 37, 38, 39, 41, 47, 69, 70, 71, 72, 73, 74, 75, 76, 78, 79, 80, 81, 86, 87, 88, 89, 91, 92, 94, 95, 96, 100, 101, 102, 103, 104, 105, 106, 108, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 131, 132, 134, 135 }

2.1.8 Mupad

A grade: { 9, 14, 15, 16, 17, 22, 25, 29, 30, 31, 40, 46, 48, 58, 62, 65, 68, 77, 82, 83, 84, 85, 90, 93, 97, 98, 99, 107, 109, 115, 126, 130, 133, 136 }

B grade: { }

C grade: { }

F grade: { 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 18, 19, 20, 21, 23, 24, 26, 27, 28, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 63, 64, 66, 67, 69, 70, 71, 72, 73, 74, 75, 76, 78, 79, 80, 81, 86, 87, 88, 89, 91, 92, 94, 95, 96, 100, 101, 102, 103, 104, 105, 106, 108, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 131, 132, 134, 135 }

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 `N.S.` in the table below, which stands for **normalized size** is defined as $\frac{\text{antiderivative leaf size}}{\text{optimal antiderivative leaf size}}$. To help make the table fit, `Mathematica` was abbreviated to `MMA`.

Problem 1	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	C	F	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	86	86	82	37	0	53	46	0	-1
N.S.	1	1.00	0.95	0.43	0.00	0.62	0.53	0.00	-0.01
time (sec)	N/A	0.049	0.042	0.558	0.000	0.110	0.543	0.000	0.000

Problem 2	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	63	63	50	56	48	49	61	49	-1
N.S.	1	1.00	0.79	0.89	0.76	0.78	0.97	0.78	-0.02
time (sec)	N/A	0.048	0.027	0.269	0.259	0.363	0.679	0.405	0.000

Problem 3	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	49	49	41	44	39	39	46	38	-1
N.S.	1	1.00	0.84	0.90	0.80	0.80	0.94	0.78	-0.02
time (sec)	N/A	0.032	0.020	0.257	0.262	0.342	0.790	0.405	0.000

Problem 4	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	35	35	35	32	29	30	29	29	-1
N.S.	1	1.00	1.00	0.91	0.83	0.86	0.83	0.83	-0.03
time (sec)	N/A	0.015	0.006	0.237	0.255	0.354	0.419	0.402	0.000

Problem 5	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	15	15	15	17	16	16	12	15	-1
N.S.	1	1.00	1.00	1.13	1.07	1.07	0.80	1.00	-0.07
time (sec)	N/A	0.003	0.002	0.200	0.259	0.370	0.447	0.405	0.000

Problem 6	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	43	43	43	20	0	0	22	0	-1
N.S.	1	1.00	1.00	0.47	0.00	0.00	0.51	0.00	-0.02
time (sec)	N/A	0.015	0.005	0.278	0.000	0.000	0.299	0.000	0.000

Problem 7	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	A	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	25	25	25	32	26	33	36	37	-1
N.S.	1	1.00	1.00	1.28	1.04	1.32	1.44	1.48	-0.04
time (sec)	N/A	0.031	0.010	0.302	0.305	0.379	0.517	0.404	0.000

Problem 8	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	A	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	46	46	46	48	32	31	41	149	-1
N.S.	1	1.00	1.00	1.04	0.70	0.67	0.89	3.24	-0.02
time (sec)	N/A	0.045	0.011	0.249	0.375	0.397	0.474	0.426	0.000

Problem 9	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.022	1.841	0.197	0.000	0.000	0.000	0.000	0.000

Problem 10	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	149	149	107	154	0	112	0	117	-1
N.S.	1	1.00	0.72	1.03	0.00	0.75	0.00	0.79	-0.01
time (sec)	N/A	0.150	0.088	0.450	0.000	0.390	0.000	0.407	0.000

Problem 11	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	112	112	78	84	0	81	0	150	-1
N.S.	1	1.00	0.70	0.75	0.00	0.72	0.00	1.34	-0.01
time (sec)	N/A	0.094	0.056	0.514	0.000	0.369	0.000	0.414	0.000

Problem 12	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	74	74	58	62	0	68	0	65	-1
N.S.	1	1.00	0.78	0.84	0.00	0.92	0.00	0.88	-0.01
time (sec)	N/A	0.061	0.037	0.381	0.000	0.372	0.000	0.411	0.000

Problem 13	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	32	32	32	32	0	31	0	49	-1
N.S.	1	1.00	1.00	1.00	0.00	0.97	0.00	1.53	-0.03
time (sec)	N/A	0.034	0.009	0.362	0.000	0.369	0.000	0.403	0.000

Problem 14	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.016	0.300	0.121	0.000	0.000	0.000	0.000	0.000

Problem 15	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.017	0.342	0.158	0.000	0.000	0.000	0.000	0.000

Problem 16	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	87	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	6.69	0.00	0.00	-0.08
time (sec)	N/A	0.017	0.360	0.143	0.000	0.369	0.000	0.000	0.000

Problem 17	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	48	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.211	2.674	0.183	0.000	0.000	0.000	0.000	0.000

Problem 18	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	184	184	96	157	123	92	0	338	-1
N.S.	1	1.00	0.52	0.85	0.67	0.50	0.00	1.84	-0.01
time (sec)	N/A	0.255	0.139	0.354	0.318	0.369	0.000	0.429	0.000

Problem 19	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	118	118	63	99	91	64	0	252	-1
N.S.	1	1.00	0.53	0.84	0.77	0.54	0.00	2.14	-0.01
time (sec)	N/A	0.191	0.100	0.303	0.315	0.343	0.000	0.420	0.000

Problem 20	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	71	71	50	61	68	48	0	191	-1
N.S.	1	1.00	0.70	0.86	0.96	0.68	0.00	2.69	-0.01
time (sec)	N/A	0.144	0.072	0.315	0.303	0.349	0.000	0.419	0.000

Problem 21	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	26	26	41	24	23	23	0	303	-1
N.S.	1	1.00	1.58	0.92	0.88	0.88	0.00	11.65	-0.04
time (sec)	N/A	0.004	0.031	0.176	0.263	0.348	0.000	0.414	0.000

Problem 22	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.016	0.464	0.148	0.000	0.000	0.000	0.000	0.000

Problem 23	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	46	46	39	48	0	51	0	181	-1
N.S.	1	1.00	0.85	1.04	0.00	1.11	0.00	3.93	-0.02
time (sec)	N/A	0.176	0.052	0.327	0.000	0.360	0.000	0.408	0.000

Problem 24	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	111	111	84	86	0	123	0	809	-1
N.S.	1	1.00	0.76	0.77	0.00	1.11	0.00	7.29	-0.01
time (sec)	N/A	0.234	0.239	0.309	0.000	0.377	0.000	0.436	0.000

Problem 25	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.030	5.184	0.154	0.000	0.000	0.000	0.000	0.000

Problem 26	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	329	329	158	0	0	163	0	0	-1
N.S.	1	1.00	0.48	0.00	0.00	0.50	0.00	0.00	-0.00
time (sec)	N/A	1.053	1.177	0.149	0.000	0.364	0.000	0.000	0.000

Problem 27	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	154	154	95	111	0	116	0	0	-1
N.S.	1	1.00	0.62	0.72	0.00	0.75	0.00	0.00	-0.01
time (sec)	N/A	0.225	0.206	0.568	0.000	0.387	0.000	0.000	0.000

Problem 28	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	49	49	43	45	0	44	0	0	-1
N.S.	1	1.00	0.88	0.92	0.00	0.90	0.00	0.00	-0.02
time (sec)	N/A	0.043	0.009	0.353	0.000	0.384	0.000	0.000	0.000

Problem 29	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.024	2.366	0.092	0.000	0.000	0.000	0.000	0.000

Problem 30	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.024	4.507	0.157	0.000	0.000	0.000	0.000	0.000

Problem 31	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.023	1.886	0.168	0.000	0.000	0.000	0.000	0.000

Problem 32	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	137	137	106	0	0	140	0	0	-1
N.S.	1	1.00	0.77	0.00	0.00	1.02	0.00	0.00	-0.01
time (sec)	N/A	0.184	0.998	0.170	0.000	0.377	0.000	0.000	0.000

Problem 33	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	137	137	106	0	0	140	0	0	-1
N.S.	1	1.00	0.77	0.00	0.00	1.02	0.00	0.00	-0.01
time (sec)	N/A	0.179	0.972	0.169	0.000	0.369	0.000	0.000	0.000

Problem 34	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	128	128	102	0	0	127	0	0	-1
N.S.	1	1.00	0.80	0.00	0.00	0.99	0.00	0.00	-0.01
time (sec)	N/A	0.166	0.933	0.160	0.000	0.351	0.000	0.000	0.000

Problem 35	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	54	54	95	54	49	57	0	59	-1
N.S.	1	1.00	1.76	1.00	0.91	1.06	0.00	1.09	-0.02
time (sec)	N/A	0.022	0.047	1.066	0.273	0.344	0.000	0.402	0.000

Problem 36	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	131	131	107	0	0	142	0	0	-1
N.S.	1	1.00	0.82	0.00	0.00	1.08	0.00	0.00	-0.01
time (sec)	N/A	0.168	0.993	0.152	0.000	0.362	0.000	0.000	0.000

Problem 37	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	139	139	111	0	0	147	0	0	-1
N.S.	1	1.00	0.80	0.00	0.00	1.06	0.00	0.00	-0.01
time (sec)	N/A	0.166	1.001	0.148	0.000	0.364	0.000	0.000	0.000

Problem 38	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	A	F	F(-1)	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	176	176	128	0	0	175	0	0	-1
N.S.	1	1.00	0.73	0.00	0.00	0.99	0.00	0.00	-0.01
time (sec)	N/A	0.214	1.735	0.139	0.000	0.382	0.000	0.000	0.000

Problem 39	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	F	F	F	A	F	F	F
verified	N/A	Yes	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	96	96	0	0	0	85	0	0	-1
N.S.	1	1.00	0.00	0.00	0.00	0.89	0.00	0.00	-0.01
time (sec)	N/A	0.144	0.692	0.073	0.000	0.368	0.000	0.000	0.000

Problem 40	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	49	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.107	0.578	0.073	0.000	0.000	0.000	0.000	0.000

Problem 41	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	A	A	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	10	10	26	9	8	8	7	0	-1
N.S.	1	1.00	2.60	0.90	0.80	0.80	0.70	0.00	-0.10
time (sec)	N/A	0.014	0.012	0.068	0.258	0.336	0.235	0.000	0.000

Problem 42	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	26	26	26	23	0	23	0	41	-1
N.S.	1	1.00	1.00	0.88	0.00	0.88	0.00	1.58	-0.04
time (sec)	N/A	0.031	0.011	0.152	0.000	0.351	0.000	0.408	0.000

Problem 43	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	61	61	44	45	0	54	0	55	-1
N.S.	1	1.00	0.72	0.74	0.00	0.89	0.00	0.90	-0.02
time (sec)	N/A	0.056	0.056	0.351	0.000	0.356	0.000	0.418	0.000

Problem 44	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	91	91	64	69	0	67	0	138	-1
N.S.	1	1.00	0.70	0.76	0.00	0.74	0.00	1.52	-0.01
time (sec)	N/A	0.080	0.071	0.407	0.000	0.361	0.000	0.407	0.000

Problem 45	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	126	126	93	138	0	99	0	106	-1
N.S.	1	1.00	0.74	1.10	0.00	0.79	0.00	0.84	-0.01
time (sec)	N/A	0.136	0.122	0.298	0.000	0.381	0.000	0.420	0.000

Problem 46	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	103	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.137	0.580	0.213	0.000	0.000	0.000	0.000	0.000

Problem 47	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	F	F	F	A	F	F	F
verified	N/A	Yes	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	44	44	0	0	0	53	0	0	-1
N.S.	1	1.00	0.00	0.00	0.00	1.20	0.00	0.00	-0.02
time (sec)	N/A	0.067	0.438	0.194	0.000	0.376	0.000	0.000	0.000

Problem 48	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.020	0.659	0.215	0.000	0.000	0.000	0.000	0.000

Problem 49	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	34	34	36	28	0	30	0	33	-1
N.S.	1	1.00	1.06	0.82	0.00	0.88	0.00	0.97	-0.03
time (sec)	N/A	0.039	0.013	0.361	0.000	0.361	0.000	0.409	0.000

Problem 50	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	61	61	42	44	0	43	0	124	-1
N.S.	1	1.00	0.69	0.72	0.00	0.70	0.00	2.03	-0.02
time (sec)	N/A	0.047	0.037	0.449	0.000	0.375	0.000	0.405	0.000

Problem 51	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	98	98	72	89	0	80	0	82	-1
N.S.	1	1.00	0.73	0.91	0.00	0.82	0.00	0.84	-0.01
time (sec)	N/A	0.087	0.071	0.374	0.000	0.348	0.000	0.418	0.000

Problem 52	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	128	128	94	111	0	92	0	180	-1
N.S.	1	1.00	0.73	0.87	0.00	0.72	0.00	1.41	-0.01
time (sec)	N/A	0.136	0.079	0.531	0.000	0.349	0.000	0.423	0.000

Problem 53	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	29	29	25	24	0	41	0	23	-1
N.S.	1	1.00	0.86	0.83	0.00	1.41	0.00	0.79	-0.03
time (sec)	N/A	0.037	0.022	0.902	0.000	0.353	0.000	0.402	0.000

Problem 54	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	A	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	29	29	25	24	0	54	0	23	-1
N.S.	1	1.00	0.86	0.83	0.00	1.86	0.00	0.79	-0.03
time (sec)	N/A	0.040	0.020	0.927	0.000	0.358	0.000	0.412	0.000

Problem 55	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	187	187	123	175	0	126	0	398	-1
N.S.	1	1.00	0.66	0.94	0.00	0.67	0.00	2.13	-0.01
time (sec)	N/A	0.578	0.233	0.558	0.000	0.368	0.000	0.445	0.000

Problem 56	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	97	97	71	82	0	88	0	507	-1
N.S.	1	1.00	0.73	0.85	0.00	0.91	0.00	5.23	-0.01
time (sec)	N/A	0.201	0.170	0.519	0.000	0.375	0.000	0.422	0.000

Problem 57	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	34	34	33	31	0	31	0	57	-1
N.S.	1	1.00	0.97	0.91	0.00	0.91	0.00	1.68	-0.03
time (sec)	N/A	0.037	0.015	0.194	0.000	0.333	0.000	0.427	0.000

Problem 58	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.095	3.277	0.124	0.000	0.000	0.000	0.000	0.000

Problem 59	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	218	218	134	212	0	141	0	431	-1
N.S.	1	1.00	0.61	0.97	0.00	0.65	0.00	1.98	-0.00
time (sec)	N/A	0.483	0.240	0.656	0.000	0.373	0.000	0.430	0.000

Problem 60	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	108	108	74	94	0	91	0	528	-1
N.S.	1	1.00	0.69	0.87	0.00	0.84	0.00	4.89	-0.01
time (sec)	N/A	0.164	0.132	0.572	0.000	0.354	0.000	0.423	0.000

Problem 61	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	B	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	46	46	45	38	0	46	0	95	-1
N.S.	1	1.00	0.98	0.83	0.00	1.00	0.00	2.07	-0.02
time (sec)	N/A	0.052	0.016	0.393	0.000	0.355	0.000	0.414	0.000

Problem 62	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.095	1.800	0.202	0.000	0.000	0.000	0.000	0.000

Problem 63	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	B	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	371	371	345	1246	0	580	0	200182	-1
N.S.	1	1.00	0.93	3.36	0.00	1.56	0.00	539.57	-0.00
time (sec)	N/A	0.640	3.279	2.029	0.000	0.389	0.000	3.719	0.000

Problem 64	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	154	154	168	290	0	195	0	9541	-1
N.S.	1	1.00	1.09	1.88	0.00	1.27	0.00	61.95	-0.01
time (sec)	N/A	0.157	1.227	1.078	0.000	0.361	0.000	0.627	0.000

Problem 65	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.105	19.977	0.167	0.000	0.000	0.000	0.000	0.000

Problem 66	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	B	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	370	370	427	1240	0	577	0	206132	-1
N.S.	1	1.00	1.15	3.35	0.00	1.56	0.00	557.11	-0.00
time (sec)	N/A	0.859	3.150	2.145	0.000	0.407	0.000	3.772	0.000

Problem 67	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	A	F	A	F	C	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	153	153	164	288	0	195	0	9214	-1
N.S.	1	1.00	1.07	1.88	0.00	1.27	0.00	60.22	-0.01
time (sec)	N/A	0.158	1.073	1.414	0.000	0.367	0.000	0.668	0.000

Problem 68	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.081	9.059	0.368	0.000	0.000	0.000	0.000	0.000

Problem 69	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	C	F	A	B	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	90	90	78	124	0	109	654	0	-1
N.S.	1	1.00	0.87	1.38	0.00	1.21	7.27	0.00	-0.01
time (sec)	N/A	0.056	0.057	0.546	0.000	0.111	0.980	0.000	0.000

Problem 70	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	63	63	53	56	94	59	85	0	-1
N.S.	1	1.00	0.84	0.89	1.49	0.94	1.35	0.00	-0.02
time (sec)	N/A	0.048	0.029	0.271	0.482	0.350	1.452	0.000	0.000

Problem 71	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	49	49	44	44	49	54	70	0	-1
N.S.	1	1.00	0.90	0.90	1.00	1.10	1.43	0.00	-0.02
time (sec)	N/A	0.033	0.022	0.247	0.272	0.352	1.174	0.000	0.000

Problem 72	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	35	35	35	32	70	51	53	0	-1
N.S.	1	1.00	1.00	0.91	2.00	1.46	1.51	0.00	-0.03
time (sec)	N/A	0.016	0.007	0.276	0.484	0.399	0.913	0.000	0.000

Problem 73	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	B	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	16	16	16	19	27	28	31	0	-1
N.S.	1	1.00	1.00	1.19	1.69	1.75	1.94	0.00	-0.06
time (sec)	N/A	0.003	0.003	0.174	0.258	0.364	0.750	0.000	0.000

Problem 74	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	B	F	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	61	61	94	158	0	0	44	0	-1
N.S.	1	1.00	1.54	2.59	0.00	0.00	0.72	0.00	-0.02
time (sec)	N/A	0.017	0.029	0.303	0.000	0.000	0.555	0.000	0.000

Problem 75	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	B	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	26	26	26	34	34	38	42	0	-1
N.S.	1	1.00	1.00	1.31	1.31	1.46	1.62	0.00	-0.04
time (sec)	N/A	0.033	0.009	0.260	0.311	0.347	0.534	0.000	0.000

Problem 76	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	B	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	46	46	46	48	61	42	87	0	-1
N.S.	1	1.00	1.00	1.04	1.33	0.91	1.89	0.00	-0.02
time (sec)	N/A	0.047	0.011	0.217	0.529	0.364	1.498	0.000	0.000

Problem 77	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.024	1.973	0.125	0.000	0.000	0.000	0.000	0.000

Problem 78	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	163	163	108	135	0	118	0	0	-1
N.S.	1	1.00	0.66	0.83	0.00	0.72	0.00	0.00	-0.01
time (sec)	N/A	0.158	0.079	0.340	0.000	0.363	0.000	0.000	0.000

Problem 79	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	112	112	78	84	0	111	0	0	-1
N.S.	1	1.00	0.70	0.75	0.00	0.99	0.00	0.00	-0.01
time (sec)	N/A	0.099	0.057	0.455	0.000	0.371	0.000	0.000	0.000

Problem 80	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	75	75	58	62	0	0	0	0	-1
N.S.	1	1.00	0.77	0.83	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.064	0.036	0.347	0.000	0.000	0.000	0.000	0.000

Problem 81	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	31	31	31	30	0	59	0	0	-1
N.S.	1	1.00	1.00	0.97	0.00	1.90	0.00	0.00	-0.03
time (sec)	N/A	0.037	0.008	0.325	0.000	0.347	0.000	0.000	0.000

Problem 82	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.016	0.295	0.068	0.000	0.000	0.000	0.000	0.000

Problem 83	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.019	0.355	0.094	0.000	0.000	0.000	0.000	0.000

Problem 84	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.017	0.365	0.106	0.000	0.000	0.000	0.000	0.000

Problem 85	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	48	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.227	2.491	0.133	0.000	0.000	0.000	0.000	0.000

Problem 86	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	184	184	95	154	502	176	0	0	-1
N.S.	1	1.00	0.52	0.84	2.73	0.96	0.00	0.00	-0.01
time (sec)	N/A	0.280	0.161	0.254	1.181	0.355	0.000	0.000	0.000

Problem 87	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	118	118	64	99	423	148	0	0	-1
N.S.	1	1.00	0.54	0.84	3.58	1.25	0.00	0.00	-0.01
time (sec)	N/A	0.198	0.106	0.249	0.910	0.363	0.000	0.000	0.000

Problem 88	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	C	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	71	71	49	60	311	104	0	0	-1
N.S.	1	1.00	0.69	0.85	4.38	1.46	0.00	0.00	-0.01
time (sec)	N/A	0.153	0.078	0.277	0.855	0.366	0.000	0.000	0.000

Problem 89	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	27	27	42	26	44	47	0	0	-1
N.S.	1	1.00	1.56	0.96	1.63	1.74	0.00	0.00	-0.04
time (sec)	N/A	0.004	0.027	0.123	0.263	0.353	0.000	0.000	0.000

Problem 90	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	13	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
time (sec)	N/A	0.015	0.440	0.210	0.000	0.000	0.000	0.000	0.000

Problem 91	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	47	47	40	49	0	0	0	0	-1
N.S.	1	1.00	0.85	1.04	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.160	0.055	0.276	0.000	0.000	0.000	0.000	0.000

Problem 92	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	111	111	76	88	0	0	0	0	-1
N.S.	1	1.00	0.68	0.79	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.258	0.296	0.271	0.000	0.000	0.000	0.000	0.000

Problem 93	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.032	5.188	0.092	0.000	0.000	0.000	0.000	0.000

Problem 94	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	329	329	159	0	0	0	0	0	-1
N.S.	1	1.00	0.48	0.00	0.00	0.00	0.00	0.00	-0.00
time (sec)	N/A	1.011	0.833	0.098	0.000	0.000	0.000	0.000	0.000

Problem 95	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	155	155	96	113	0	0	0	0	-1
N.S.	1	1.00	0.62	0.73	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.244	0.233	0.576	0.000	0.000	0.000	0.000	0.000

Problem 96	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	48	48	41	43	0	88	0	0	-1
N.S.	1	1.00	0.85	0.90	0.00	1.83	0.00	0.00	-0.02
time (sec)	N/A	0.048	0.010	0.290	0.000	0.360	0.000	0.000	0.000

Problem 97	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.022	0.918	0.056	0.000	0.000	0.000	0.000	0.000

Problem 98	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.024	1.508	0.114	0.000	0.000	0.000	0.000	0.000

Problem 99	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.025	1.814	0.115	0.000	0.000	0.000	0.000	0.000

Problem 100	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	133	133	102	0	0	448	0	0	-1
N.S.	1	1.00	0.77	0.00	0.00	3.37	0.00	0.00	-0.01
time (sec)	N/A	0.182	0.999	0.260	0.000	0.408	0.000	0.000	0.000

Problem 101	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	133	133	102	0	0	448	0	0	-1
N.S.	1	1.00	0.77	0.00	0.00	3.37	0.00	0.00	-0.01
time (sec)	N/A	0.172	0.989	0.198	0.000	0.426	0.000	0.000	0.000

Problem 102	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	124	124	98	0	0	445	0	0	-1
N.S.	1	1.00	0.79	0.00	0.00	3.59	0.00	0.00	-0.01
time (sec)	N/A	0.160	0.962	0.245	0.000	0.382	0.000	0.000	0.000

Problem 103	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	A	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	55	55	96	56	82	121	0	0	-1
N.S.	1	1.00	1.75	1.02	1.49	2.20	0.00	0.00	-0.02
time (sec)	N/A	0.023	0.059	0.967	0.256	0.399	0.000	0.000	0.000

Problem 104	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	127	127	102	0	0	444	0	0	-1
N.S.	1	1.00	0.80	0.00	0.00	3.50	0.00	0.00	-0.01
time (sec)	N/A	0.167	1.020	0.196	0.000	0.437	0.000	0.000	0.000

Problem 105	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	135	135	105	0	0	460	0	0	-1
N.S.	1	1.00	0.78	0.00	0.00	3.41	0.00	0.00	-0.01
time (sec)	N/A	0.166	1.001	0.217	0.000	0.380	0.000	0.000	0.000

Problem 106	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	172	172	124	0	0	674	0	0	-1
N.S.	1	1.00	0.72	0.00	0.00	3.92	0.00	0.00	-0.01
time (sec)	N/A	0.208	1.791	0.042	0.000	0.396	0.000	0.000	0.000

Problem 107	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	103	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.176	0.996	0.072	0.000	0.000	0.000	0.000	0.000

Problem 108	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	44	44	44	0	0	0	0	0	-1
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.070	0.010	0.076	0.000	0.000	0.000	0.000	0.000

Problem 109	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	15	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
time (sec)	N/A	0.017	1.431	0.101	0.000	0.000	0.000	0.000	0.000

Problem 110	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	35	35	37	29	0	145	0	0	-1
N.S.	1	1.00	1.06	0.83	0.00	4.14	0.00	0.00	-0.03
time (sec)	N/A	0.039	0.012	0.351	0.000	0.371	0.000	0.000	0.000

Problem 111	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	62	62	44	45	0	219	0	0	-1
N.S.	1	1.00	0.71	0.73	0.00	3.53	0.00	0.00	-0.02
time (sec)	N/A	0.047	0.039	0.413	0.000	0.409	0.000	0.000	0.000

Problem 112	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	111	111	72	91	0	296	0	0	-1
N.S.	1	1.00	0.65	0.82	0.00	2.67	0.00	0.00	-0.01
time (sec)	N/A	0.091	0.065	0.323	0.000	0.406	0.000	0.000	0.000

Problem 113	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	147	147	94	111	0	361	0	0	-1
N.S.	1	1.00	0.64	0.76	0.00	2.46	0.00	0.00	-0.01
time (sec)	N/A	0.131	0.079	0.396	0.000	0.436	0.000	0.000	0.000

Problem 114	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	F	F	F	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	97	97	97	0	0	0	0	0	-1
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	-0.01
time (sec)	N/A	0.140	0.012	0.190	0.000	0.000	0.000	0.000	0.000

Problem 115	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	51	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
time (sec)	N/A	0.067	0.324	0.175	0.000	0.000	0.000	0.000	0.000

Problem 116	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	F	A	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	10	10	10	9	0	0	7	0	-1
N.S.	1	1.00	1.00	0.90	0.00	0.00	0.70	0.00	-0.10
time (sec)	N/A	0.015	0.005	0.118	0.000	0.000	0.239	0.000	0.000

Problem 117	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	25	25	25	22	0	143	0	0	-1
N.S.	1	1.00	1.00	0.88	0.00	5.72	0.00	0.00	-0.04
time (sec)	N/A	0.030	0.010	0.233	0.000	0.356	0.000	0.000	0.000

Problem 118	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	60	60	42	44	0	221	0	0	-1
N.S.	1	1.00	0.70	0.73	0.00	3.68	0.00	0.00	-0.02
time (sec)	N/A	0.055	0.035	0.391	0.000	0.430	0.000	0.000	0.000

Problem 119	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	89	89	64	66	0	297	0	0	-1
N.S.	1	1.00	0.72	0.74	0.00	3.34	0.00	0.00	-0.01
time (sec)	N/A	0.080	0.060	0.497	0.000	0.423	0.000	0.000	0.000

Problem 120	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	142	142	93	116	0	361	0	0	-1
N.S.	1	1.00	0.65	0.82	0.00	2.54	0.00	0.00	-0.01
time (sec)	N/A	0.131	0.083	0.379	0.000	0.411	0.000	0.000	0.000

Problem 121	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	29	29	23	24	0	84	0	0	-1
N.S.	1	1.00	0.79	0.83	0.00	2.90	0.00	0.00	-0.03
time (sec)	N/A	0.038	0.022	0.694	0.000	0.364	0.000	0.000	0.000

Problem 122	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	29	29	27	24	0	86	0	0	-1
N.S.	1	1.00	0.93	0.83	0.00	2.97	0.00	0.00	-0.03
time (sec)	N/A	0.037	0.019	0.720	0.000	0.374	0.000	0.000	0.000

Problem 123	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	220	220	134	217	0	414	0	0	-1
N.S.	1	1.00	0.61	0.99	0.00	1.88	0.00	0.00	-0.00
time (sec)	N/A	0.569	0.228	0.559	0.000	0.433	0.000	0.000	0.000

Problem 124	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	109	109	76	94	0	274	0	0	-1
N.S.	1	1.00	0.70	0.86	0.00	2.51	0.00	0.00	-0.01
time (sec)	N/A	0.170	0.132	0.533	0.000	0.404	0.000	0.000	0.000

Problem 125	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	47	47	46	39	0	161	0	0	-1
N.S.	1	1.00	0.98	0.83	0.00	3.43	0.00	0.00	-0.02
time (sec)	N/A	0.051	0.021	0.311	0.000	0.361	0.000	0.000	0.000

Problem 126	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.105	4.645	0.107	0.000	0.000	0.000	0.000	0.000

Problem 127	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	185	185	123	170	0	414	0	0	-1
N.S.	1	1.00	0.66	0.92	0.00	2.24	0.00	0.00	-0.01
time (sec)	N/A	0.498	0.219	0.625	0.000	0.422	0.000	0.000	0.000

Problem 128	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	96	96	69	82	0	276	0	0	-1
N.S.	1	1.00	0.72	0.85	0.00	2.88	0.00	0.00	-0.01
time (sec)	N/A	0.190	0.115	0.578	0.000	0.415	0.000	0.000	0.000

Problem 129	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	A	A	F	B	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	33	33	32	30	0	159	0	0	-1
N.S.	1	1.00	0.97	0.91	0.00	4.82	0.00	0.00	-0.03
time (sec)	N/A	0.037	0.014	0.256	0.000	0.377	0.000	0.000	0.000

Problem 130	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.050	2.273	0.222	0.000	0.000	0.000	0.000	0.000

Problem 131	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	B	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	371	371	328	1242	0	451	0	0	-1
N.S.	1	1.00	0.88	3.35	0.00	1.22	0.00	0.00	-0.00
time (sec)	N/A	0.795	4.051	1.440	0.000	0.439	0.000	0.000	0.000

Problem 132	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	154	154	144	288	0	239	0	0	-1
N.S.	1	1.00	0.94	1.87	0.00	1.55	0.00	0.00	-0.01
time (sec)	N/A	0.161	0.805	0.864	0.000	0.409	0.000	0.000	0.000

Problem 133	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.108	21.641	0.121	0.000	0.000	0.000	0.000	0.000

Problem 134	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	B	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	370	370	433	1244	0	453	0	0	-1
N.S.	1	1.00	1.17	3.36	0.00	1.22	0.00	0.00	-0.00
time (sec)	N/A	0.586	2.792	1.613	0.000	0.445	0.000	0.000	0.000

Problem 135	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	A	A	C	A	F	A	F	F	F
verified	N/A	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	153	153	153	290	0	239	0	0	-1
N.S.	1	1.00	1.00	1.90	0.00	1.56	0.00	0.00	-0.01
time (sec)	N/A	0.155	0.913	0.907	0.000	0.394	0.000	0.000	0.000

Problem 136	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	A
verified	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	19	0	0	0	0	0	0	0	-1
N.S.	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
time (sec)	N/A	0.070	12.953	0.334	0.000	0.000	0.000	0.000	0.000

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 [38] had the largest ratio of [19]

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	5	4	1.00	8	0.500
2	A	6	4	1.00	8	0.500
3	A	5	4	1.00	8	0.500
4	A	4	4	1.00	6	0.667
5	A	1	1	1.00	4	0.250
6	A	1	1	1.00	8	0.125
7	A	4	4	1.00	8	0.500
8	A	5	4	1.00	8	0.500
9	A	0	0	0.00	0	0.000
10	A	19	11	1.00	10	1.100
11	A	15	10	1.00	10	1.000
12	A	10	8	1.00	8	1.000
13	A	6	5	1.00	6	0.833
14	A	0	0	0.00	0	0.000
15	A	0	0	0.00	0	0.000
16	A	0	0	0.00	0	0.000
17	A	0	0	0.00	0	0.000
18	A	14	6	1.00	10	0.600
19	A	10	6	1.00	10	0.600
20	A	7	6	1.00	8	0.750
21	A	1	1	1.00	6	0.167
22	A	0	0	0.00	0	0.000
23	A	7	5	1.00	10	0.500
24	A	11	6	1.00	10	0.600
25	A	0	0	0.00	0	0.000

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
26	A	39	19	1.00	12	1.583
27	A	17	14	1.00	10	1.400
28	A	5	5	1.00	8	0.625
29	A	0	0	0.00	0	0.000
30	A	0	0	0.00	0	0.000
31	A	0	0	0.00	0	0.000
32	A	7	5	1.00	17	0.294
33	A	7	5	1.00	15	0.333
34	A	7	5	1.00	13	0.385
35	A	3	1	1.00	17	0.059
36	A	7	5	1.00	17	0.294
37	A	7	5	1.00	17	0.294
38	A	7	5	1.00	19	0.263
39	A	14	10	1.00	12	0.833
40	A	0	0	0.00	0	0.000
41	A	1	1	1.00	12	0.083
42	A	5	4	1.00	9	0.444
43	A	9	7	1.00	10	0.700
44	A	14	9	1.00	12	0.750
45	A	18	10	1.00	12	0.833
46	A	0	0	0.00	0	0.000
47	A	7	6	1.00	12	0.500
48	A	0	0	0.00	0	0.000
49	A	5	4	1.00	9	0.444
50	A	9	7	1.00	10	0.700
51	A	13	9	1.00	12	0.750
52	A	20	11	1.00	12	0.917
53	A	6	4	1.00	9	0.444
54	A	6	4	1.00	9	0.444
55	A	21	16	1.00	16	1.000
56	A	11	9	1.00	14	0.643
57	A	4	4	1.00	13	0.308
58	A	0	0	0.00	0	0.000
59	A	21	14	1.00	16	0.875
60	A	12	10	1.00	14	0.714

Continued on next page

Table 2.1 – continued from previous page

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
61	A	4	3	1.00	13	0.231
62	A	0	0	0.00	0	0.000
63	A	24	10	1.00	14	0.714
64	A	9	5	1.00	13	0.385
65	A	0	0	0.00	0	0.000
66	A	24	9	1.00	14	0.643
67	A	9	5	1.00	13	0.385
68	A	0	0	0.00	0	0.000
69	A	5	4	1.00	8	0.500
70	A	6	4	1.00	8	0.500
71	A	5	4	1.00	8	0.500
72	A	4	4	1.00	6	0.667
73	A	1	1	1.00	4	0.250
74	A	1	1	1.00	8	0.125
75	A	4	4	1.00	8	0.500
76	A	5	4	1.00	8	0.500
77	A	0	0	0.00	0	0.000
78	A	19	11	1.00	10	1.100
79	A	15	10	1.00	10	1.000
80	A	10	8	1.00	8	1.000
81	A	6	5	1.00	6	0.833
82	A	0	0	0.00	0	0.000
83	A	0	0	0.00	0	0.000
84	A	0	0	0.00	0	0.000
85	A	0	0	0.00	0	0.000
86	A	14	6	1.00	10	0.600
87	A	10	6	1.00	10	0.600
88	A	7	6	1.00	8	0.750
89	A	1	1	1.00	6	0.167
90	A	0	0	0.00	0	0.000
91	A	7	5	1.00	10	0.500
92	A	11	6	1.00	10	0.600
93	A	0	0	0.00	0	0.000
94	A	39	19	1.00	12	1.583
95	A	17	14	1.00	10	1.400

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
96	A	5	5	1.00	8	0.625
97	A	0	0	0.00	0	0.000
98	A	0	0	0.00	0	0.000
99	A	0	0	0.00	0	0.000
100	A	7	5	1.00	17	0.294
101	A	7	5	1.00	15	0.333
102	A	7	5	1.00	13	0.385
103	A	3	1	1.00	17	0.059
104	A	7	5	1.00	17	0.294
105	A	7	5	1.00	17	0.294
106	A	7	5	1.00	19	0.263
107	A	0	0	0.00	0	0.000
108	A	7	6	1.00	12	0.500
109	A	0	0	0.00	0	0.000
110	A	5	4	1.00	9	0.444
111	A	9	7	1.00	10	0.700
112	A	13	9	1.00	12	0.750
113	A	20	11	1.00	12	0.917
114	A	14	10	1.00	12	0.833
115	A	0	0	0.00	0	0.000
116	A	1	1	1.00	12	0.083
117	A	5	4	1.00	9	0.444
118	A	9	7	1.00	10	0.700
119	A	14	9	1.00	12	0.750
120	A	18	10	1.00	12	0.833
121	A	6	4	1.00	9	0.444
122	A	6	4	1.00	9	0.444
123	A	21	14	1.00	16	0.875
124	A	12	10	1.00	14	0.714
125	A	4	3	1.00	13	0.231
126	A	0	0	0.00	0	0.000
127	A	21	16	1.00	16	1.000
128	A	11	9	1.00	14	0.643
129	A	4	4	1.00	13	0.308
130	A	0	0	0.00	0	0.000

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
131	A	24	9	1.00	14	0.643
132	A	9	5	1.00	13	0.385
133	A	0	0	0.00	0	0.000
134	A	24	10	1.00	14	0.714
135	A	9	5	1.00	13	0.385
136	A	0	0	0.00	0	0.000

Chapter 3

Listing of integrals

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3.127 $\int x^2\cos(a+bx)\text{CosIntegral}(a+bx)\,dx$ . . . 534
3.128 $\int x\cos(a+bx)\text{CosIntegral}(a+bx)\,dx$ . . . 540
3.129 $\int \cos(a+bx)\text{CosIntegral}(a+bx)\,dx$ . . . 544
3.130 $\int \frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{x}\,dx$ . . . 547
3.131 $\int x\text{CosIntegral}(c+dx)\sin(a+bx)\,dx$ . . . 550
3.132 $\int \text{CosIntegral}(c+dx)\sin(a+bx)\,dx$ . . . 555
3.133 $\int \frac{\text{CosIntegral}(c+dx)\sin(a+bx)}{x}\,dx$ . . . 559
3.134 $\int x\cos(a+bx)\text{CosIntegral}(c+dx)\,dx$ . . . 562
3.135 $\int \cos(a+bx)\text{CosIntegral}(c+dx)\,dx$ . . . 567
3.136 $\int \frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{x}\,dx$ . . . 571

3.1 $\int x^m \mathbf{Si}(bx)\,dx$

Optimal. Leaf size=86

$$\frac{x^m(-ibx)^{-m}\Gamma(1+m,-ibx)}{2b(1+m)}+\frac{x^m(ibx)^{-m}\Gamma(1+m,ibx)}{2b(1+m)}+\frac{x^{1+m}\mathrm{Si}(bx)}{1+m}$$

```
[Out] 1/2*x^m*GAMMA(1+m,-I*b*x)/b/(1+m)/((-I*b*x)^m)+1/2*x^m*GAMMA(1+m,I*b*x)/b/(
1+m)/((I*b*x)^m)+x^(1+m)*Si(b*x)/(1+m)
```

Rubi [A]
time = 0.05, antiderivative size = 86, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.500, Rules used = {6638, 12, 3389, 2212}

$$\frac{x^m(-ibx)^{-m}\mathrm{Gamma}(m+1,-ibx)}{2b(m+1)}+\frac{x^m(ibx)^{-m}\mathrm{Gamma}(m+1,ibx)}{2b(m+1)}+\frac{x^{m+1}\mathrm{Si}(bx)}{m+1}$$

Antiderivative was successfully verified.

```
[In] Int[x^m*SinIntegral[b*x],x]
```

```
[Out] (x^m*Gamma[1 + m, (-I)*b*x])/(2*b*(1 + m)*((-I)*b*x)^m) + (x^m*Gamma[1 + m,
 I*b*x])/(2*b*(1 + m)*(I*b*x)^m) + (x^(1 + m)*SinIntegral[b*x])/(1 + m)
```

Rule 12

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

Rule 2212

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))*((c_.) + (d_.)*(x_))^(m_), x_Symbol]
:> Simp[(-F^(g*(e - c*(f/d))))*((c + d*x)^FracPart[m]/(d*((-f)*g*(Log[F]/d)
)^(IntPart[m] + 1)*((-f)*g*Log[F]*((c + d*x)/d))^FracPart[m]))*Gamma[m + 1,
 ((-f)*g*(Log[F]/d))*(c + d*x)], x] /; FreeQ[{F, c, d, e, f, g, m}, x] &&
!IntegerQ[m]
```

Rule 3389

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Dist[I
/2, Int[(c + d*x)^m/E^(I*(e + f*x)), x], x] - Dist[I/2, Int[(c + d*x)^m*E^(
I*(e + f*x)), x], x] /; FreeQ[{c, d, e, f, m}, x]
```

Rule 6638

```
Int[((c_.) + (d_.)*(x_))^(m_.)*SinIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :
> Simp[(c + d*x)^(m + 1)*(SinIntegral[a + b*x]/(d*(m + 1))), x] - Dist[b/(d
```

```
*(m + 1)), Int[(c + d*x)^(m + 1)*(Sin[a + b*x]/(a + b*x)), x], x] /; FreeQ[
{a, b, c, d, m}, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}\int x^m \mathrm{Si}(bx)\,dx &= \frac{x^{1+m}\mathrm{Si}(bx)}{1+m} - \frac{b\int \frac{x^m \sin(bx)}{b}\,dx}{1+m}\\ &= \frac{x^{1+m}\mathrm{Si}(bx)}{1+m} - \frac{\int x^m \sin(bx)\,dx}{1+m}\\ &= \frac{x^{1+m}\mathrm{Si}(bx)}{1+m} - \frac{i\int e^{-ibx}x^m\,dx}{2(1+m)} + \frac{i\int e^{ibx}x^m\,dx}{2(1+m)}\\ &= \frac{x^m(-ibx)^{-m}\Gamma(1+m,-ibx)}{2b(1+m)} + \frac{x^m(ibx)^{-m}\Gamma(1+m,ibx)}{2b(1+m)} + \frac{x^{1+m}\mathrm{Si}(bx)}{1+m}\end{aligned}$$

Mathematica [A]
time = 0.04, size = 82, normalized size = 0.95

$$\frac{x^m(b^2x^2)^{-m}\left((ibx)^m\Gamma(1+m,-ibx)+(-ibx)^m\Gamma(1+m,ibx)+2bx(b^2x^2)^m\,\mathrm{Si}(bx)\right)}{2b(1+m)}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^m*SinIntegral[b*x],x]
```

```
[Out] (x^m*((I*b*x)^m*Gamma[1 + m, (-I)*b*x] + ((-I)*b*x)^m*Gamma[1 + m, I*b*x] +
 2*b*x*(b^2*x^2)^m*SinIntegral[b*x]))/(2*b*(1 + m)*(b^2*x^2)^m)
```

Maple [C] Result contains higher order function than in optimal. Order 5 vs. order 4.
time = 0.56, size = 37, normalized size = 0.43

method	result	size
meijerg	$\frac{b\,x^{2+m}\,\mathrm{hypergeom}\left(\left[\frac{1}{2},1+\frac{m}{2}\right],\left[\frac{3}{2},\frac{3}{2},2+\frac{m}{2}\right],-\frac{b^2x^2}{4}\right)}{2+m}$	37

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] b/(2+m)*x^(2+m)*hypergeom([1/2,1+1/2*m],[3/2,3/2,2+1/2*m],-1/4*b^2*x^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x),x, algorithm="maxima")
[Out] integrate(x^m*sin_integral(b*x), x)
```

Fricas [A]
time = 0.11, size = 53, normalized size = 0.62

$$\frac{2\,bxx^m\,\mathrm{Si}\,(bx) + \frac{\Gamma(m+1,i\,bx)}{(i\,b)^m} + \frac{\Gamma(m+1,-i\,bx)}{(-i\,b)^m}}{2\,(bm+b)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x),x, algorithm="fricas")
[Out] 1/2*(2*b*x*x^m*sin_integral(b*x) + gamma(m + 1, I*b*x)/(I*b)^m + gamma(m +
1, -I*b*x)/(-I*b)^m)/(b*m + b)
```

Sympy [A]
time = 0.54, size = 46, normalized size = 0.53

$$\frac{bx^2x^m\Gamma\left(\frac{m}{2}+1\right)\,{}_2F_3\left(\left.\begin{matrix}\frac{1}{2},\frac{m}{2}+1\\ \frac{3}{2},\frac{3}{2},\frac{m}{2}+2\end{matrix}\right|-\frac{b^2x^2}{4}\right)}{2\Gamma\left(\frac{m}{2}+2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Si(b*x),x)
[Out] b*x**2*x**m*gamma(m/2 + 1)*hyper((1/2, m/2 + 1), (3/2, 3/2, m/2 + 2), -b**2
*x**2/4)/(2*gamma(m/2 + 2))
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x),x, algorithm="giac")
[Out] integrate(x^m*sin_integral(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^m\,\mathrm{sinint}(b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*sinint(b*x),x)
[Out] int(x^m*sinint(b*x), x)
```

3.2 $\int x^3 \mathbf{Si}(bx)\,dx$

Optimal. Leaf size=63

$$-\frac{3x\cos(bx)}{2b^3}+\frac{x^3\cos(bx)}{4b}+\frac{3\sin(bx)}{2b^4}-\frac{3x^2\sin(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)$$

```
[Out] -3/2*x*cos(b*x)/b^3+1/4*x^3*cos(b*x)/b+1/4*x^4*Si(b*x)+3/2*sin(b*x)/b^4-3/4
*x^2*sin(b*x)/b^2
```

Rubi [A]
time = 0.05, antiderivative size = 63, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6638, 12, 3377, 2717}

$$\frac{3\sin(bx)}{2b^4}-\frac{3x\cos(bx)}{2b^3}-\frac{3x^2\sin(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)+\frac{x^3\cos(bx)}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*SinIntegral[b*x],x]
```

```
[Out] (-3*x*Cos[b*x])/(2*b^3) + (x^3*Cos[b*x])/(4*b) + (3*Sin[b*x])/(2*b^4) - (3*
x^2*Sin[b*x])/(4*b^2) + (x^4*SinIntegral[b*x])/4
```

Rule 12

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

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6638

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

Rubi steps

$$\begin{aligned}
\int x^3\text{Si}(bx)\,dx &= \frac{1}{4}x^4\text{Si}(bx)-\frac{1}{4}b\int\frac{x^3\sin(bx)}{b}\,dx\\
&= \frac{1}{4}x^4\text{Si}(bx)-\frac{1}{4}\int x^3\sin(bx)\,dx\\
&= \frac{x^3\cos(bx)}{4b}+\frac{1}{4}x^4\text{Si}(bx)-\frac{3\int x^2\cos(bx)\,dx}{4b}\\
&= \frac{x^3\cos(bx)}{4b}-\frac{3x^2\sin(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)+\frac{3\int x\sin(bx)\,dx}{2b^2}\\
&= -\frac{3x\cos(bx)}{2b^3}+\frac{x^3\cos(bx)}{4b}-\frac{3x^2\sin(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)+\frac{3\int\cos(bx)\,dx}{2b^3}\\
&= -\frac{3x\cos(bx)}{2b^3}+\frac{x^3\cos(bx)}{4b}+\frac{3\sin(bx)}{2b^4}-\frac{3x^2\sin(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)
\end{aligned}$$

Mathematica [A]
time = 0.03, size = 50, normalized size = 0.79

$$\frac{bx(-6+b^2x^2)\cos(bx)-3(-2+b^2x^2)\sin(bx)+b^4x^4\text{Si}(bx)}{4b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*SinIntegral[b*x],x]
```

```
[Out] (b*x*(-6 + b^2*x^2)*Cos[b*x] - 3*(-2 + b^2*x^2)*Sin[b*x] + b^4*x^4*SinInteg
ral[b*x])/(4*b^4)
```

Maple [A]
time = 0.27, size = 56, normalized size = 0.89

method	result	size
meijerg	$\frac{b\,x^5\,\text{hypergeom}\left(\left[\frac{1}{2},\frac{5}{2}\right],\left[\frac{3}{2},\frac{3}{2},\frac{7}{2}\right],-\frac{b^2x^2}{4}\right)}{5}$	23
derivativedivides	$\frac{\frac{b^4x^4\,\text{sinIntegral}(bx)}{4}+\frac{b^3x^3\cos(bx)}{4}-\frac{3b^2x^2\sin(bx)}{4}+\frac{3\sin(bx)}{2}-\frac{3bx\cos(bx)}{2}}{b^4}$	56
default	$\frac{\frac{b^4x^4\,\text{sinIntegral}(bx)}{4}+\frac{b^3x^3\cos(bx)}{4}-\frac{3b^2x^2\sin(bx)}{4}+\frac{3\sin(bx)}{2}-\frac{3bx\cos(bx)}{2}}{b^4}$	56

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*b^4*x^4*Si(b*x)+1/4*b^3*x^3*cos(b*x)-3/4*b^2*x^2*sin(b*x)+3/2*si
n(b*x)-3/2*b*x*cos(b*x))
```

Maxima [A]
time = 0.26, size = 48, normalized size = 0.76

$$\frac{1}{4}\,x^4\,\mathrm{Si}\,(bx) + \frac{(b^3x^3 - 6\,bx)\cos{(bx)} - 3\,(b^2x^2 - 2)\sin{(bx)}}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] 1/4*x^4*sin_integral(b*x) + 1/4*((b^3*x^3 - 6*b*x)*cos(b*x) - 3*(b^2*x^2 -
2)*sin(b*x))/b^4
```

Fricas [A]
time = 0.36, size = 49, normalized size = 0.78

$$\frac{b^4x^4\,\mathrm{Si}\,(bx) + (b^3x^3 - 6\,bx)\cos{(bx)} - 3\,(b^2x^2 - 2)\sin{(bx)}}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] 1/4*(b^4*x^4*sin_integral(b*x) + (b^3*x^3 - 6*b*x)*cos(b*x) - 3*(b^2*x^2 -
2)*sin(b*x))/b^4
```

Sympy [A]
time = 0.68, size = 61, normalized size = 0.97

$$\frac{x^4\,\mathrm{Si}\,(bx)}{4} + \frac{x^3\cos{(bx)}}{4b} - \frac{3x^2\sin{(bx)}}{4b^2} - \frac{3x\cos{(bx)}}{2b^3} + \frac{3\sin{(bx)}}{2b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Si(b*x),x)
```

```
[Out] x**4*Si(b*x)/4 + x**3*cos(b*x)/(4*b) - 3*x**2*sin(b*x)/(4*b**2) - 3*x*cos(b
*x)/(2*b**3) + 3*sin(b*x)/(2*b**4)
```

Giac [A]
time = 0.41, size = 49, normalized size = 0.78

$$\frac{1}{4}\,x^4\,\mathrm{Si}\,(bx) + \frac{(b^3x^3 - 6\,bx)\cos{(bx)}}{4\,b^4} - \frac{3\,(b^2x^2 - 2)\sin{(bx)}}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] 1/4*x^4*sin_integral(b*x) + 1/4*(b^3*x^3 - 6*b*x)*cos(b*x)/b^4 - 3/4*(b^2*x
^2 - 2)*sin(b*x)/b^4
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{\sin(bx)\left(\frac{6}{b^4}-\frac{3x^2}{b^2}\right)}{4}+\frac{x^4\,\mathrm{sinint}(bx)}{4}-\frac{\cos(bx)\left(\frac{6x}{b^3}-\frac{x^3}{b}\right)}{4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*sinint(b*x),x)
```

```
[Out] (sin(b*x)*(6/b^4 - (3*x^2)/b^2))/4 + (x^4*sinint(b*x))/4 - (cos(b*x)*((6*x)
/b^3 - x^3/b))/4
```

3.3 $\int x^2\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=49

$$-\frac{2\cos(bx)}{3b^3}+\frac{x^2\cos(bx)}{3b}-\frac{2x\sin(bx)}{3b^2}+\frac{1}{3}x^3\mathrm{Si}(bx)$$

```
[Out] -2/3*cos(b*x)/b^3+1/3*x^2*cos(b*x)/b+1/3*x^3*Si(b*x)-2/3*x*sin(b*x)/b^2
```

Rubi [A]
time = 0.03, antiderivative size = 49, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.500, Rules used = {6638, 12, 3377, 2718}

$$-\frac{2\cos(bx)}{3b^3}-\frac{2x\sin(bx)}{3b^2}+\frac{1}{3}x^3\mathrm{Si}(bx)+\frac{x^2\cos(bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*SinIntegral[b*x],x]
```

```
[Out] (-2*Cos[b*x])/(3*b^3) + (x^2*Cos[b*x])/(3*b) - (2*x*Sin[b*x])/(3*b^2) + (x^
3*SinIntegral[b*x])/3
```

Rule 12

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

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6638

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

Rubi steps

$$\begin{aligned}\int x^2\text{Si}(bx)\,dx &= \frac{1}{3}x^3\text{Si}(bx) - \frac{1}{3}b\int \frac{x^2\sin(bx)}{b}\,dx \\ &= \frac{1}{3}x^3\text{Si}(bx) - \frac{1}{3}\int x^2\sin(bx)\,dx \\ &= \frac{x^2\cos(bx)}{3b} + \frac{1}{3}x^3\text{Si}(bx) - \frac{2\int x\cos(bx)\,dx}{3b} \\ &= \frac{x^2\cos(bx)}{3b} - \frac{2x\sin(bx)}{3b^2} + \frac{1}{3}x^3\text{Si}(bx) + \frac{2\int \sin(bx)\,dx}{3b^2} \\ &= -\frac{2\cos(bx)}{3b^3} + \frac{x^2\cos(bx)}{3b} - \frac{2x\sin(bx)}{3b^2} + \frac{1}{3}x^3\text{Si}(bx)\end{aligned}$$

Mathematica [A]
time = 0.02, size = 41, normalized size = 0.84

$$\frac{(-2+b^2x^2)\cos(bx) - 2bx\sin(bx) + b^3x^3\text{Si}(bx)}{3b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*SinIntegral[b*x],x]
```

```
[Out] ((-2 + b^2*x^2)*Cos[b*x] - 2*b*x*Sin[b*x] + b^3*x^3*SinIntegral[b*x])/(3*b^
3)
```

Maple [A]
time = 0.26, size = 44, normalized size = 0.90

method	result	size
derivativedivides	$\frac{\frac{b^3x^3\,\text{sinIntegral}(bx)}{3}+\frac{b^2x^2\cos(bx)}{3}-\frac{2\cos(bx)}{3}-\frac{2bx\sin(bx)}{3}}{b^3}$	44
default	$\frac{\frac{b^3x^3\,\text{sinIntegral}(bx)}{3}+\frac{b^2x^2\cos(bx)}{3}-\frac{2\cos(bx)}{3}-\frac{2bx\sin(bx)}{3}}{b^3}$	44
meijerg	$\frac{2\sqrt{\pi}\left(\frac{1}{3\sqrt{\pi}}-\frac{\left(-\frac{b^2x^2}{2}+1\right)\cos(bx)}{3\sqrt{\pi}}-\frac{bx\sin(bx)}{3\sqrt{\pi}}+\frac{b^3x^3\,\text{sinIntegral}(bx)}{6\sqrt{\pi}}\right)}{b^3}$	60

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*b^3*x^3*Si(b*x)+1/3*b^2*x^2*cos(b*x)-2/3*cos(b*x)-2/3*b*x*sin(b*
x))
```

Maxima [A]
time = 0.26, size = 39, normalized size = 0.80

$$\frac{1}{3}\,x^3\,\mathrm{Si}\left(bx\right)-\frac{2\,bx\sin\left(bx\right)-\left(b^2x^2-2\right)\cos\left(bx\right)}{3\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] 1/3*x^3*sin_integral(b*x) - 1/3*(2*b*x*sin(b*x) - (b^2*x^2 - 2)*cos(b*x))/b
^3
```

Fricas [A]
time = 0.34, size = 39, normalized size = 0.80

$$\frac{b^3x^3\,\mathrm{Si}\left(bx\right)-2\,bx\sin\left(bx\right)+\left(b^2x^2-2\right)\cos\left(bx\right)}{3\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] 1/3*(b^3*x^3*sin_integral(b*x) - 2*b*x*sin(b*x) + (b^2*x^2 - 2)*cos(b*x))/b
^3
```

Sympy [A]
time = 0.79, size = 46, normalized size = 0.94

$$\frac{x^3\,\mathrm{Si}\left(bx\right)}{3}+\frac{x^2\cos\left(bx\right)}{3b}-\frac{2x\sin\left(bx\right)}{3b^2}-\frac{2\cos\left(bx\right)}{3b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x),x)
```

```
[Out] x**3*Si(b*x)/3 + x**2*cos(b*x)/(3*b) - 2*x*sin(b*x)/(3*b**2) - 2*cos(b*x)/(
3*b**3)
```

Giac [A]
time = 0.40, size = 38, normalized size = 0.78

$$\frac{1}{3}\,x^3\,\mathrm{Si}\left(bx\right)-\frac{2\,x\sin\left(bx\right)}{3\,b^2}+\frac{\left(b^2x^2-2\right)\cos\left(bx\right)}{3\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] 1/3*x^3*sin_integral(b*x) - 2/3*x*sin(b*x)/b^2 + 1/3*(b^2*x^2 - 2)*cos(b*x)
/b^3
```

<u>**Mupad**</u> [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{x^3\,\mathrm{sinint}(b\,x)}{3}-\frac{\cos\left(b\,x\right)\,\left(\frac{2}{b^3}-\frac{x^2}{b}\right)}{3}-\frac{2\,x\,\sin\left(b\,x\right)}{3\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(b*x),x)
[Out] (x^3*sinint(b*x))/3 - (cos(b*x)*(2/b^3 - x^2/b))/3 - (2*x*sin(b*x))/(3*b^2)
```

3.4 $\int x\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=35

$$\frac{x\cos(bx)}{2b}-\frac{\sin(bx)}{2b^2}+\frac{1}{2}x^2\mathrm{Si}(bx)$$

```
[Out] 1/2*x*cos(b*x)/b+1/2*x^2*Si(b*x)-1/2*sin(b*x)/b^2
```

Rubi [A]
time = 0.02, antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.667, Rules used = {6638, 12, 3377, 2717}

$$-\frac{\sin(bx)}{2b^2}+\frac{1}{2}x^2\mathrm{Si}(bx)+\frac{x\cos(bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*SinIntegral[b*x],x]
```

```
[Out] (x*Cos[b*x])/(2*b) - Sin[b*x]/(2*b^2) + (x^2*SinIntegral[b*x])/2
```

Rule 12

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

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6638

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

Rubi steps

$$
\begin{aligned}
\int x\mathrm{Si}(bx)\,dx &= \frac{1}{2}x^2\mathrm{Si}(bx) - \frac{1}{2}b\int \frac{x\sin(bx)}{b}\,dx \\
&= \frac{1}{2}x^2\mathrm{Si}(bx) - \frac{1}{2}\int x\sin(bx)\,dx \\
&= \frac{x\cos(bx)}{2b} + \frac{1}{2}x^2\mathrm{Si}(bx) - \frac{\int\cos(bx)\,dx}{2b} \\
&= \frac{x\cos(bx)}{2b} - \frac{\sin(bx)}{2b^2} + \frac{1}{2}x^2\mathrm{Si}(bx)
\end{aligned}
$$

Mathematica [A]
time = 0.01, size = 35, normalized size = 1.00

$$\frac{x\cos(bx)}{2b} - \frac{\sin(bx)}{2b^2} + \frac{1}{2}x^2\mathrm{Si}(bx)$$

Antiderivative was successfully verified.

```
[In] Integrate[x*SinIntegral[b*x],x]
[Out] (x*Cos[b*x])/(2*b) - Sin[b*x]/(2*b^2) + (x^2*SinIntegral[b*x])/2
```

Maple [A]
time = 0.24, size = 32, normalized size = 0.91

method	result	size
derivativedivides	$\frac{\frac{b^2x^2\,\mathrm{sinIntegral}(bx)}{2}-\frac{\sin(bx)}{2}+\frac{bx\cos(bx)}{2}}{b^2}$	32
default	$\frac{\frac{b^2x^2\,\mathrm{sinIntegral}(bx)}{2}-\frac{\sin(bx)}{2}+\frac{bx\cos(bx)}{2}}{b^2}$	32
meijerg	$\frac{\sqrt{\pi}\left(\frac{bx\cos(bx)}{2\sqrt{\pi}}-\frac{\sin(bx)}{2\sqrt{\pi}}+\frac{b^2x^2\,\mathrm{sinIntegral}(bx)}{2\sqrt{\pi}}\right)}{b^2}$	44

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b^2*(1/2*b^2*x^2*Si(b*x)-1/2*sin(b*x)+1/2*b*x*cos(b*x))
```

Maxima [A]
time = 0.25, size = 29, normalized size = 0.83

$$\frac{1}{2}\,x^2\,\mathrm{Si}\left(bx\right) + \frac{bx\cos\left(bx\right) - \sin\left(bx\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] 1/2*x^2*sin_integral(b*x) + 1/2*(b*x*cos(b*x) - sin(b*x))/b^2
```

Fricas [A]
time = 0.35, size = 30, normalized size = 0.86

$$\frac{b^2x^2\,\mathrm{Si}\,(bx)+bx\cos{(bx)}-\sin{(bx)}}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] 1/2*(b^2*x^2*sin_integral(b*x) + b*x*cos(b*x) - sin(b*x))/b^2
```

Sympy [A]
time = 0.42, size = 29, normalized size = 0.83

$$\frac{x^2\,\mathrm{Si}\,(bx)}{2}+\frac{x\cos{(bx)}}{2b}-\frac{\sin{(bx)}}{2b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(b*x),x)
```

```
[Out] x**2*Si(b*x)/2 + x*cos(b*x)/(2*b) - sin(b*x)/(2*b**2)
```

Giac [A]
time = 0.40, size = 29, normalized size = 0.83

$$\frac{1}{2}\,x^2\,\mathrm{Si}\,(bx)+\frac{x\cos{(bx)}}{2\,b}-\frac{\sin{(bx)}}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] 1/2*x^2*sin_integral(b*x) + 1/2*x*cos(b*x)/b - 1/2*sin(b*x)/b^2
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\frac{x^2\,\mathrm{sinint}(b\,x)}{2}-\frac{\sin{(b\,x)}-b\,x\,\cos{(b\,x)}}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(b*x),x)
```

```
[Out] (x^2*sinint(b*x))/2 - (sin(b*x) - b*x*cos(b*x))/(2*b^2)
```

3.5 $\int \mathrm{Si}(bx)\,dx$

Optimal. Leaf size=15

$$\frac{\cos(bx)}{b} + x\mathrm{Si}(bx)$$

[Out] cos(b*x)/b+x*Si(b*x)

Rubi [A]
time = 0.00, antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {6634}

$$x\mathrm{Si}(bx) + \frac{\cos(bx)}{b}$$

Antiderivative was successfully verified.

[In] Int[SinIntegral[b*x],x]

[Out] Cos[b*x]/b + x*SinIntegral[b*x]

Rule 6634

```
Int[SinIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(SinIntegr
al[a + b*x]/b), x] + Simp[Cos[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\int \mathrm{Si}(bx)\,dx = \frac{\cos(bx)}{b} + x\mathrm{Si}(bx)$$

Mathematica [A]
time = 0.00, size = 15, normalized size = 1.00

$$\frac{\cos(bx)}{b} + x\mathrm{Si}(bx)$$

Antiderivative was successfully verified.

[In] Integrate[SinIntegral[b*x],x]

[Out] Cos[b*x]/b + x*SinIntegral[b*x]

Maple [A]
time = 0.20, size = 17, normalized size = 1.13

method	result	size
derivativedivides	$\frac{\text{sinIntegral}(bx)bx+\cos(bx)}{b}$	17
default	$\frac{\text{sinIntegral}(bx)bx+\cos(bx)}{b}$	17
meijerg	$\frac{\sqrt{\pi}\left(-\frac{2}{\sqrt{\pi}}+\frac{2\cos(bx)}{\sqrt{\pi}}+\frac{2bx\,\text{sinIntegral}(bx)}{\sqrt{\pi}}\right)}{2b}$	35

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b*(Si(b*x)*b*x+cos(b*x))
```

Maxima [A]
time = 0.26, size = 16, normalized size = 1.07

$$\frac{bx\,\text{Si}\,(bx)+\cos\,(bx)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] (b*x*sin_integral(b*x) + cos(b*x))/b
```

Fricas [A]
time = 0.37, size = 16, normalized size = 1.07

$$\frac{bx\,\text{Si}\,(bx)+\cos\,(bx)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] (b*x*sin_integral(b*x) + cos(b*x))/b
```

Sympy [A]
time = 0.45, size = 12, normalized size = 0.80

$$x\,\text{Si}\,(bx)+\frac{\cos\,(bx)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x),x)
```

```
[Out] x*Si(b*x) + cos(b*x)/b
```

Giac [**A**]
time = 0.40, size = 15, normalized size = 1.00

$$x\,\mathrm{Si}\,(bx) + \frac{\cos{(bx)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x),x, algorithm="giac")
```

```
[Out] x*sin_integral(b*x) + cos(b*x)/b
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.07

$$x\,\mathrm{sinint}(b\,x) + \frac{\cos{(b\,x)}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x),x)
```

```
[Out] x*sinint(b*x) + cos(b*x)/b
```

3.6 $\int \frac{\textbf{Si}(bx)}{x} \, dx$

Optimal. Leaf size=43

$$\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;ibx)$$

```
[Out] 1/2*b*x*hypergeom([1, 1, 1],[2, 2, 2],-I*b*x)+1/2*b*x*hypergeom([1, 1, 1],[
2, 2, 2],I*b*x)
```

Rubi [A]
time = 0.02, antiderivative size = 43, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {6636}

$$\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;ibx)$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[b*x]/x,x]
```

```
[Out] (b*x*HypergeometricPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x])/2 + (b*x*Hypergeome
tricPFQ[{1, 1, 1}, {2, 2, 2}, I*b*x])/2
```

Rule 6636

```
Int[SinIntegral[(b_.)*(x_)]/(x_), x_Symbol] :> Simp[(1/2)*b*x*Hypergeometri
cPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x], x] + Simp[(1/2)*b*x*HypergeometricPFQ
[{1, 1, 1}, {2, 2, 2}, I*b*x], x] /; FreeQ[b, x]
```

Rubi steps

$$\int \frac{\text{Si}(bx)}{x}\,dx=\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;ibx)$$

Mathematica [A]
time = 0.00, size = 43, normalized size = 1.00

$$\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}bx\,{}_3F_3(1,1,1;2,2,2;ibx)$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[b*x]/x,x]
```

```
[Out] (b*x*HypergeometricPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x])/2 + (b*x*Hypergeome
tricPFQ[{1, 1, 1}, {2, 2, 2}, I*b*x])/2
```

Maple [A]
time = 0.28, size = 20, normalized size = 0.47

method	result	size
meijerg	$bx\,\mathrm{hypergeom}\left(\left[\frac{1}{2},\frac{1}{2}\right],\left[\frac{3}{2},\frac{3}{2},\frac{3}{2}\right],-\frac{b^2x^2}{4}\right)$	20

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)/x,x,method=_RETURNVERBOSE)
[Out] b*x*hypergeom([1/2,1/2],[3/2,3/2,3/2],-1/4*b^2*x^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x,x, algorithm="maxima")
[Out] integrate(sin_integral(b*x)/x, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x,x, algorithm="fricas")
[Out] integral(sin_integral(b*x)/x, x)
```

Sympy [A]
time = 0.30, size = 22, normalized size = 0.51

$$bx\,{}_2F_3\left(\begin{matrix}\frac{1}{2},\frac{1}{2}\\ \frac{3}{2},\frac{3}{2},\frac{3}{2}\end{matrix}\middle|-\frac{b^2x^2}{4}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)/x,x)
[Out] b*x*hyper((1/2, 1/2), (3/2, 3/2, 3/2), -b**2*x**2/4)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x)/x, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{sinint}(b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)/x,x)
```

```
[Out] int(sinint(b*x)/x, x)
```

3.7 $\int \frac{\mathbf{Si}(bx)}{x^2} \, dx$

Optimal. Leaf size=25

$$b\text{CosIntegral}(bx) - \frac{\sin(bx)}{x} - \frac{\text{Si}(bx)}{x}$$

```
[Out] b*Ci(b*x)-Si(b*x)/x-sin(b*x)/x
```

Rubi [A]
time = 0.03, antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6638, 12, 3378, 3383}

$$b\text{CosIntegral}(bx) - \frac{\text{Si}(bx)}{x} - \frac{\sin(bx)}{x}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[b*x]/x^2,x]
```

```
[Out] b*CosIntegral[b*x] - Sin[b*x]/x - SinIntegral[b*x]/x
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 6638

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

Rubi steps

$$\begin{aligned}\int \frac{\text{Si}(bx)}{x^2}\,dx &= -\frac{\text{Si}(bx)}{x} + b\int \frac{\sin(bx)}{bx^2}\,dx\\ &= -\frac{\text{Si}(bx)}{x} + \int \frac{\sin(bx)}{x^2}\,dx\\ &= -\frac{\sin(bx)}{x} - \frac{\text{Si}(bx)}{x} + b\int \frac{\cos(bx)}{x}\,dx\\ &= b\text{Ci}(bx) - \frac{\sin(bx)}{x} - \frac{\text{Si}(bx)}{x}\end{aligned}$$

Mathematica [A]
time = 0.01, size = 25, normalized size = 1.00

$$b\text{CosIntegral}(bx) - \frac{\sin(bx)}{x} - \frac{\text{Si}(bx)}{x}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[b*x]/x^2,x]
[Out] b*CosIntegral[b*x] - Sin[b*x]/x - SinIntegral[b*x]/x
```

Maple [A]
time = 0.30, size = 32, normalized size = 1.28

method	result	size
derivativedivides	$b\left(-\frac{\text{sinIntegral}(bx)}{bx} - \frac{\sin(bx)}{bx} + \text{cosineIntegral}\,(bx)\right)$	32
default	$b\left(-\frac{\text{sinIntegral}(bx)}{bx} - \frac{\sin(bx)}{bx} + \text{cosineIntegral}\,(bx)\right)$	32
meijerg	$\frac{b\sqrt{\pi}\left(-\frac{2b^2x^2\,\text{hypergeom}\left(\left[1,1,\frac{3}{2}\right],\left[2,2,\frac{5}{2},\frac{5}{2}\right],-\frac{b^2x^2}{4}\right)}{9\sqrt{\pi}} + \frac{8\gamma-16+8\ln(x)+8\ln(b)}{\sqrt{\pi}}\right)}{8}$	55

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)/x^2,x,method=_RETURNVERBOSE)
[Out] b*(-Si(b*x)/b/x-sin(b*x)/b/x+Ci(b*x))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.30, size = 26, normalized size = 1.04

$$\frac{1}{2}\,b(\Gamma(-1, i\,bx) + \Gamma(-1, -i\,bx)) - \frac{\text{Si}\,(bx)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x^2,x, algorithm="maxima")
[Out] 1/2*b*(gamma(-1, I*b*x) + gamma(-1, -I*b*x)) - sin_integral(b*x)/x
```

Fricas [A]
time = 0.38, size = 33, normalized size = 1.32

$$\frac{bx\,\mathrm{Ci}\,(bx) + bx\,\mathrm{Ci}\,(-bx) - 2\,\sin\,(bx) - 2\,\mathrm{Si}\,(bx)}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x^2,x, algorithm="fricas")
[Out] 1/2*(b*x*cos_integral(b*x) + b*x*cos_integral(-b*x) - 2*sin(b*x) - 2*sin_in
tegral(b*x))/x
```

Sympy [A]
time = 0.52, size = 36, normalized size = 1.44

$$-\frac{b^3x^2{}_3F_4\left(\begin{matrix}1,1,\frac{3}{2}\\2,2,\frac{5}{2},\frac{5}{2}\end{matrix}\middle|-\frac{b^2x^2}{4}\right)}{36}+\frac{b\log\left(b^2x^2\right)}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)/x**2,x)
[Out] -b**3*x**2*hyper((1, 1, 3/2), (2, 2, 5/2, 5/2), -b**2*x**2/4)/36 + b*log(b*
*2*x**2)/2
```

Giac [A]
time = 0.40, size = 37, normalized size = 1.48

$$\frac{bx\,\mathrm{Ci}\,(bx) + bx\,\mathrm{Ci}\,(-bx) - 2\,\sin\,(bx)}{2\,x} - \frac{\mathrm{Si}\,(bx)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x^2,x, algorithm="giac")
[Out] 1/2*(b*x*cos_integral(b*x) + b*x*cos_integral(-b*x) - 2*sin(b*x))/x - sin_i
ntegral(b*x)/x
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.04

$$b\,\mathrm{cosint}(b\,x) - \frac{\mathrm{sinint}(b\,x)}{x} - \frac{\sin\,(b\,x)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)/x^2,x)
[Out] b*cosint(b*x) - sinint(b*x)/x - sin(b*x)/x
```

3.8 $\int \frac{\mathbf{Si}(bx)}{x^3}\,dx$

Optimal. Leaf size=46

$$-\frac{b\cos(bx)}{4x}-\frac{\sin(bx)}{4x^2}-\frac{1}{4}b^2\text{Si}(bx)-\frac{\text{Si}(bx)}{2x^2}$$

```
[Out] -1/4*b*cos(b*x)/x-1/4*b^2*Si(b*x)-1/2*Si(b*x)/x^2-1/4*sin(b*x)/x^2
```

Rubi [A]
time = 0.05, antiderivative size = 46, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6638, 12, 3378, 3380}

$$-\frac{1}{4}b^2\text{Si}(bx)-\frac{\text{Si}(bx)}{2x^2}-\frac{\sin(bx)}{4x^2}-\frac{b\cos(bx)}{4x}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[b*x]/x^3,x]
```

```
[Out] -1/4*(b*Cos[b*x])/x - Sin[b*x]/(4*x^2) - (b^2*SinIntegral[b*x])/4 - SinInte
gral[b*x]/(2*x^2)
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 6638

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

Rubi steps

$$
\begin{aligned}
\int \frac{\text{Si}(bx)}{x^3}\,dx &= -\frac{\text{Si}(bx)}{2x^2}+\frac{1}{2}b\int \frac{\sin(bx)}{bx^3}\,dx\\
&= -\frac{\text{Si}(bx)}{2x^2}+\frac{1}{2}\int \frac{\sin(bx)}{x^3}\,dx\\
&= -\frac{\sin(bx)}{4x^2}-\frac{\text{Si}(bx)}{2x^2}+\frac{1}{4}b\int \frac{\cos(bx)}{x^2}\,dx\\
&= -\frac{b\cos(bx)}{4x}-\frac{\sin(bx)}{4x^2}-\frac{\text{Si}(bx)}{2x^2}-\frac{1}{4}b^2\int \frac{\sin(bx)}{x}\,dx\\
&= -\frac{b\cos(bx)}{4x}-\frac{\sin(bx)}{4x^2}-\frac{1}{4}b^2\text{Si}(bx)-\frac{\text{Si}(bx)}{2x^2}
\end{aligned}
$$

Mathematica [A]
time = 0.01, size = 46, normalized size = 1.00

$$-\frac{b\cos(bx)}{4x}-\frac{\sin(bx)}{4x^2}-\frac{1}{4}b^2\text{Si}(bx)-\frac{\text{Si}(bx)}{2x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[b*x]/x^3,x]
[Out] -1/4*(b*Cos[b*x])/x - Sin[b*x]/(4*x^2) - (b^2*SinIntegral[b*x])/4 - SinInte
gral[b*x]/(2*x^2)
```

Maple [A]
time = 0.25, size = 48, normalized size = 1.04

method	result	size
derivativedivides	$b^2\left(-\frac{\text{sinIntegral}(bx)}{2b^2x^2}-\frac{\sin(bx)}{4b^2x^2}-\frac{\cos(bx)}{4bx}-\frac{\text{sinIntegral}(bx)}{4}\right)$	48
default	$b^2\left(-\frac{\text{sinIntegral}(bx)}{2b^2x^2}-\frac{\sin(bx)}{4b^2x^2}-\frac{\cos(bx)}{4bx}-\frac{\text{sinIntegral}(bx)}{4}\right)$	48
meijerg	$\frac{\sqrt{\pi}\,b^2\left(-\frac{4\cos(bx)}{bx\sqrt{\pi}}-\frac{4\sin(bx)}{b^2x^2\sqrt{\pi}}-\frac{4\left(b^2x^2+2\right)\text{sinIntegral}(bx)}{b^2x^2\sqrt{\pi}}\right)}{16}$	64

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)/x^3,x,method=_RETURNVERBOSE)
[Out] b^2*(-1/2*Si(b*x)/b^2/x^2-1/4*sin(b*x)/b^2/x^2-1/4*cos(b*x)/b/x-1/4*Si(b*x)
)
```

Maxima [C] Result contains complex when optimal does not.
time = 0.37, size = 32, normalized size = 0.70

$$-\frac{1}{4}\,b^{2}(-i\,\Gamma(-2,i\,bx)+i\,\Gamma(-2,-i\,bx))-\frac{\mathrm{Si}\,(bx)}{2\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/4*b^2*(-I*gamma(-2, I*b*x) + I*gamma(-2, -I*b*x)) - 1/2*sin_integral(b*x
)/x^2
```

Fricas [A]
time = 0.40, size = 31, normalized size = 0.67

$$-\frac{bx\cos\left(bx\right)+\left(b^{2}x^{2}+2\right)\mathrm{Si}\left(bx\right)+\sin\left(bx\right)}{4\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/4*(b*x*cos(b*x) + (b^2*x^2 + 2)*sin_integral(b*x) + sin(b*x))/x^2
```

Sympy [A]
time = 0.47, size = 41, normalized size = 0.89

$$-\frac{b^{2}\,\mathrm{Si}\left(bx\right)}{4}-\frac{b\cos\left(bx\right)}{4x}-\frac{\sin\left(bx\right)}{4x^{2}}-\frac{\mathrm{Si}\left(bx\right)}{2x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)/x**3,x)
```

```
[Out] -b**2*Si(b*x)/4 - b*cos(b*x)/(4*x) - sin(b*x)/(4*x**2) - Si(b*x)/(2*x**2)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.43, size = 149, normalized size = 3.24

$$-\frac{b^{2}x^{2}\Im(\mathrm{Ci}\left(bx\right))\tan\left(\frac{1}{2}\,bx\right)^{2}-b^{2}x^{2}\Im(\mathrm{Ci}\left(-bx\right))\tan\left(\frac{1}{2}\,bx\right)^{2}+2\,b^{2}x^{2}\,\mathrm{Si}\left(bx\right)\tan\left(\frac{1}{2}\,bx\right)^{2}+b^{2}x^{2}\Im(\mathrm{Ci}\left(bx\right))-b^{2}x^{2}\Im(\mathrm{Ci}\left(-bx\right))+2\,b^{2}x^{2}\,\mathrm{Si}\left(bx\right)-2\,bx\tan\left(\frac{1}{2}\,bx\right)^{2}+2\,bx+4\,\tan\left(\frac{1}{2}\,bx\right)}{8\left(x^{2}\tan\left(\frac{1}{2}\,bx\right)^{2}+x^{2}\right)}-\frac{\mathrm{Si}\left(bx\right)}{2\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)/x^3,x, algorithm="giac")
```

```
[Out] -1/8*(b^2*x^2*imag_part(cos_integral(b*x))*tan(1/2*b*x)^2 - b^2*x^2*imag_pa
rt(cos_integral(-b*x))*tan(1/2*b*x)^2 + 2*b^2*x^2*sin_integral(b*x)*tan(1/2
*b*x)^2 + b^2*x^2*imag_part(cos_integral(b*x)) - b^2*x^2*imag_part(cos_inte
gral(-b*x)) + 2*b^2*x^2*sin_integral(b*x) - 2*b*x*tan(1/2*b*x)^2 + 2*b*x +
4*tan(1/2*b*x))/(x^2*tan(1/2*b*x)^2 + x^2) - 1/2*sin_integral(b*x)/x^2
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$-\frac{\frac{\sin(b\,x)}{2}+\frac{b\,x\,\cos(b\,x)}{2}}{2\,x^2}-\frac{b^2\,\mathrm{sinint}(b\,x)}{4}-\frac{\mathrm{sinint}(b\,x)}{2\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)/x^3,x)
```

```
[Out] - (sin(b*x)/2 + (b*x*cos(b*x))/2)/(2*x^2) - (b^2*sinint(b*x))/4 - sinint(b*
x)/(2*x^2)
```

3.9 $\int x^m \mathbf{Si}(bx)^2\,dx$

Optimal. Leaf size=13

$$\text{Int}\left(x^m \text{Si}(bx)^2, x\right)$$

```
[Out] CannotIntegrate(x^m*Si(b*x)^2,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int x^m \text{Si}(bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Int[x^m*SinIntegral[b*x]^2,x]
[Out] Defer[Int][x^m*SinIntegral[b*x]^2, x]
```

Rubi steps

$$\int x^m \text{Si}(bx)^2\,dx = \int x^m \text{Si}(bx)^2\,dx$$

Mathematica [A]
time = 1.84, size = 0, normalized size = 0.00

$$\int x^m \text{Si}(bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[x^m*SinIntegral[b*x]^2,x]
[Out] Integrate[x^m*SinIntegral[b*x]^2, x]
```

Maple [A]
time = 0.20, size = 0, normalized size = 0.00

$$\int x^m \,\text{sinIntegral}\left(bx\right)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Si(b*x)^2,x)
```

```
[Out] int(x^m*Si(b*x)^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x)^2,x, algorithm="maxima")
[Out] integrate(x^m*sin_integral(b*x)^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x)^2,x, algorithm="fricas")
[Out] integral(x^m*sin_integral(b*x)^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Si}^2(bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Si(b*x)**2,x)
[Out] Integral(x**m*Si(b*x)**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x)^2,x, algorithm="giac")
[Out] integrate(x^m*sin_integral(b*x)^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int x^m\, \mathrm{sinint}(b\,x)^2\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*sinint(b*x)^2,x)
[Out] int(x^m*sinint(b*x)^2, x)
```

3.10 $\int x^3\mathbf{Si}(bx)^2\,dx$

Optimal. Leaf size=149

$$\frac{x^2}{2b^2}+\frac{3\text{CosIntegral}(2bx)}{2b^4}-\frac{3\log(x)}{2b^4}-\frac{x\cos(bx)\sin(bx)}{b^3}+\frac{2\sin^2(bx)}{b^4}-\frac{x^2\sin^2(bx)}{4b^2}-\frac{3x\cos(bx)\text{Si}(bx)}{b^3}+\frac{x^3\cos(bx)}{2b}$$

```
[Out] 1/2*x^2/b^2+3/2*Ci(2*b*x)/b^4-3/2*ln(x)/b^4-3*x*cos(b*x)*Si(b*x)/b^3+1/2*x^
3*cos(b*x)*Si(b*x)/b+1/4*x^4*Si(b*x)^2-x*cos(b*x)*sin(b*x)/b^3+3*Si(b*x)*si
n(b*x)/b^4-3/2*x^2*Si(b*x)*sin(b*x)/b^2+2*sin(b*x)^2/b^4-1/4*x^2*sin(b*x)^2
/b^2
```

Rubi [A]
time = 0.15, antiderivative size = 149, normalized size of antiderivative = 1.00, number of steps used = 19, number of rules used = 11, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}}$ = 1.100, Rules used = {6642, 6648, 12, 3524, 3391, 30, 6654, 2644, 6652, 3393, 3383}

$$\frac{3\text{CosIntegral}(2bx)}{2b^4}+\frac{3\text{Si}(bx)\sin(bx)}{b^4}-\frac{3\log(x)}{2b^4}+\frac{2\sin^2(bx)}{b^4}-\frac{3x\text{Si}(bx)\cos(bx)}{b^3}-\frac{x\sin(bx)\cos(bx)}{b^3}-\frac{3x^2\text{Si}(bx)\sin(bx)}{2b^2}+\frac{x^2}{2b^2}-\frac{x^2\sin^2(bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(bx)^2+\frac{x^3\text{Si}(bx)\cos(bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*SinIntegral[b*x]^2,x]
```

```
[Out] x^2/(2*b^2) + (3*CosIntegral[2*b*x])/(2*b^4) - (3*Log[x])/(2*b^4) - (x*Cos[
b*x]*Sin[b*x])/b^3 + (2*Sin[b*x]^2)/b^4 - (x^2*Sin[b*x]^2)/(4*b^2) - (3*x*C
os[b*x]*SinIntegral[b*x])/b^3 + (x^3*Cos[b*x]*SinIntegral[b*x])/(2*b) + (3*
Sin[b*x]*SinIntegral[b*x])/b^4 - (3*x^2*Sin[b*x]*SinIntegral[b*x])/(2*b^2)
+ (x^4*SinIntegral[b*x]^2)/4
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 6642

```
Int[(x_)^(m_.)*SinIntegral[(b_.)*(x_)]^2, x_Symbol] :> Simp[x^(m + 1)*(SinI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Sin[b*x]*SinIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^3\mathrm{Si}(bx)^2\,dx = \frac{1}{4}x^4\mathrm{Si}(bx)^2 - \frac{1}{2}\int x^3\sin(bx)\mathrm{Si}(bx)\,dx$$
$$= \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b} + \frac{1}{4}x^4\mathrm{Si}(bx)^2 - \frac{1}{2}\int \frac{x^2\cos(bx)\sin(bx)}{b}\,dx - \frac{3\int x^2\cos(bx)\mathrm{Si}(bx)\,dx}{2b}$$
$$= \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b} - \frac{3x^2\sin(bx)\mathrm{Si}(bx)}{2b^2} + \frac{1}{4}x^4\mathrm{Si}(bx)^2 + \frac{3\int x\sin(bx)\mathrm{Si}(bx)\,dx}{b^2} - \frac{\int x^2\cos(bx}{2}$$
$$= -\frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b} - \frac{3x^2\sin(bx)\mathrm{Si}(bx)}{2b^2} + \frac{1}{4}x^4\mathrm{Si}(bx)^2 + \frac{3}{}$$
$$= -\frac{x\cos(bx)\sin(bx)}{b^3} + \frac{\sin^2(bx)}{2b^4} - \frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b} + \frac{3\sin}{}$$
$$= \frac{x^2}{2b^2} - \frac{x\cos(bx)\sin(bx)}{b^3} + \frac{\sin^2(bx)}{2b^4} - \frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b} +$$
$$= \frac{x^2}{2b^2} - \frac{x\cos(bx)\sin(bx)}{b^3} + \frac{2\sin^2(bx)}{b^4} - \frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^3\cos(bx)\mathrm{Si}(bx)}{2b}$$
$$= \frac{x^2}{2b^2} - \frac{3\log(x)}{2b^4} - \frac{x\cos(bx)\sin(bx)}{b^3} + \frac{2\sin^2(bx)}{b^4} - \frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^3\cos}{}$$
$$= \frac{x^2}{2b^2} + \frac{3\mathrm{Ci}(2bx)}{2b^4} - \frac{3\log(x)}{2b^4} - \frac{x\cos(bx)\sin(bx)}{b^3} + \frac{2\sin^2(bx)}{b^4} - \frac{x^2\sin^2(bx)}{4b^2} - \frac{3x\cos(bx)\mathrm{Si}(}{b^3}$$

Mathematica [A]
time = 0.09, size = 107, normalized size = 0.72

$$\frac{3b^2x^2 - 8\cos(2bx) + b^2x^2\cos(2bx) + 12\mathrm{CosIntegral}(2bx) - 12\log(x) - 4bx\sin(2bx) + 4(bx(-6+b^2x^2)\cos(bx) - 3(-2+b^2x^2)\sin(bx))\mathrm{Si}(bx) + 2b^4x^4\mathrm{Si}(bx)^2}{8b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*SinIntegral[b*x]^2,x]
```

```
[Out] (3*b^2*x^2 - 8*Cos[2*b*x] + b^2*x^2*Cos[2*b*x] + 12*CosIntegral[2*b*x] - 12
*Log[x] - 4*b*x*Sin[2*b*x] + 4*(b*x*(-6 + b^2*x^2)*Cos[b*x] - 3*(-2 + b^2*x
^2)*Sin[b*x])*SinIntegral[b*x] + 2*b^4*x^4*SinIntegral[b*x]^2)/(8*b^4)
```

Maple [A]
time = 0.45, size = 154, normalized size = 1.03

method	result
derivativedivides	$\frac{\frac{b^4x^4\,\mathrm{sinIntegral}(bx)^2}{4}-2\,\mathrm{sinIntegral}(bx)\left(-\frac{b^3x^3\cos(bx)}{4}+\frac{3b^2x^2\sin(bx)}{4}-\frac{3\sin(bx)}{2}+\frac{3bx\cos(bx)}{2}\right)+\frac{b^2x^2\left(\cos^2(bx)\right)}{4}-\frac{bx\left(\frac{\sin(b}{}\right.}{}}{b^4}$
default	$\frac{\frac{b^4x^4\,\mathrm{sinIntegral}(bx)^2}{4}-2\,\mathrm{sinIntegral}(bx)\left(-\frac{b^3x^3\cos(bx)}{4}+\frac{3b^2x^2\sin(bx)}{4}-\frac{3\sin(bx)}{2}+\frac{3bx\cos(bx)}{2}\right)+\frac{b^2x^2\left(\cos^2(bx)\right)}{4}-\frac{bx\left(\frac{\sin(b}{}\right.}{}}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Si(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*b^4*x^4*Si(b*x)^2-2*Si(b*x)*(-1/4*b^3*x^3*cos(b*x)+3/4*b^2*x^2*s
in(b*x)-3/2*sin(b*x)+3/2*b*x*cos(b*x))+1/4*b^2*x^2*cos(b*x)^2-1/2*b*x*(1/2*
sin(b*x)*cos(b*x)+1/2*b*x)-1/4*b^2*x^2+1/2*sin(b*x)^2+3/2*b*x*(-1/2*sin(b*x
)*cos(b*x)+1/2*b*x)-3/2*cos(b*x)^2-3/2*ln(b*x)+3/2*Ci(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x^3*sin_integral(b*x)^2, x)
```

Fricas [A]
time = 0.39, size = 112, normalized size = 0.75

$$\frac{b^4x^4\,\mathrm{Si}\,(bx)^2+b^2x^2+(b^2x^2-8)\cos(bx)^2+2\,(b^3x^3-6\,bx)\cos(bx)\,\mathrm{Si}\,(bx)-2\,(2\,bx\cos(bx)+3\,(b^2x^2-2)\,\mathrm{Si}\,(bx))\sin(bx)+3\,\mathrm{Ci}\,(2\,bx)+3\,\mathrm{Ci}\,(-2\,bx)-6\,\log(x)}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)^2,x, algorithm="fricas")
```

```
[Out] 1/4*(b^4*x^4*sin_integral(b*x)^2 + b^2*x^2 + (b^2*x^2 - 8)*cos(b*x)^2 + 2*(
b^3*x^3 - 6*b*x)*cos(b*x)*sin_integral(b*x) - 2*(2*b*x*cos(b*x) + 3*(b^2*x^
2 - 2)*sin_integral(b*x))*sin(b*x) + 3*cos_integral(2*b*x) + 3*cos_integral
(-2*b*x) - 6*log(x))/b^4
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3\,\mathrm{Si}^2\,(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Si(b*x)**2,x)
```

```
[Out] Integral(x**3*Si(b*x)**2, x)
```

Giac [**A**]
time = 0.41, size = 117, normalized size = 0.79

$$\frac{1}{4}x^4\,\mathrm{Si}\,(bx)^2+\frac{1}{2}\left(\frac{(b^3x^3-6\,bx)\cos(bx)}{b^4}-\frac{3\,(b^2x^2-2)\sin(bx)}{b^4}\right)\mathrm{Si}\,(bx)+\frac{b^2x^2\cos(2\,bx)+3\,b^2x^2-4\,bx\sin(2\,bx)-8\,\cos(2\,bx)+6\,\mathrm{Ci}\,(2\,bx)+6\,\mathrm{Ci}\,(-2\,bx)-12\,\log(x)}{8\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)^2,x, algorithm="giac")
```

```
[Out] 1/4*x^4*sin_integral(b*x)^2 + 1/2*((b^3*x^3 - 6*b*x)*cos(b*x)/b^4 - 3*(b^2*
x^2 - 2)*sin(b*x)/b^4)*sin_integral(b*x) + 1/8*(b^2*x^2*cos(2*b*x) + 3*b^2*
x^2 - 4*b*x*sin(2*b*x) - 8*cos(2*b*x) + 6*cos_integral(2*b*x) + 6*cos_integ
ral(-2*b*x) - 12*log(x))/b^4
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3\,\mathrm{sinint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*sinint(b*x)^2,x)
```

```
[Out] int(x^3*sinint(b*x)^2, x)
```

3.11 $\int x^2\mathbf{Si}(bx)^2\,dx$

Optimal. Leaf size=112

$$\frac{5x}{6b^2}-\frac{5\cos(bx)\sin(bx)}{6b^3}-\frac{x\sin^2(bx)}{3b^2}-\frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3}+\frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b}-\frac{4x\sin(bx)\mathrm{Si}(bx)}{3b^2}+\frac{1}{3}x^3\mathrm{Si}(bx)^2+\frac{2\mathrm{S}}{}$$

```
[Out] 5/6*x/b^2-4/3*cos(b*x)*Si(b*x)/b^3+2/3*x^2*cos(b*x)*Si(b*x)/b+1/3*x^3*Si(b*
x)^2+2/3*Si(2*b*x)/b^3-5/6*cos(b*x)*sin(b*x)/b^3-4/3*x*Si(b*x)*sin(b*x)/b^2
-1/3*x*sin(b*x)^2/b^2
```

Rubi [A]

time = 0.09, antiderivative size = 112, normalized size of antiderivative = 1.00, number of steps used = 15, number of rules used = 10, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {6642, 6648, 12, 3524, 2715, 8, 6654, 6646, 4491, 3380}

$$\frac{2\mathrm{Si}(2bx)}{3b^3}-\frac{4\mathrm{Si}(bx)\cos(bx)}{3b^3}-\frac{5\sin(bx)\cos(bx)}{6b^3}-\frac{4x\mathrm{Si}(bx)\sin(bx)}{3b^2}+\frac{5x}{6b^2}-\frac{x\sin^2(bx)}{3b^2}+\frac{1}{3}x^3\mathrm{Si}(bx)^2+\frac{2x^2\mathrm{Si}(bx)\cos(bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*SinIntegral[b*x]^2,x]
```

```
[Out] (5*x)/(6*b^2) - (5*Cos[b*x]*Sin[b*x])/(6*b^3) - (x*Sin[b*x]^2)/(3*b^2) - (4
*Cos[b*x]*SinIntegral[b*x])/(3*b^3) + (2*x^2*Cos[b*x]*SinIntegral[b*x])/(3*
b) - (4*x*Sin[b*x]*SinIntegral[b*x])/(3*b^2) + (x^3*SinIntegral[b*x]^2)/3 +
 (2*SinIntegral[2*b*x])/(3*b^3)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6642

```
Int[(x_)^(m_.)*SinIntegral[(b_.)*(x_)]^2, x_Symbol] :> Simp[x^(m + 1)*(SinI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Sin[b*x]*SinIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\mathrm{Si}(bx)^2\,dx = \frac{1}{3}x^3\mathrm{Si}(bx)^2 - \frac{2}{3}\int x^2\sin(bx)\mathrm{Si}(bx)\,dx$$
$$= \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} + \frac{1}{3}x^3\mathrm{Si}(bx)^2 - \frac{2}{3}\int \frac{x\cos(bx)\sin(bx)}{b}\,dx - \frac{4\int x\cos(bx)\mathrm{Si}(bx)\,dx}{3b}$$
$$= \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)\mathrm{Si}(bx)}{3b^2} + \frac{1}{3}x^3\mathrm{Si}(bx)^2 + \frac{4\int \sin(bx)\mathrm{Si}(bx)\,dx}{3b^2} - \frac{2\int x\cos(bx}{3}$$
$$= -\frac{x\sin^2(bx)}{3b^2} - \frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3} + \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)\mathrm{Si}(bx)}{3b^2} + \frac{1}{3}x^3\mathrm{Si}(bx)^2 + \int$$
$$= -\frac{5\cos(bx)\sin(bx)}{6b^3} - \frac{x\sin^2(bx)}{3b^2} - \frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3} + \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)\mathrm{Si}(bx}{3b^2}$$
$$= \frac{5x}{6b^2} - \frac{5\cos(bx)\sin(bx)}{6b^3} - \frac{x\sin^2(bx)}{3b^2} - \frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3} + \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)}{3b^2}$$
$$= \frac{5x}{6b^2} - \frac{5\cos(bx)\sin(bx)}{6b^3} - \frac{x\sin^2(bx)}{3b^2} - \frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3} + \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)}{3b^2}$$
$$= \frac{5x}{6b^2} - \frac{5\cos(bx)\sin(bx)}{6b^3} - \frac{x\sin^2(bx)}{3b^2} - \frac{4\cos(bx)\mathrm{Si}(bx)}{3b^3} + \frac{2x^2\cos(bx)\mathrm{Si}(bx)}{3b} - \frac{4x\sin(bx)}{3b^2}$$

Mathematica [A]
time = 0.06, size = 78, normalized size = 0.70

$$\frac{8bx + 2bx\cos(2bx) - 5\sin(2bx) + 8((-2+b^2x^2)\cos(bx) - 2bx\sin(bx))\,\mathrm{Si}(bx) + 4b^3x^3\mathrm{Si}(bx)^2 + 8\mathrm{Si}(2bx)}{12b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*SinIntegral[b*x]^2,x]
```

```
[Out] (8*b*x + 2*b*x*Cos[2*b*x] - 5*Sin[2*b*x] + 8*((-2 + b^2*x^2)*Cos[b*x] - 2*b
*x*Sin[b*x])*SinIntegral[b*x] + 4*b^3*x^3*SinIntegral[b*x]^2 + 8*SinIntegra
l[2*b*x])/(12*b^3)
```

Maple [A]
time = 0.51, size = 84, normalized size = 0.75

method	result
derivativedivides	$\frac{\frac{b^3x^3\,\mathrm{sinIntegral}(bx)^2}{3} - 2\,\mathrm{sinIntegral}(bx)\left(-\frac{b^2x^2\cos(bx)}{3} + \frac{2\cos(bx)}{3} + \frac{2bx\sin(bx)}{3}\right) + \frac{bx\left(\cos^2(bx)\right)}{3} - \frac{5\sin(bx)\cos(bx)}{6} + \frac{bx}{2} + \frac{2\,\mathrm{si}}{}}{b^3}$
default	$\frac{\frac{b^3x^3\,\mathrm{sinIntegral}(bx)^2}{3} - 2\,\mathrm{sinIntegral}(bx)\left(-\frac{b^2x^2\cos(bx)}{3} + \frac{2\cos(bx)}{3} + \frac{2bx\sin(bx)}{3}\right) + \frac{bx\left(\cos^2(bx)\right)}{3} - \frac{5\sin(bx)\cos(bx)}{6} + \frac{bx}{2} + \frac{2\,\mathrm{si}}{}}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*b^3*x^3*Si(b*x)^2-2*Si(b*x)*(-1/3*b^2*x^2*cos(b*x)+2/3*cos(b*x)+
2/3*b*x*sin(b*x))+1/3*b*x*cos(b*x)^2-5/6*sin(b*x)*cos(b*x)+1/2*b*x+2/3*Si(2
*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x^2*sin_integral(b*x)^2, x)
```

Fricas [A]
time = 0.37, size = 81, normalized size = 0.72

$$\frac{2\,b^3x^3\,\mathrm{Si}\left(bx\right)^2+2\,bx\cos\left(bx\right)^2+4\left(b^2x^2-2\right)\cos\left(bx\right)\mathrm{Si}\left(bx\right)+3\,bx-\left(8\,bx\,\mathrm{Si}\left(bx\right)+5\,\cos\left(bx\right)\right)\sin\left(bx\right)+4\,\mathrm{Si}\left(2\,bx\right)}{6\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)^2,x, algorithm="fricas")
```

```
[Out] 1/6*(2*b^3*x^3*sin_integral(b*x)^2 + 2*b*x*cos(b*x)^2 + 4*(b^2*x^2 - 2)*cos
(b*x)*sin_integral(b*x) + 3*b*x - (8*b*x*sin_integral(b*x) + 5*cos(b*x))*si
n(b*x) + 4*sin_integral(2*b*x))/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\,\mathrm{Si}^2\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x)**2,x)
```

```
[Out] Integral(x**2*Si(b*x)**2, x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 150, normalized size = 1.34

$$\frac{1}{3}\,x^3\,\mathrm{Si}\left(bx\right)^2-\frac{2}{3}\left(\frac{2\,x\sin\left(bx\right)}{b^2}-\frac{\left(b^2x^2-2\right)\cos\left(bx\right)}{b^3}\right)\mathrm{Si}\left(bx\right)+\frac{3\,bx\tan\left(bx\right)^2+2\,\Im\left(\mathrm{Ci}\left(2\,bx\right)\right)\tan\left(bx\right)^2-2\,\Im\left(\mathrm{Ci}\left(-2\,bx\right)\right)\tan\left(bx\right)^2+4\,\mathrm{Si}\left(2\,bx\right)\tan\left(bx\right)^2+5\,bx+2\,\Im\left(\mathrm{Ci}\left(2\,bx\right)\right)-2\,\Im\left(\mathrm{Ci}\left(-2\,bx\right)\right)+4\,\mathrm{Si}\left(2\,bx\right)-5\,\tan\left(bx\right)}{6\left(b^3\tan\left(bx\right)^2+b^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)^2,x, algorithm="giac")
```

```
[Out] 1/3*x^3*sin_integral(b*x)^2 - 2/3*(2*x*sin(b*x)/b^2 - (b^2*x^2 - 2)*cos(b*x
)/b^3)*sin_integral(b*x) + 1/6*(3*b*x*tan(b*x)^2 + 2*imag_part(cos_integral
(2*b*x))*tan(b*x)^2 - 2*imag_part(cos_integral(-2*b*x))*tan(b*x)^2 + 4*sin_
integral(2*b*x)*tan(b*x)^2 + 5*b*x + 2*imag_part(cos_integral(2*b*x)) - 2*i
mag_part(cos_integral(-2*b*x)) + 4*sin_integral(2*b*x) - 5*tan(b*x))/(b^3*t
an(b*x)^2 + b^3)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2\,\mathrm{sinint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(b*x)^2,x)
```

```
[Out] int(x^2*sinint(b*x)^2, x)
```

3.12 $\int x\mathbf{Si}(bx)^2\,dx$

Optimal. Leaf size=74

$$-\frac{\text{CosIntegral}(2bx)}{2b^2}+\frac{\log(x)}{2b^2}-\frac{\sin^2(bx)}{2b^2}+\frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2$$

```
[Out] -1/2*Ci(2*b*x)/b^2+1/2*ln(x)/b^2+x*cos(b*x)*Si(b*x)/b+1/2*x^2*Si(b*x)^2-Si(
b*x)*sin(b*x)/b^2-1/2*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.06, antiderivative size = 74, normalized size of antiderivative = 1.00, number of steps used = 10, number of rules used = 8, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {6642, 6648, 12, 2644, 30, 6652, 3393, 3383}

$$-\frac{\text{CosIntegral}(2bx)}{2b^2}-\frac{\text{Si}(bx)\sin(bx)}{b^2}+\frac{\log(x)}{2b^2}-\frac{\sin^2(bx)}{2b^2}+\frac{1}{2}x^2\text{Si}(bx)^2+\frac{x\text{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*SinIntegral[b*x]^2,x]
```

```
[Out] -1/2*CosIntegral[2*b*x]/b^2 + Log[x]/(2*b^2) - Sin[b*x]^2/(2*b^2) + (x*Cos[
b*x]*SinIntegral[b*x])/b - (Sin[b*x]*SinIntegral[b*x])/b^2 + (x^2*SinIntegr
al[b*x]^2)/2
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6642

```
Int[(x_)^(m_.)*SinIntegral[(b_.)*(x_)]^2, x_Symbol] :> Simp[x^(m + 1)*(SinI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Sin[b*x]*SinIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int x\text{Si}(bx)^2\,dx &= \frac{1}{2}x^2\text{Si}(bx)^2-\int x\sin(bx)\text{Si}(bx)\,dx\\
&= \frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{1}{2}x^2\text{Si}(bx)^2-\frac{\int\cos(bx)\text{Si}(bx)\,dx}{b}-\int\frac{\cos(bx)\sin(bx)}{b}\,dx\\
&= \frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2-\frac{\int\cos(bx)\sin(bx)\,dx}{b}+\frac{\int\frac{\sin^2(bx)}{bx}\,dx}{b}\\
&= \frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2+\frac{\int\frac{\sin^2(bx)}{x}\,dx}{b^2}-\frac{\text{Subst}(\int x\,dx,x,\sin(bx))}{b^2}\\
&= -\frac{\sin^2(bx)}{2b^2}+\frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2+\frac{\int\left(\frac{1}{2x}-\frac{\cos(2bx)}{2x}\right)dx}{b^2}\\
&= \frac{\log(x)}{2b^2}-\frac{\sin^2(bx)}{2b^2}+\frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2-\frac{\int\frac{\cos(2bx)}{x}\,dx}{2b^2}\\
&= -\frac{\text{Ci}(2bx)}{2b^2}+\frac{\log(x)}{2b^2}-\frac{\sin^2(bx)}{2b^2}+\frac{x\cos(bx)\text{Si}(bx)}{b}-\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{1}{2}x^2\text{Si}(bx)^2
\end{aligned}
$$

Mathematica [A]
time = 0.04, size = 58, normalized size = 0.78

$$\frac{\cos(2bx) - 2\text{CosIntegral}(2bx) + 2\log(x) + 4(bx\cos(bx) - \sin(bx))\text{Si}(bx) + 2b^2x^2\text{Si}(bx)^2}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*SinIntegral[b*x]^2,x]
```

```
[Out] (Cos[2*b*x] - 2*CosIntegral[2*b*x] + 2*Log[x] + 4*(b*x*Cos[b*x] - Sin[b*x])
*SinIntegral[b*x] + 2*b^2*x^2*SinIntegral[b*x]^2)/(4*b^2)
```

Maple [A]
time = 0.38, size = 62, normalized size = 0.84

method	result	size
derivativedivides	$\frac{\frac{b^2x^2 \operatorname{sinIntegral}(bx)^2}{2} - 2\operatorname{sinIntegral}(bx)\left(\frac{\sin(bx)}{2} - \frac{bx\cos(bx)}{2}\right) + \frac{\left(\cos^2(bx)\right)}{2} + \frac{\ln(bx)}{2} - \frac{\operatorname{cosineIntegral}(2bx)}{2}}{b^2}$	62
default	$\frac{\frac{b^2x^2 \operatorname{sinIntegral}(bx)^2}{2} - 2\operatorname{sinIntegral}(bx)\left(\frac{\sin(bx)}{2} - \frac{bx\cos(bx)}{2}\right) + \frac{\left(\cos^2(bx)\right)}{2} + \frac{\ln(bx)}{2} - \frac{\operatorname{cosineIntegral}(2bx)}{2}}{b^2}$	62

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(1/2*b^2*x^2*Si(b*x)^2-2*Si(b*x)*(1/2*sin(b*x)-1/2*b*x*cos(b*x))+1/2*
cos(b*x)^2+1/2*ln(b*x)-1/2*Ci(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x*sin_integral(b*x)^2, x)
```

Fricas [A]
time = 0.37, size = 68, normalized size = 0.92

$$\frac{2\,b^2x^2\,\text{Si}\left(bx\right)^2 + 4\,bx\cos\left(bx\right)\text{Si}\left(bx\right) + 2\,\cos\left(bx\right)^2 - 4\,\sin\left(bx\right)\text{Si}\left(bx\right) - \text{Ci}\left(2\,bx\right) - \text{Ci}\left(-2\,bx\right) + 2\,\log\left(x\right)}{4\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x)^2,x, algorithm="fricas")
```

```
[Out] 1/4*(2*b^2*x^2*sin_integral(b*x)^2 + 4*b*x*cos(b*x)*sin_integral(b*x) + 2*c
os(b*x)^2 - 4*sin(b*x)*sin_integral(b*x) - cos_integral(2*b*x) - cos_integr
al(-2*b*x) + 2*log(x))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Si}^{2}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(b*x)**2,x)
```

```
[Out] Integral(x*Si(b*x)**2, x)
```

Giac [A]
time = 0.41, size = 65, normalized size = 0.88

$$\frac{1}{2}\,x^{2}\,\mathrm{Si}\left(bx\right)^{2}+\left(\frac{x\cos\left(bx\right)}{b}-\frac{\sin\left(bx\right)}{b^{2}}\right)\mathrm{Si}\left(bx\right)+\frac{\cos\left(2\,bx\right)-\mathrm{Ci}\left(2\,bx\right)-\mathrm{Ci}\left(-2\,bx\right)+2\,\log\left(x\right)}{4\,b^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x)^2,x, algorithm="giac")
```

```
[Out] 1/2*x^2*sin_integral(b*x)^2 + (x*cos(b*x)/b - sin(b*x)/b^2)*sin_integral(b*
x) + 1/4*(cos(2*b*x) - cos_integral(2*b*x) - cos_integral(-2*b*x) + 2*log(x
))/b^2
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{sinint}(b\,x)^{2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(b*x)^2,x)
```

```
[Out] int(x*sinint(b*x)^2, x)
```

3.13 $\int \mathbf{Si}(bx)^2\,dx$

Optimal. Leaf size=32

$$\frac{2\cos(bx)\text{Si}(bx)}{b}+x\text{Si}(bx)^2-\frac{\text{Si}(2bx)}{b}$$

```
[Out] 2*cos(b*x)*Si(b*x)/b+x*Si(b*x)^2-Si(2*b*x)/b
```

Rubi [A]
time = 0.03, antiderivative size = 32, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 5, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.833, Rules used = {6640, 6646, 12, 4491, 3380}

$$x\text{Si}(bx)^2-\frac{\text{Si}(2bx)}{b}+\frac{2\text{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[b*x]^2,x]
```

```
[Out] (2*Cos[b*x]*SinIntegral[b*x])/b + x*SinIntegral[b*x]^2 - SinIntegral[2*b*x]
/b
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6640

```
Int[SinIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(SinInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Sin[a + b*x]*SinIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \text{Si}(bx)^2\,dx &= x\text{Si}(bx)^2 - 2\int \sin(bx)\text{Si}(bx)\,dx\\ &= \frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - 2\int \frac{\cos(bx)\sin(bx)}{bx}\,dx\\ &= \frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - \frac{2\int \frac{\cos(bx)\sin(bx)}{x}\,dx}{b}\\ &= \frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - \frac{2\int \frac{\sin(2bx)}{2x}\,dx}{b}\\ &= \frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - \frac{\int \frac{\sin(2bx)}{x}\,dx}{b}\\ &= \frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - \frac{\text{Si}(2bx)}{b}\end{aligned}$$

Mathematica [A]
time = 0.01, size = 32, normalized size = 1.00

$$\frac{2\cos(bx)\text{Si}(bx)}{b} + x\text{Si}(bx)^2 - \frac{\text{Si}(2bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[b*x]^2,x]
```

```
[Out] (2*Cos[b*x]*SinIntegral[b*x])/b + x*SinIntegral[b*x]^2 - SinIntegral[2*b*x]
/b
```

Maple [A]
time = 0.36, size = 32, normalized size = 1.00

method	result	size
derivativedivides	$\frac{\text{sinIntegral}(bx)^2 bx+2\cos(bx)\,\text{sinIntegral}(bx)-\text{sinIntegral}(2bx)}{b}$	32
default	$\frac{\text{sinIntegral}(bx)^2 bx+2\cos(bx)\,\text{sinIntegral}(bx)-\text{sinIntegral}(2bx)}{b}$	32

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b*(Si(b*x)^2*b*x+2*cos(b*x)*Si(b*x)-Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x)^2, x)
```

Fricas [A]
time = 0.37, size = 31, normalized size = 0.97

$$\frac{bx\,\mathrm{Si}\,(bx)^2+2\,\cos\,(bx)\,\mathrm{Si}\,(bx)-\mathrm{Si}\,(2\,bx)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2,x, algorithm="fricas")
```

```
[Out] (b*x*sin_integral(b*x)^2 + 2*cos(b*x)*sin_integral(b*x) - sin_integral(2*b*
x))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \mathrm{Si}^2\,(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)**2,x)
```

```
[Out] Integral(Si(b*x)**2, x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.40, size = 49, normalized size = 1.53

$$x\,\mathrm{Si}\,(bx)^2+\frac{2\,\cos\,(bx)\,\mathrm{Si}\,(bx)}{b}-\frac{\Im(\mathrm{Ci}\,(2\,bx))-\Im(\mathrm{Ci}\,(-2\,bx))+2\,\mathrm{Si}\,(2\,bx)}{2\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2,x, algorithm="giac")
```

```
[Out] x*sin_integral(b*x)^2 + 2*cos(b*x)*sin_integral(b*x)/b - 1/2*(imag_part(cos
_integral(2*b*x)) - imag_part(cos_integral(-2*b*x)) + 2*sin_integral(2*b*x)
)/b
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int \operatorname{sinint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)^2,x)
```

```
[Out] int(sinint(b*x)^2, x)
```

3.14 $\int \frac{\mathbf{Si}(bx)^2}{x}\,dx$

Optimal. Leaf size=13

$$\operatorname{Int}\left(\frac{\operatorname{Si}(bx)^2}{x},x\right)$$

```
[Out] CannotIntegrate(Si(b*x)^2/x,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\operatorname{Si}(bx)^2}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[b*x]^2/x,x]
```

```
[Out] Defer[Int][SinIntegral[b*x]^2/x, x]
```

Rubi steps

$$\int \frac{\operatorname{Si}(bx)^2}{x}\,dx = \int \frac{\operatorname{Si}(bx)^2}{x}\,dx$$

Mathematica [A]
time = 0.30, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}(bx)^2}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[b*x]^2/x,x]
```

```
[Out] Integrate[SinIntegral[b*x]^2/x, x]
```

Maple [A]
time = 0.12, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{sinIntegral}\left(bx\right)^{2}}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)^2/x,x)
```

```
[Out] int(Si(b*x)^2/x,x)
```

Maxima [**A**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x)^2/x, x)
```

Fricas [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x,x, algorithm="fricas")
```

```
[Out] integral(sin_integral(b*x)^2/x, x)
```

Sympy [**A**]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}^{2}\left(bx\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)**2/x,x)
```

```
[Out] Integral(Si(b*x)**2/x, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x)^2/x, x)
```

Mupad [**A**]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{{\mathrm{sinint}\left(b\,x\right)}^2}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)^2/x,x)
```

```
[Out] int(sinint(b*x)^2/x, x)
```

3.15 $\int \frac{\mathbf{Si}(bx)^2}{x^2}\,dx$

Optimal. Leaf size=13

$$\mathrm{Int}\left(\frac{\mathrm{Si}(bx)^2}{x^2},x\right)$$

```
[Out] CannotIntegrate(Si(b*x)^2/x^2,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\mathrm{Si}(bx)^2}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[b*x]^2/x^2,x]
[Out] Defer[Int][SinIntegral[b*x]^2/x^2, x]
```

Rubi steps

$$\int \frac{\mathrm{Si}(bx)^2}{x^2}\,dx = \int \frac{\mathrm{Si}(bx)^2}{x^2}\,dx$$

Mathematica [A]
time = 0.34, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Si}(bx)^2}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[b*x]^2/x^2,x]
[Out] Integrate[SinIntegral[b*x]^2/x^2, x]
```

Maple [A]
time = 0.16, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{sinIntegral}\left(bx\right)^2}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)^2/x^2,x)
```

```
[Out] int(Si(b*x)^2/x^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^2,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x)^2/x^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^2,x, algorithm="fricas")
```

```
[Out] integral(sin_integral(b*x)^2/x^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}^{2}\left(bx\right)}{x^{2}}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)**2/x**2,x)
```

```
[Out] Integral(Si(b*x)**2/x**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^2,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x)^2/x^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{{\mathrm{sinint}\left(b\,x\right)}^2}{x^2} \,d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)^2/x^2,x)
```

```
[Out] int(sinint(b*x)^2/x^2, x)
```

3.16 $\int \frac{\mathbf{Si}(bx)^2}{x^3} \, dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{Si}(bx)^2}{x^3}, x\right)$$

`[Out] CannotIntegrate(Si(b*x)^2/x^3,x)`

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{Si}(bx)^2}{x^3} \, dx$$

Verification is not applicable to the result.

`[In] Int[SinIntegral[b*x]^2/x^3,x]`

`[Out] Defer[Int][SinIntegral[b*x]^2/x^3, x]`

Rubi steps

$$\int \frac{\text{Si}(bx)^2}{x^3} \, dx = \int \frac{\text{Si}(bx)^2}{x^3} \, dx$$

Mathematica [A]
time = 0.36, size = 0, normalized size = 0.00

$$\int \frac{\text{Si}(bx)^2}{x^3} \, dx$$

Verification is not applicable to the result.

`[In] Integrate[SinIntegral[b*x]^2/x^3,x]`

`[Out] Integrate[SinIntegral[b*x]^2/x^3, x]`

Maple [A]
time = 0.14, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\,(bx)^2}{x^3} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)^2/x^3,x)
```

```
[Out] int(Si(b*x)^2/x^3,x)
```

Maxima [**A**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^3,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x)^2/x^3, x)
```

Fricas [**A**] Leaf count of result is larger than twice the leaf count of optimal. 87 vs. 2(12) = 24.
time = 0.37, size = 87, normalized size = 6.69

$$\frac{2\,b^2x^2\,\mathrm{Ci}\left(2\,bx\right)+2\,b^2x^2\,\mathrm{Ci}\left(-2\,bx\right)-2\,bx\cos\left(bx\right)\mathrm{Si}\left(bx\right)-\left(b^2x^2+2\right)\mathrm{Si}\left(bx\right)^2+\cos\left(bx\right)^2-2\left(2\,bx\cos\left(bx\right)+\mathrm{Si}\left(bx\right)\right)\sin\left(bx\right)-1}{4\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^3,x, algorithm="fricas")
```

```
[Out] 1/4*(2*b^2*x^2*cos_integral(2*b*x) + 2*b^2*x^2*cos_integral(-2*b*x) - 2*b*x
*cos(b*x)*sin_integral(b*x) - (b^2*x^2 + 2)*sin_integral(b*x)^2 + cos(b*x)^
2 - 2*(2*b*x*cos(b*x) + sin_integral(b*x))*sin(b*x) - 1)/x^2
```

Sympy [**A**]
time = 0.00, size = 0, normalized size = 0.00

$$\int\frac{\mathrm{Si}^{2}\left(bx\right)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)**2/x**3,x)
```

```
[Out] Integral(Si(b*x)**2/x**3, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)^2/x^3,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x)^2/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{\operatorname{sinint}(b\,x)^2}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)^2/x^3,x)
```

```
[Out] int(sinint(b*x)^2/x^3, x)
```

3.17 $\int x^m \mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=48

$$\frac{x^{1+m}\text{Si}(a+bx)}{1+m}-\frac{b\text{Int}\left(\frac{x^{1+m}\sin(a+bx)}{a+bx},x\right)}{1+m}$$

```
[Out] -b*CannotIntegrate(x^(1+m)*sin(b*x+a)/(b*x+a),x)/(1+m)+x^(1+m)*Si(b*x+a)/(1
+m)
```

Rubi [A]
time = 0.21, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {}

$$\int x^m \text{Si}(a+bx)\,dx$$

Verification is not applicable to the result.

```
[In] Int[x^m*SinIntegral[a + b*x],x]
[Out] (x^(1 + m)*SinIntegral[a + b*x])/(1 + m) - (b*Defer[Int][(x^(1 + m)*Sin[a +
 b*x])/(a + b*x), x])/(1 + m)
```

Rubi steps

$$\int x^m \text{Si}(a+bx)\,dx=\frac{x^{1+m}\text{Si}(a+bx)}{1+m}-\frac{b\int \frac{x^{1+m}\sin(a+bx)}{a+bx}\,dx}{1+m}$$

Mathematica [A]
time = 2.67, size = 0, normalized size = 0.00

$$\int x^m \text{Si}(a+bx)\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[x^m*SinIntegral[a + b*x],x]
[Out] Integrate[x^m*SinIntegral[a + b*x], x]
```

Maple [A]
time = 0.18, size = 0, normalized size = 0.00

$$\int x^m \,\text{sinIntegral}\left(bx+a\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Si(b*x+a),x)
```

```
[Out] int(x^m*Si(b*x+a),x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^m*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(x^m*sin_integral(b*x + a), x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Si}(a + bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Si(b*x+a),x)
```

```
[Out] Integral(x**m*Si(a + b*x), x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^m*sin_integral(b*x + a), x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.02

$$\int x^m \operatorname{sinint}(a + b\,x)\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*sinint(a + b*x),x)
```

```
[Out] int(x^m*sinint(a + b*x), x)
```

3.18 $\int x^3\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=184

$$\frac{a\cos(a+bx)}{2b^4}-\frac{a^3\cos(a+bx)}{4b^4}-\frac{3x\cos(a+bx)}{2b^3}+\frac{a^2x\cos(a+bx)}{4b^3}-\frac{ax^2\cos(a+bx)}{4b^2}+\frac{x^3\cos(a+bx)}{4b}+\frac{3\sin(a-}{2b^4}$$

```
[Out] 1/2*a*cos(b*x+a)/b^4-1/4*a^3*cos(b*x+a)/b^4-3/2*x*cos(b*x+a)/b^3+1/4*a^2*x*
cos(b*x+a)/b^3-1/4*a*x^2*cos(b*x+a)/b^2+1/4*x^3*cos(b*x+a)/b-1/4*a^4*Si(b*x
+a)/b^4+1/4*x^4*Si(b*x+a)+3/2*sin(b*x+a)/b^4-1/4*a^2*sin(b*x+a)/b^4+1/2*a*x
*sin(b*x+a)/b^3-3/4*x^2*sin(b*x+a)/b^2
```

Rubi [A]
time = 0.25, antiderivative size = 184, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {6638, 6874, 2718, 3377, 2717, 3380}

$$-\frac{a^4\text{Si}(a+bx)}{4b^4}-\frac{a^3\cos(a+bx)}{4b^4}-\frac{a^2\sin(a+bx)}{4b^4}+\frac{a^2x\cos(a+bx)}{4b^3}+\frac{3\sin(a+bx)}{2b^4}+\frac{a\cos(a+bx)}{2b^4}+\frac{ax\sin(a+bx)}{2b^3}-\frac{3x\cos(a+bx)}{2b^3}-\frac{3x^2\sin(a+bx)}{4b^2}-\frac{ax^2\cos(a+bx)}{4b^2}+\frac{1}{4}x^4\text{Si}(a+bx)+\frac{x^3\cos(a+bx)}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*SinIntegral[a + b*x],x]
```

```
[Out] (a*Cos[a + b*x])/(2*b^4) - (a^3*Cos[a + b*x])/(4*b^4) - (3*x*Cos[a + b*x])/
(2*b^3) + (a^2*x*Cos[a + b*x])/(4*b^3) - (a*x^2*Cos[a + b*x])/(4*b^2) + (x^
3*Cos[a + b*x])/(4*b) + (3*Sin[a + b*x])/(2*b^4) - (a^2*Sin[a + b*x])/(4*b^
4) + (a*x*Sin[a + b*x])/(2*b^3) - (3*x^2*Sin[a + b*x])/(4*b^2) - (a^4*SinIn
tegral[a + b*x])/(4*b^4) + (x^4*SinIntegral[a + b*x])/4
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 6638

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x^3\text{Si}(a+bx)\,dx &= \frac{1}{4}x^4\text{Si}(a+bx)-\frac{1}{4}b\int\frac{x^4\sin(a+bx)}{a+bx}\,dx\\
&= \frac{1}{4}x^4\text{Si}(a+bx)-\frac{1}{4}b\int\left(-\frac{a^3\sin(a+bx)}{b^4}+\frac{a^2x\sin(a+bx)}{b^3}-\frac{ax^2\sin(a+bx)}{b^2}+\frac{x^3\text{si}}{}\right.\\
&= \frac{1}{4}x^4\text{Si}(a+bx)-\frac{1}{4}\int x^3\sin(a+bx)\,dx+\frac{a^3\int\sin(a+bx)\,dx}{4b^3}-\frac{a^4\int\frac{\sin(a+bx)}{a+bx}\,dx}{4b^3}-\frac{a^2}{}\\
&= -\frac{a^3\cos(a+bx)}{4b^4}+\frac{a^2x\cos(a+bx)}{4b^3}-\frac{ax^2\cos(a+bx)}{4b^2}+\frac{x^3\cos(a+bx)}{4b}-\frac{a^4\text{Si}(a+bx}{4b^4}\\
&= -\frac{a^3\cos(a+bx)}{4b^4}+\frac{a^2x\cos(a+bx)}{4b^3}-\frac{ax^2\cos(a+bx)}{4b^2}+\frac{x^3\cos(a+bx)}{4b}-\frac{a^2\sin(a+b}{4b^4}\\
&= \frac{a\cos(a+bx)}{2b^4}-\frac{a^3\cos(a+bx)}{4b^4}-\frac{3x\cos(a+bx)}{2b^3}+\frac{a^2x\cos(a+bx)}{4b^3}-\frac{ax^2\cos(a+bx}{4b^2}\\
&= \frac{a\cos(a+bx)}{2b^4}-\frac{a^3\cos(a+bx)}{4b^4}-\frac{3x\cos(a+bx)}{2b^3}+\frac{a^2x\cos(a+bx)}{4b^3}-\frac{ax^2\cos(a+bx}{4b^2}
\end{aligned}$$

Mathematica [A]
time = 0.14, size = 96, normalized size = 0.52

$$\frac{(2a-a^3-6bx+a^2bx-ab^2x^2+b^3x^3)\cos(a+bx)-(-6+a^2-2abx+3b^2x^2)\sin(a+bx)+(-a^4+b^4x^4)\,\text{Si}(a+bx)}{4b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*SinIntegral[a + b*x],x]
```

```
[Out] ((2*a - a^3 - 6*b*x + a^2*b*x - a*b^2*x^2 + b^3*x^3)*Cos[a + b*x] - (-6 + a
^2 - 2*a*b*x + 3*b^2*x^2)*Sin[a + b*x] + (-a^4 + b^4*x^4)*SinIntegral[a + b
*x])/(4*b^4)
```

Maple [A]
time = 0.35, size = 157, normalized size = 0.85

method	result
derivativedivides	$\frac{\frac{\mathrm{sinIntegral}(bx+a) b^4 x^4}{4}-\frac{a^4 \mathrm{sinIntegral}(bx+a)}{4}-a^3 \cos(bx+a)-\frac{3a^2(\sin(bx+a)-(bx+a)\cos(bx+a))}{2}+a\left(-(bx+a)^2\cos(bx+a)+2\,\mathrm{co}\right.}{b^4}$
default	$\frac{\frac{\mathrm{sinIntegral}(bx+a) b^4 x^4}{4}-\frac{a^4 \mathrm{sinIntegral}(bx+a)}{4}-a^3 \cos(bx+a)-\frac{3a^2(\sin(bx+a)-(bx+a)\cos(bx+a))}{2}+a\left(-(bx+a)^2\cos(bx+a)+2\,\mathrm{co}\right.}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Si(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*Si(b*x+a)*b^4*x^4-1/4*a^4*Si(b*x+a)-a^3*cos(b*x+a)-3/2*a^2*(sin(
b*x+a)-(b*x+a)*cos(b*x+a))+a*(-(b*x+a)^2*cos(b*x+a)+2*cos(b*x+a)+2*(b*x+a)*
sin(b*x+a))+1/4*(b*x+a)^3*cos(b*x+a)-3/4*(b*x+a)^2*sin(b*x+a)+3/2*sin(b*x+a
)-3/2*(b*x+a)*cos(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.32, size = 123, normalized size = 0.67

$$\frac{1}{4}\,x^4\,\mathrm{Si}\left(bx+a\right)-\frac{a^4(-i\,\mathrm{Ei}(i\,bx+i\,a)+i\,\mathrm{Ei}(-i\,bx-i\,a))-2\left((bx+a)^3-4\,(bx+a)^2a-4\,a^3+6\,(a^2-1)(bx+a)+8\,a\right)\cos\left(bx+a\right)+2\left(3\,(bx+a)^2-8\,(bx+a)a+6\,a^2-6\right)\sin\left(bx+a\right)}{8\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x+a),x, algorithm="maxima")
```

```
[Out] 1/4*x^4*sin_integral(b*x + a) - 1/8*(a^4*(-I*Ei(I*b*x + I*a) + I*Ei(-I*b*x
- I*a)) - 2*((b*x + a)^3 - 4*(b*x + a)^2*a - 4*a^3 + 6*(a^2 - 1)*(b*x + a)
+ 8*a)*cos(b*x + a) + 2*(3*(b*x + a)^2 - 8*(b*x + a)*a + 6*a^2 - 6)*sin(b*x
 + a))/b^4
```

Fricas [A]
time = 0.37, size = 92, normalized size = 0.50

$$\frac{(b^3x^3-ab^2x^2-a^3+(a^2-6)bx+2\,a)\cos\left(bx+a\right)-(3\,b^2x^2-2\,abx+a^2-6)\sin\left(bx+a\right)+(b^4x^4-a^4)\,\mathrm{Si}\left(bx+a\right)}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/4*((b^3*x^3 - a*b^2*x^2 - a^3 + (a^2 - 6)*b*x + 2*a)*cos(b*x + a) - (3*b^
2*x^2 - 2*a*b*x + a^2 - 6)*sin(b*x + a) + (b^4*x^4 - a^4)*sin_integral(b*x
+ a))/b^4
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3 \operatorname{Si}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Si(b*x+a),x)
```

```
[Out] Integral(x**3*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.43, size = 338, normalized size = 1.84

$$\frac{1}{4}\,x^4 \operatorname{Si}(bx+a) - \frac{\left(2\,b^3x^3\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 - 2\,ab^2x^2\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + a^4\Im(\operatorname{Ci}(bx+a))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 - a^4\Im(\operatorname{Ci}(-bx-a))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + 2\,a^4\operatorname{Si}(bx+a)\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 - 2\,b^3x^3 + 2\,a^2bx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + 2\,ab^2x^2 + a^4\Im(\operatorname{Ci}(bx+a)) - a^4\Im(\operatorname{Ci}(-bx-a)) + 2\,a^4\operatorname{Si}(bx+a) + 12\,b^2x^2\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right) - 2\,a^3\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 - 2\,a^2bx - 8\,abx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right) - 12\,bx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + 2\,a^3 + 4\,a^2\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right) + 4\,a\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + 12\,bx - 4\,a - 24\,\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)\right)b}{8\left(b^5\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2 + b^5\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x+a),x, algorithm="giac")
```

```
[Out] 1/4*x^4*sin_integral(b*x + a) - 1/8*(2*b^3*x^3*tan(1/2*b*x + 1/2*a)^2 - 2*a
*b^2*x^2*tan(1/2*b*x + 1/2*a)^2 + a^4*imag_part(cos_integral(b*x + a))*tan(
1/2*b*x + 1/2*a)^2 - a^4*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x + 1/
2*a)^2 + 2*a^4*sin_integral(b*x + a)*tan(1/2*b*x + 1/2*a)^2 - 2*b^3*x^3 + 2
*a^2*b*x*tan(1/2*b*x + 1/2*a)^2 + 2*a*b^2*x^2 + a^4*imag_part(cos_integral(
b*x + a)) - a^4*imag_part(cos_integral(-b*x - a)) + 2*a^4*sin_integral(b*x
+ a) + 12*b^2*x^2*tan(1/2*b*x + 1/2*a) - 2*a^3*tan(1/2*b*x + 1/2*a)^2 - 2*a
^2*b*x - 8*a*b*x*tan(1/2*b*x + 1/2*a) - 12*b*x*tan(1/2*b*x + 1/2*a)^2 + 2*a
^3 + 4*a^2*tan(1/2*b*x + 1/2*a) + 4*a*tan(1/2*b*x + 1/2*a)^2 + 12*b*x - 4*a
 - 24*tan(1/2*b*x + 1/2*a))*b/(b^5*tan(1/2*b*x + 1/2*a)^2 + b^5)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3\,\mathrm{sinint}(a+b\,x)\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*sinint(a + b*x),x)
```

```
[Out] int(x^3*sinint(a + b*x), x)
```

3.19 $\int x^2\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=118

$$-\frac{2\cos(a+bx)}{3b^3}+\frac{a^2\cos(a+bx)}{3b^3}-\frac{ax\cos(a+bx)}{3b^2}+\frac{x^2\cos(a+bx)}{3b}+\frac{a\sin(a+bx)}{3b^3}-\frac{2x\sin(a+bx)}{3b^2}+\frac{a^3\mathrm{Si}(a+b}{3b^3}$$

```
[Out] -2/3*cos(b*x+a)/b^3+1/3*a^2*cos(b*x+a)/b^3-1/3*a*x*cos(b*x+a)/b^2+1/3*x^2*c
os(b*x+a)/b+1/3*a^3*Si(b*x+a)/b^3+1/3*x^3*Si(b*x+a)+1/3*a*sin(b*x+a)/b^3-2/
3*x*sin(b*x+a)/b^2
```

Rubi [A]
time = 0.19, antiderivative size = 118, normalized size of antiderivative = 1.00, number of steps used = 10, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {6638, 6874, 2718, 3377, 2717, 3380}

$$\frac{a^3\mathrm{Si}(a+bx)}{3b^3}+\frac{a^2\cos(a+bx)}{3b^3}+\frac{a\sin(a+bx)}{3b^3}-\frac{2\cos(a+bx)}{3b^3}-\frac{2x\sin(a+bx)}{3b^2}-\frac{ax\cos(a+bx)}{3b^2}+\frac{1}{3}x^3\mathrm{Si}(a+bx)+\frac{x^2\cos(a+bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*SinIntegral[a + b*x],x]
```

```
[Out] (-2*Cos[a + b*x])/(3*b^3) + (a^2*Cos[a + b*x])/(3*b^3) - (a*x*Cos[a + b*x])
/(3*b^2) + (x^2*Cos[a + b*x])/(3*b) + (a*Sin[a + b*x])/(3*b^3) - (2*x*Sin[a
 + b*x])/(3*b^2) + (a^3*SinIntegral[a + b*x])/(3*b^3) + (x^3*SinIntegral[a
+ b*x])/3
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 6638

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x^2\text{Si}(a+bx)\,dx &= \frac{1}{3}x^3\text{Si}(a+bx)-\frac{1}{3}b\int\frac{x^3\sin(a+bx)}{a+bx}\,dx\\
&= \frac{1}{3}x^3\text{Si}(a+bx)-\frac{1}{3}b\int\left(\frac{a^2\sin(a+bx)}{b^3}-\frac{ax\sin(a+bx)}{b^2}+\frac{x^2\sin(a+bx)}{b}-\frac{a^3\sin(a+}{b^3(a+}\right.\\
&= \frac{1}{3}x^3\text{Si}(a+bx)-\frac{1}{3}\int x^2\sin(a+bx)\,dx-\frac{a^2\int\sin(a+bx)\,dx}{3b^2}+\frac{a^3\int\frac{\sin(a+bx)}{a+bx}\,dx}{3b^2}+\frac{a\int}{}\\
&= \frac{a^2\cos(a+bx)}{3b^3}-\frac{ax\cos(a+bx)}{3b^2}+\frac{x^2\cos(a+bx)}{3b}+\frac{a^3\text{Si}(a+bx)}{3b^3}+\frac{1}{3}x^3\text{Si}(a+bx)+\\
&= \frac{a^2\cos(a+bx)}{3b^3}-\frac{ax\cos(a+bx)}{3b^2}+\frac{x^2\cos(a+bx)}{3b}+\frac{a\sin(a+bx)}{3b^3}-\frac{2x\sin(a+bx)}{3b^2}+\\
&= -\frac{2\cos(a+bx)}{3b^3}+\frac{a^2\cos(a+bx)}{3b^3}-\frac{ax\cos(a+bx)}{3b^2}+\frac{x^2\cos(a+bx)}{3b}+\frac{a\sin(a+bx)}{3b^3}
\end{aligned}$$

Mathematica [A]
time = 0.10, size = 63, normalized size = 0.53

$$\frac{(-2+a^2-abx+b^2x^2)\cos(a+bx)+(a-2bx)\sin(a+bx)+(a^3+b^3x^3)\,\text{Si}(a+bx)}{3b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*SinIntegral[a + b*x],x]
```

```
[Out] ((-2 + a^2 - a*b*x + b^2*x^2)*Cos[a + b*x] + (a - 2*b*x)*Sin[a + b*x] + (a^
3 + b^3*x^3)*SinIntegral[a + b*x])/(3*b^3)
```

Maple [A]
time = 0.30, size = 99, normalized size = 0.84

method	result
derivativedivides	$\frac{\frac{\text{sinIntegral}(bx+a)b^3x^3}{3}+\frac{a^3\,\text{sinIntegral}(bx+a)}{3}+a^2\cos(bx+a)+a(\sin(bx+a)-(bx+a)\cos(bx+a))+\frac{(bx+a)^2\cos(bx+a)}{3}-\frac{2\cos(bx-}{3}}{b^3}$
default	$\frac{\frac{\text{sinIntegral}(bx+a)b^3x^3}{3}+\frac{a^3\,\text{sinIntegral}(bx+a)}{3}+a^2\cos(bx+a)+a(\sin(bx+a)-(bx+a)\cos(bx+a))+\frac{(bx+a)^2\cos(bx+a)}{3}-\frac{2\cos(bx-}{3}}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*Si(b*x+a)*b^3*x^3+1/3*a^3*Si(b*x+a)+a^2*cos(b*x+a)+a*(sin(b*x+a)
-(b*x+a)*cos(b*x+a))+1/3*(b*x+a)^2*cos(b*x+a)-2/3*cos(b*x+a)-2/3*(b*x+a)*si
n(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.31, size = 91, normalized size = 0.77

$$\frac{1}{3}\,x^3\,\mathrm{Si}\left(bx+a\right)-\frac{a^3(i\,\mathrm{Ei}(i\,bx+i\,a)-i\,\mathrm{Ei}(-i\,bx-i\,a))-2\left((bx+a)^2-3\,(bx+a)a+3\,a^2-2\right)\cos\left(bx+a\right)+2\left(2\,bx-a\right)\sin\left(bx+a\right)}{6\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a),x, algorithm="maxima")
```

```
[Out] 1/3*x^3*sin_integral(b*x + a) - 1/6*(a^3*(I*Ei(I*b*x + I*a) - I*Ei(-I*b*x -
 I*a)) - 2*((b*x + a)^2 - 3*(b*x + a)*a + 3*a^2 - 2)*cos(b*x + a) + 2*(2*b*
x - a)*sin(b*x + a))/b^3
```

Fricas [A]
time = 0.34, size = 64, normalized size = 0.54

$$\frac{\left(b^2x^2-abx+a^2-2\right)\cos\left(bx+a\right)-\left(2\,bx-a\right)\sin\left(bx+a\right)+\left(b^3x^3+a^3\right)\mathrm{Si}\left(bx+a\right)}{3\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/3*((b^2*x^2 - a*b*x + a^2 - 2)*cos(b*x + a) - (2*b*x - a)*sin(b*x + a) +
(b^3*x^3 + a^3)*sin_integral(b*x + a))/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\,\mathrm{Si}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x+a),x)
```

[Out] Integral(x**2*Si(a + b*x), x)

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.42, size = 252, normalized size = 2.14

$$\frac{1}{3}\,x^3\,\mathrm{Si}\left(bx+a\right)-\frac{\left(2\,b^2x^2\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-a^3\Im(\mathrm{Ci}\left(bx+a\right))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+a^3\Im(\mathrm{Ci}\left(-bx-a\right))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-2\,a^3\,\mathrm{Si}\left(bx+a\right)\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-2\,abx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-2\,b^2x^2-a^3\Im(\mathrm{Ci}\left(bx+a\right))+a^3\Im(\mathrm{Ci}\left(-bx-a\right))-2\,a^3\,\mathrm{Si}\left(bx+a\right)+2\,a^2\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+2\,abx+8\,bx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)-2\,a^2-4\,a\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)-4\,\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+4\right)b}{6\,\left(b^4\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+b^4\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

[Out] 1/3*x^3*sin_integral(b*x + a) - 1/6*(2*b^2*x^2*tan(1/2*b*x + 1/2*a)^2 - a^3*imag_part(cos_integral(b*x + a))*tan(1/2*b*x + 1/2*a)^2 + a^3*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x + 1/2*a)^2 - 2*a^3*sin_integral(b*x + a)*tan(1/2*b*x + 1/2*a)^2 - 2*a*b*x*tan(1/2*b*x + 1/2*a)^2 - 2*b^2*x^2 - a^3*imag_part(cos_integral(b*x + a)) + a^3*imag_part(cos_integral(-b*x - a)) - 2*a^3*sin_integral(b*x + a) + 2*a^2*tan(1/2*b*x + 1/2*a)^2 + 2*a*b*x + 8*b*x*tan(1/2*b*x + 1/2*a) - 2*a^2 - 4*a*tan(1/2*b*x + 1/2*a) - 4*tan(1/2*b*x + 1/2*a)^2 + 4)*b/(b^4*tan(1/2*b*x + 1/2*a)^2 + b^4)

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2\,\mathrm{sinint}(a+b\,x)\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*sinint(a + b*x),x)

[Out] int(x^2*sinint(a + b*x), x)

3.20 $\int x\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=71

$$-\frac{a\cos(a+bx)}{2b^2}+\frac{x\cos(a+bx)}{2b}-\frac{\sin(a+bx)}{2b^2}-\frac{a^2\mathrm{Si}(a+bx)}{2b^2}+\frac{1}{2}x^2\mathrm{Si}(a+bx)$$

```
[Out] -1/2*a*cos(b*x+a)/b^2+1/2*x*cos(b*x+a)/b-1/2*a^2*Si(b*x+a)/b^2+1/2*x^2*Si(b
*x+a)-1/2*sin(b*x+a)/b^2
```

Rubi [A]
time = 0.14, antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}=0.750$, Rules used = {6638, 6874, 2718, 3377, 2717, 3380}

$$-\frac{a^2\mathrm{Si}(a+bx)}{2b^2}-\frac{\sin(a+bx)}{2b^2}-\frac{a\cos(a+bx)}{2b^2}+\frac{1}{2}x^2\mathrm{Si}(a+bx)+\frac{x\cos(a+bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*SinIntegral[a + b*x],x]
```

```
[Out] -1/2*(a*Cos[a + b*x])/b^2 + (x*Cos[a + b*x])/(2*b) - Sin[a + b*x]/(2*b^2) -
 (a^2*SinIntegral[a + b*x])/(2*b^2) + (x^2*SinIntegral[a + b*x])/2
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 6638

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x\text{Si}(a+bx)\,dx &= \frac{1}{2}x^2\text{Si}(a+bx)-\frac{1}{2}b\int\frac{x^2\sin(a+bx)}{a+bx}\,dx\\
&= \frac{1}{2}x^2\text{Si}(a+bx)-\frac{1}{2}b\int\left(-\frac{a\sin(a+bx)}{b^2}+\frac{x\sin(a+bx)}{b}+\frac{a^2\sin(a+bx)}{b^2(a+bx)}\right)\,dx\\
&= \frac{1}{2}x^2\text{Si}(a+bx)-\frac{1}{2}\int x\sin(a+bx)\,dx+\frac{a\int\sin(a+bx)\,dx}{2b}-\frac{a^2\int\frac{\sin(a+bx)}{a+bx}\,dx}{2b}\\
&= -\frac{a\cos(a+bx)}{2b^2}+\frac{x\cos(a+bx)}{2b}-\frac{a^2\text{Si}(a+bx)}{2b^2}+\frac{1}{2}x^2\text{Si}(a+bx)-\frac{\int\cos(a+bx)\,dx}{2b}\\
&= -\frac{a\cos(a+bx)}{2b^2}+\frac{x\cos(a+bx)}{2b}-\frac{\sin(a+bx)}{2b^2}-\frac{a^2\text{Si}(a+bx)}{2b^2}+\frac{1}{2}x^2\text{Si}(a+bx)
\end{aligned}$$

Mathematica [A]
time = 0.07, size = 50, normalized size = 0.70

$$\frac{(-a+bx)\cos(a+bx)-\sin(a+bx)+(-a^2+b^2x^2)\,\text{Si}(a+bx)}{2b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*SinIntegral[a + b*x],x]
```

```
[Out] ((-a + b*x)*Cos[a + b*x] - Sin[a + b*x] + (-a^2 + b^2*x^2)*SinIntegral[a +
b*x])/(2*b^2)
```

Maple [A]
time = 0.32, size = 61, normalized size = 0.86

method	result	size
derivativedivides	$\frac{\text{sinIntegral}(bx+a)\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-a\cos(bx+a)-\frac{\sin(bx+a)}{2}+\frac{(bx+a)\cos(bx+a)}{2}}{b^2}$	61

default	$\frac{\mathrm{sinIntegral}(bx+a)\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-a\cos(bx+a)-\frac{\sin(bx+a)}{2}+\frac{(bx+a)\cos(bx+a)}{2}}{b^2}$	61

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Si(b*x+a)*(-a*(b*x+a)+1/2*(b*x+a)^2)-a*cos(b*x+a)-1/2*sin(b*x+a)+1/2
*(b*x+a)*cos(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.30, size = 68, normalized size = 0.96

$$\frac{1}{2}\,x^2\,\mathrm{Si}\left(bx+a\right)-\frac{a^2(-i\,\mathrm{Ei}(i\,bx+i\,a)+i\,\mathrm{Ei}(-i\,bx-i\,a))-2\left(bx-a\right)\cos\left(bx+a\right)+2\,\sin\left(bx+a\right)}{4\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*x^2*sin_integral(b*x + a) - 1/4*(a^2*(-I*Ei(I*b*x + I*a) + I*Ei(-I*b*x
- I*a)) - 2*(b*x - a)*cos(b*x + a) + 2*sin(b*x + a))/b^2
```

Fricas [A]
time = 0.35, size = 48, normalized size = 0.68

$$\frac{(bx-a)\cos\left(bx+a\right)+(b^2x^2-a^2)\,\mathrm{Si}\left(bx+a\right)-\sin\left(bx+a\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*((b*x - a)*cos(b*x + a) + (b^2*x^2 - a^2)*sin_integral(b*x + a) - sin(b
*x + a))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Si}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Integral(x*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.42, size = 191, normalized size = 2.69

$$\frac{1}{2}\,x^2\,\mathrm{Si}\left(bx+a\right)-\frac{\left(a^2\Im(\mathrm{Ci}\left(bx+a\right))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-a^2\Im(\mathrm{Ci}\left(-bx-a\right))\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+2\,a^2\,\mathrm{Si}\left(bx+a\right)\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+2\,bx\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+a^2\Im(\mathrm{Ci}\left(bx+a\right))-a^2\Im(\mathrm{Ci}\left(-bx-a\right))+2\,a^2\,\mathrm{Si}\left(bx+a\right)-2\,a\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2-2\,bx+2\,a+4\,\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)\right)b}{4\left(b^3\tan\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)^2+b^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*x^2*sin_integral(b*x + a) - 1/4*(a^2*imag_part(cos_integral(b*x + a))*t
an(1/2*b*x + 1/2*a)^2 - a^2*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x +
 1/2*a)^2 + 2*a^2*sin_integral(b*x + a)*tan(1/2*b*x + 1/2*a)^2 + 2*b*x*tan(
1/2*b*x + 1/2*a)^2 + a^2*imag_part(cos_integral(b*x + a)) - a^2*imag_part(c
os_integral(-b*x - a)) + 2*a^2*sin_integral(b*x + a) - 2*a*tan(1/2*b*x + 1/
2*a)^2 - 2*b*x + 2*a + 4*tan(1/2*b*x + 1/2*a))*b/(b^3*tan(1/2*b*x + 1/2*a)^
2 + b^3)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\frac{x^2\,\mathrm{sinint}(a+b\,x)}{2}-\frac{\sin\left(a+b\,x\right)+a\,\cos\left(a+b\,x\right)+a^2\,\mathrm{sinint}(a+b\,x)-b\,x\,\cos\left(a+b\,x\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(a + b*x),x)
```

```
[Out] (x^2*sinint(a + b*x))/2 - (sin(a + b*x) + a*cos(a + b*x) + a^2*sinint(a + b
*x) - b*x*cos(a + b*x))/(2*b^2)
```

3.21 $\int \mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=26

$$\frac{\cos(a+bx)}{b}+\frac{(a+bx)\text{Si}(a+bx)}{b}$$

```
[Out] cos(b*x+a)/b+(b*x+a)*Si(b*x+a)/b
```

Rubi [A]
time = 0.00, antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.167, Rules used = {6634}

$$\frac{(a+bx)\text{Si}(a+bx)}{b}+\frac{\cos(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[a + b*x],x]
[Out] Cos[a + b*x]/b + ((a + b*x)*SinIntegral[a + b*x])/b
```

Rule 6634

```
Int[SinIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(SinIntegr
al[a + b*x]/b), x] + Simp[Cos[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\int \text{Si}(a+bx)\,dx=\frac{\cos(a+bx)}{b}+\frac{(a+bx)\text{Si}(a+bx)}{b}$$

Mathematica [A]
time = 0.03, size = 41, normalized size = 1.58

$$\frac{\cos(a)\cos(bx)}{b}-\frac{\sin(a)\sin(bx)}{b}+\frac{a\text{Si}(a+bx)}{b}+x\text{Si}(a+bx)$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[a + b*x],x]
[Out] (Cos[a]*Cos[b*x])/b - (Sin[a]*Sin[b*x])/b + (a*SinIntegral[a + b*x])/b + x*
SinIntegral[a + b*x]
```

Maple [A]
time = 0.18, size = 24, normalized size = 0.92

method	result	size
derivativedivides	$\frac{\text{sinIntegral}(bx+a)(bx+a)+\cos(bx+a)}{b}$	24
default	$\frac{\text{sinIntegral}(bx+a)(bx+a)+\cos(bx+a)}{b}$	24

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a),x,method=_RETURNVERBOSE)
[Out] 1/b*(Si(b*x+a)*(b*x+a)+cos(b*x+a))
```

Maxima [A]
time = 0.26, size = 23, normalized size = 0.88

$$\frac{(bx+a)\,\text{Si}\,(bx+a)+\cos\,(bx+a)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a),x, algorithm="maxima")
[Out] ((b*x + a)*sin_integral(b*x + a) + cos(b*x + a))/b
```

Fricas [A]
time = 0.35, size = 23, normalized size = 0.88

$$\frac{(bx+a)\,\text{Si}\,(bx+a)+\cos\,(bx+a)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a),x, algorithm="fricas")
[Out] ((b*x + a)*sin_integral(b*x + a) + cos(b*x + a))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \text{Si}\,(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a),x)
[Out] Integral(Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 303, normalized size = 11.65

$$x\,\text{Si}\,(bx+a)+\frac{\left(a\Im(\text{Ci}\,(bx+a))\tan\left(\frac{1}{2}\,bx\right)^2\tan\left(\frac{1}{2}\,a\right)^2-a\Im(\text{Ci}\,(-bx-a))\tan\left(\frac{1}{2}\,bx\right)^2\tan\left(\frac{1}{2}\,a\right)^2+2\,a\,\text{Si}\,(bx+a)\tan\left(\frac{1}{2}\,bx\right)^2\tan\left(\frac{1}{2}\,a\right)^2+a\Im(\text{Ci}\,(bx+a))\tan\left(\frac{1}{2}\,bx\right)^2-a\Im(\text{Ci}\,(-bx-a))\tan\left(\frac{1}{2}\,bx\right)^2+2\,a\,\text{Si}\,(bx+a)\tan\left(\frac{1}{2}\,bx\right)^2+a\Im(\text{Ci}\,(bx+a))\tan\left(\frac{1}{2}\,a\right)^2-a\Im(\text{Ci}\,(-bx-a))\tan\left(\frac{1}{2}\,a\right)^2+2\,a\,\text{Si}\,(bx+a)\tan\left(\frac{1}{2}\,a\right)^2+2\,\tan\left(\frac{1}{2}\,bx\right)^2\tan\left(\frac{1}{2}\,a\right)^2+a\Im(\text{Ci}\,(bx+a))-a\Im(\text{Ci}\,(-bx-a))+2\,a\,\text{Si}\,(bx+a)-2\,\tan\left(\frac{1}{2}\,bx\right)^2-8\,\tan\left(\frac{1}{2}\,bx\right)\tan\left(\frac{1}{2}\,a\right)-2\,\tan\left(\frac{1}{2}\,a\right)^2+2\right)b}{2\left(b^2\tan\left(\frac{1}{2}\,bx\right)^2\tan\left(\frac{1}{2}\,a\right)^2+b^2\tan\left(\frac{1}{2}\,bx\right)^2+b^2\tan\left(\frac{1}{2}\,a\right)^2+b^2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] x*sin_integral(b*x + a) + 1/2*(a*imag_part(cos_integral(b*x + a))*tan(1/2*b
*x)^2*tan(1/2*a)^2 - a*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x)^2*tan
(1/2*a)^2 + 2*a*sin_integral(b*x + a)*tan(1/2*b*x)^2*tan(1/2*a)^2 + a*imag_
part(cos_integral(b*x + a))*tan(1/2*b*x)^2 - a*imag_part(cos_integral(-b*x
- a))*tan(1/2*b*x)^2 + 2*a*sin_integral(b*x + a)*tan(1/2*b*x)^2 + a*imag_pa
rt(cos_integral(b*x + a))*tan(1/2*a)^2 - a*imag_part(cos_integral(-b*x - a)
)*tan(1/2*a)^2 + 2*a*sin_integral(b*x + a)*tan(1/2*a)^2 + 2*tan(1/2*b*x)^2*
tan(1/2*a)^2 + a*imag_part(cos_integral(b*x + a)) - a*imag_part(cos_integra
l(-b*x - a)) + 2*a*sin_integral(b*x + a) - 2*tan(1/2*b*x)^2 - 8*tan(1/2*b*x
)*tan(1/2*a) - 2*tan(1/2*a)^2 + 2)*b/(b^2*tan(1/2*b*x)^2*tan(1/2*a)^2 + b^2
*tan(1/2*b*x)^2 + b^2*tan(1/2*a)^2 + b^2)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.04

$$x\,\mathrm{sinint}(a+b\,x)+\frac{\cos\left(a+b\,x\right)+a\,\mathrm{sinint}(a+b\,x)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x),x)
```

```
[Out] x*sinint(a + b*x) + (cos(a + b*x) + a*sinint(a + b*x))/b
```

3.22 $\int \frac{\text{Si}(a+bx)}{x} \, dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{Si}(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Si(b*x+a)/x,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{Si}(a+bx)}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[a + b*x]/x,x]
```

```
[Out] Defer[Int][SinIntegral[a + b*x]/x, x]
```

Rubi steps

$$\int \frac{\text{Si}(a+bx)}{x} \, dx = \int \frac{\text{Si}(a+bx)}{x} \, dx$$

Mathematica [A]
time = 0.46, size = 0, normalized size = 0.00

$$\int \frac{\text{Si}(a+bx)}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[a + b*x]/x,x]
```

```
[Out] Integrate[SinIntegral[a + b*x]/x, x]
```

Maple [A]
time = 0.15, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\,(bx+a)}{x} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)/x,x)
```

```
[Out] int(Si(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)/x,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)/x,x, algorithm="fricas")
```

```
[Out] integral(sin_integral(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}\left(a + bx\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)/x,x)
```

```
[Out] Integral(Si(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)/x,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{\mathrm{sinint}(a+b\,x)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)/x,x)
```

```
[Out] int(sinint(a + b*x)/x, x)
```

3.23 $\int \frac{\mathbf{Si}(a+bx)}{x^2} dx$

Optimal. Leaf size=46

$$\frac{b\text{CosIntegral}(bx)\sin(a)}{a}+\frac{b\cos(a)\text{Si}(bx)}{a}-\frac{b\text{Si}(a+bx)}{a}-\frac{\text{Si}(a+bx)}{x}$$

```
[Out] b*cos(a)*Si(b*x)/a-b*Si(b*x+a)/a-Si(b*x+a)/x+b*Ci(b*x)*sin(a)/a
```

Rubi [A]
time = 0.18, antiderivative size = 46, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6638, 6874, 3384, 3380, 3383}

$$\frac{b\sin(a)\text{CosIntegral}(bx)}{a}-\frac{b\text{Si}(a+bx)}{a}-\frac{\text{Si}(a+bx)}{x}+\frac{b\cos(a)\text{Si}(bx)}{a}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[a + b*x]/x^2,x]
```

```
[Out] (b*CosIntegral[b*x]*Sin[a])/a + (b*Cos[a]*SinIntegral[b*x])/a - (b*SinInteg
ral[a + b*x])/a - SinIntegral[a + b*x]/x
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 6638

```
Int[((c_.) + (d_.)*(x_))^(m_.)*SinIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :
> Simp[(c + d*x)^(m + 1)*(SinIntegral[a + b*x]/(d*(m + 1))), x] - Dist[b/(d
*(m + 1)), Int[(c + d*x)^(m + 1)*(Sin[a + b*x]/(a + b*x)), x], x] /; FreeQ[
```

```
{a, b, c, d, m}, x] && NeQ[m, -1]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int \frac{\mathrm{Si}(a+bx)}{x^2}\,dx &= -\frac{\mathrm{Si}(a+bx)}{x}+b\int \frac{\sin(a+bx)}{x(a+bx)}\,dx\\
&= -\frac{\mathrm{Si}(a+bx)}{x}+b\int \left(\frac{\sin(a+bx)}{ax}-\frac{b\sin(a+bx)}{a(a+bx)}\right)dx\\
&= -\frac{\mathrm{Si}(a+bx)}{x}+\frac{b\int \frac{\sin(a+bx)}{x}\,dx}{a}-\frac{b^2\int \frac{\sin(a+bx)}{a+bx}\,dx}{a}\\
&= -\frac{b\mathrm{Si}(a+bx)}{a}-\frac{\mathrm{Si}(a+bx)}{x}+\frac{(b\cos(a))\int \frac{\sin(bx)}{x}\,dx}{a}+\frac{(b\sin(a))\int \frac{\cos(bx)}{x}\,dx}{a}\\
&= \frac{b\mathrm{Ci}(bx)\sin(a)}{a}+\frac{b\cos(a)\mathrm{Si}(bx)}{a}-\frac{b\mathrm{Si}(a+bx)}{a}-\frac{\mathrm{Si}(a+bx)}{x}
\end{aligned}$$

Mathematica [A]
time = 0.05, size = 39, normalized size = 0.85

$$\frac{bx\mathrm{CosIntegral}(bx)\sin(a)+bx\cos(a)\mathrm{Si}(bx)-(a+bx)\mathrm{Si}(a+bx)}{ax}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[a + b*x]/x^2,x]
[Out] (b*x*CosIntegral[b*x]*Sin[a] + b*x*Cos[a]*SinIntegral[b*x] - (a + b*x)*SinI
ntegral[a + b*x])/(a*x)
```

Maple [A]
time = 0.33, size = 48, normalized size = 1.04

method	result	size
derivativedivides	$b\left(-\frac{\mathrm{sinIntegral}(bx+a)}{bx}+\frac{\mathrm{sinIntegral}(bx)\cos(a)+\mathrm{cosineIntegral}(bx)\sin(a)}{a}-\frac{\mathrm{sinIntegral}(bx+a)}{a}\right)$	48
default	$b\left(-\frac{\mathrm{sinIntegral}(bx+a)}{bx}+\frac{\mathrm{sinIntegral}(bx)\cos(a)+\mathrm{cosineIntegral}(bx)\sin(a)}{a}-\frac{\mathrm{sinIntegral}(bx+a)}{a}\right)$	48

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)/x^2,x,method=_RETURNVERBOSE)
```

```
[Out] b*(-Si(b*x+a)/b/x+1/a*(Si(b*x)*cos(a)+Ci(b*x)*sin(a))-1/a*Si(b*x+a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)/x^2, x)
```

Fricas [A]
time = 0.36, size = 51, normalized size = 1.11

$$\frac{2\,bx\cos\left(a\right)\mathrm{Si}\left(bx\right)+\left(bx\,\mathrm{Ci}\left(bx\right)+bx\,\mathrm{Ci}\left(-bx\right)\right)\sin\left(a\right)-2\left(bx+a\right)\mathrm{Si}\left(bx+a\right)}{2\,ax}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*(2*b*x*cos(a)*sin_integral(b*x) + (b*x*cos_integral(b*x) + b*x*cos_inte
gral(-b*x))*sin(a) - 2*(b*x + a)*sin_integral(b*x + a))/(a*x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\frac{\mathrm{Si}\left(a+bx\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)/x**2,x)
```

```
[Out] Integral(Si(a + b*x)/x**2, x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 181, normalized size = 3.93

$$-\frac{\left(\Im(\mathrm{Ci}\left(bx+a\right))\tan\left(\frac{1}{2}\,a\right)^{2}+\Im(\mathrm{Ci}\left(bx\right))\tan\left(\frac{1}{2}\,a\right)^{2}-\Im(\mathrm{Ci}\left(-bx-a\right))\tan\left(\frac{1}{2}\,a\right)^{2}-\Im(\mathrm{Ci}\left(-bx\right))\tan\left(\frac{1}{2}\,a\right)^{2}+2\,\mathrm{Si}\left(bx+a\right)\tan\left(\frac{1}{2}\,a\right)^{2}+2\,\mathrm{Si}\left(bx\right)\tan\left(\frac{1}{2}\,a\right)^{2}-2\,\Re(\mathrm{Ci}\left(bx\right))\tan\left(\frac{1}{2}\,a\right)-2\,\Re(\mathrm{Ci}\left(-bx\right))\tan\left(\frac{1}{2}\,a\right)+\Im(\mathrm{Ci}\left(bx+a\right))-\Im(\mathrm{Ci}\left(bx\right))-\Im(\mathrm{Ci}\left(-bx-a\right))+\Im(\mathrm{Ci}\left(-bx\right))+2\,\mathrm{Si}\left(bx+a\right)-2\,\mathrm{Si}\left(bx\right)\right)b}{2\left(a\tan\left(\frac{1}{2}\,a\right)^{2}+a\right)}-\frac{\mathrm{Si}\left(bx+a\right)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/2*(imag_part(cos_integral(b*x + a))*tan(1/2*a)^2 + imag_part(cos_integra
l(b*x))*tan(1/2*a)^2 - imag_part(cos_integral(-b*x - a))*tan(1/2*a)^2 - ima
g_part(cos_integral(-b*x))*tan(1/2*a)^2 + 2*sin_integral(b*x + a)*tan(1/2*a
```

```
)^2 + 2*sin_integral(b*x)*tan(1/2*a)^2 - 2*real_part(cos_integral(b*x))*tan
(1/2*a) - 2*real_part(cos_integral(-b*x))*tan(1/2*a) + imag_part(cos_integr
al(b*x + a)) - imag_part(cos_integral(b*x)) - imag_part(cos_integral(-b*x -
 a)) + imag_part(cos_integral(-b*x)) + 2*sin_integral(b*x + a) - 2*sin_inte
gral(b*x))*b/(a*tan(1/2*a)^2 + a) - sin_integral(b*x + a)/x
```

Mupad [F]

time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{sinint}(a+b\,x)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)/x^2,x)
```

```
[Out] int(sinint(a + b*x)/x^2, x)
```

3.24 $\int \frac{\mathbf{Si}(a+bx)}{x^3}\,dx$

Optimal. Leaf size=111

$$\frac{b^2\cos(a)\text{CosIntegral}(bx)}{2a}-\frac{b^2\text{CosIntegral}(bx)\sin(a)}{2a^2}-\frac{b\sin(a+bx)}{2ax}-\frac{b^2\cos(a)\text{Si}(bx)}{2a^2}-\frac{b^2\sin(a)\text{Si}(bx)}{2a}+\frac{b^2\text{Si}(a}{2a}$$

```
[Out] 1/2*b^2*Ci(b*x)*cos(a)/a-1/2*b^2*cos(a)*Si(b*x)/a^2+1/2*b^2*Si(b*x+a)/a^2-1
/2*Si(b*x+a)/x^2-1/2*b^2*Ci(b*x)*sin(a)/a^2-1/2*b^2*Si(b*x)*sin(a)/a-1/2*b*
sin(b*x+a)/a/x
```

Rubi [A]
time = 0.23, antiderivative size = 111, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {6638, 6874, 3378, 3384, 3380, 3383}

$$-\frac{b^2\sin(a)\text{CosIntegral}(bx)}{2a^2}+\frac{b^2\text{Si}(a+bx)}{2a^2}-\frac{b^2\cos(a)\text{Si}(bx)}{2a^2}+\frac{b^2\cos(a)\text{CosIntegral}(bx)}{2a}-\frac{b^2\sin(a)\text{Si}(bx)}{2a}-\frac{\text{Si}(a+bx)}{2x^2}-\frac{b\sin(a+bx)}{2ax}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[a + b*x]/x^3,x]
```

```
[Out] (b^2*Cos[a]*CosIntegral[b*x])/(2*a) - (b^2*CosIntegral[b*x]*Sin[a])/(2*a^2)
 - (b*Sin[a + b*x])/(2*a*x) - (b^2*Cos[a]*SinIntegral[b*x])/(2*a^2) - (b^2*
Sin[a]*SinIntegral[b*x])/(2*a) + (b^2*SinIntegral[a + b*x])/(2*a^2) - SinIn
tegral[a + b*x]/(2*x^2)
```

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 6638

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int \frac{\mathrm{Si}(a+bx)}{x^3}\,dx &= -\frac{\mathrm{Si}(a+bx)}{2x^2}+\frac{1}{2}b\int \frac{\sin(a+bx)}{x^2(a+bx)}\,dx\\
&= -\frac{\mathrm{Si}(a+bx)}{2x^2}+\frac{1}{2}b\int \left(\frac{\sin(a+bx)}{ax^2}-\frac{b\sin(a+bx)}{a^2x}+\frac{b^2\sin(a+bx)}{a^2(a+bx)}\right)dx\\
&= -\frac{\mathrm{Si}(a+bx)}{2x^2}+\frac{b\int \frac{\sin(a+bx)}{x^2}\,dx}{2a}-\frac{b^2\int \frac{\sin(a+bx)}{x}\,dx}{2a^2}+\frac{b^3\int \frac{\sin(a+bx)}{a+bx}\,dx}{2a^2}\\
&= -\frac{b\sin(a+bx)}{2ax}+\frac{b^2\mathrm{Si}(a+bx)}{2a^2}-\frac{\mathrm{Si}(a+bx)}{2x^2}+\frac{b^2\int \frac{\cos(a+bx)}{x}\,dx}{2a}-\frac{(b^2\cos(a))\int \frac{\sin(bx)}{x}\,dx}{2a^2}\\
&= -\frac{b^2\mathrm{Ci}(bx)\sin(a)}{2a^2}-\frac{b\sin(a+bx)}{2ax}-\frac{b^2\cos(a)\mathrm{Si}(bx)}{2a^2}+\frac{b^2\mathrm{Si}(a+bx)}{2a^2}-\frac{\mathrm{Si}(a+bx)}{2x^2}+\frac{(b^2
\end{aligned}$$

$$= \frac{b^2\cos(a)\mathrm{Ci}(bx)}{2a}-\frac{b^2\mathrm{Ci}(bx)\sin(a)}{2a^2}-\frac{b\sin(a+bx)}{2ax}-\frac{b^2\cos(a)\mathrm{Si}(bx)}{2a^2}-\frac{b^2\sin(a)\mathrm{Si}(bx)}{2a}+$$

Mathematica [A]
time = 0.24, size = 84, normalized size = 0.76

$$-\frac{-b^2x^2\mathrm{CosIntegral}(bx)(a\cos(a)-\sin(a))+abx\sin(a+bx)+b^2x^2(\cos(a)+a\sin(a))\mathrm{Si}(bx)+a^2\mathrm{Si}(a+bx)-b^2x^2\mathrm{Si}(a+bx)}{2a^2x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[a + b*x]/x^3,x]
```

```
[Out] -1/2*(-(b^2*x^2*CosIntegral[b*x]*(a*Cos[a] - Sin[a])) + a*b*x*Sin[a + b*x]
+ b^2*x^2*(Cos[a] + a*Sin[a])*SinIntegral[b*x] + a^2*SinIntegral[a + b*x] -
 b^2*x^2*SinIntegral[a + b*x])/(a^2*x^2)
```

Maple [A]
time = 0.31, size = 86, normalized size = 0.77

method	result
derivativedivides	$b^2\left(-\frac{\text{sinIntegral}(bx+a)}{2b^2x^2}+\frac{\text{sinIntegral}(bx+a)}{2a^2}-\frac{\text{sinIntegral}(bx)\cos(a)+\text{cosineIntegral}(bx)\sin(a)}{2a^2}+\frac{-\frac{\sin(bx+a)}{bx}-\text{si}}{}\right.$
default	$b^2\left(-\frac{\text{sinIntegral}(bx+a)}{2b^2x^2}+\frac{\text{sinIntegral}(bx+a)}{2a^2}-\frac{\text{sinIntegral}(bx)\cos(a)+\text{cosineIntegral}(bx)\sin(a)}{2a^2}+\frac{-\frac{\sin(bx+a)}{bx}-\text{si}}{}\right.$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)/x^3,x,method=_RETURNVERBOSE)
```

```
[Out] b^2*(-1/2*Si(b*x+a)/b^2/x^2+1/2/a^2*Si(b*x+a)-1/2/a^2*(Si(b*x)*cos(a)+Ci(b*
x)*sin(a))+1/2/a*(-sin(b*x+a)/b/x-Si(b*x)*sin(a)+Ci(b*x)*cos(a)))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)/x^3, x)
```

Fricas [A]
time = 0.38, size = 123, normalized size = 1.11

$$-\frac{2\,abx\sin\left(bx+a\right)-\left(ab^2x^2\operatorname{Ci}\left(bx\right)+ab^2x^2\operatorname{Ci}\left(-bx\right)-2\,b^2x^2\operatorname{Si}\left(bx\right)\right)\cos\left(a\right)+\left(2\,ab^2x^2\operatorname{Si}\left(bx\right)+b^2x^2\operatorname{Ci}\left(bx\right)+b^2x^2\operatorname{Ci}\left(-bx\right)\right)\sin\left(a\right)-2\left(b^2x^2-a^2\right)\operatorname{Si}\left(bx+a\right)}{4\,a^2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/4*(2*a*b*x*sin(b*x + a) - (a*b^2*x^2*cos_integral(b*x) + a*b^2*x^2*cos_i
ntegral(-b*x) - 2*b^2*x^2*sin_integral(b*x))*cos(a) + (2*a*b^2*x^2*sin_inte
gral(b*x) + b^2*x^2*cos_integral(b*x) + b^2*x^2*cos_integral(-b*x))*sin(a)
- 2*(b^2*x^2 - a^2)*sin_integral(b*x + a))/(a^2*x^2)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\frac{\operatorname{Si}\left(a+bx\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)/x**3,x)
```

```
[Out] Integral(Si(a + b*x)/x**3, x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.44, size = 809, normalized size = 7.29

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/4*(a*b*x*real_part(cos_integral(b*x))*tan(1/2*b*x)^2*tan(1/2*a)^2 + a*b*
x*real_part(cos_integral(-b*x))*tan(1/2*b*x)^2*tan(1/2*a)^2 + 2*a*b*x*imag_
part(cos_integral(b*x))*tan(1/2*b*x)^2*tan(1/2*a) - 2*a*b*x*imag_part(cos_i
ntegral(-b*x))*tan(1/2*b*x)^2*tan(1/2*a) + 4*a*b*x*sin_integral(b*x)*tan(1/
2*b*x)^2*tan(1/2*a) - b*x*imag_part(cos_integral(b*x + a))*tan(1/2*b*x)^2*t
an(1/2*a)^2 - b*x*imag_part(cos_integral(b*x))*tan(1/2*b*x)^2*tan(1/2*a)^2
+ b*x*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x)^2*tan(1/2*a)^2 + b*x*i
mag_part(cos_integral(-b*x))*tan(1/2*b*x)^2*tan(1/2*a)^2 - 2*b*x*sin_integr
al(b*x + a)*tan(1/2*b*x)^2*tan(1/2*a)^2 - 2*b*x*sin_integral(b*x)*tan(1/2*b
*x)^2*tan(1/2*a)^2 - a*b*x*real_part(cos_integral(b*x))*tan(1/2*b*x)^2 - a*
b*x*real_part(cos_integral(-b*x))*tan(1/2*b*x)^2 + 2*b*x*real_part(cos_inte
gral(b*x))*tan(1/2*b*x)^2*tan(1/2*a) + 2*b*x*real_part(cos_integral(-b*x))*
tan(1/2*b*x)^2*tan(1/2*a) + a*b*x*real_part(cos_integral(b*x))*tan(1/2*a)^2
 + a*b*x*real_part(cos_integral(-b*x))*tan(1/2*a)^2 - b*x*imag_part(cos_int
egral(b*x + a))*tan(1/2*b*x)^2 + b*x*imag_part(cos_integral(b*x))*tan(1/2*b
*x)^2 + b*x*imag_part(cos_integral(-b*x - a))*tan(1/2*b*x)^2 - b*x*imag_par
t(cos_integral(-b*x))*tan(1/2*b*x)^2 - 2*b*x*sin_integral(b*x + a)*tan(1/2*
b*x)^2 + 2*b*x*sin_integral(b*x)*tan(1/2*b*x)^2 + 2*a*b*x*imag_part(cos_int
egral(b*x))*tan(1/2*a) - 2*a*b*x*imag_part(cos_integral(-b*x))*tan(1/2*a) +
 4*a*b*x*sin_integral(b*x)*tan(1/2*a) - b*x*imag_part(cos_integral(b*x + a)
)*tan(1/2*a)^2 - b*x*imag_part(cos_integral(b*x))*tan(1/2*a)^2 + b*x*imag_p
art(cos_integral(-b*x - a))*tan(1/2*a)^2 + b*x*imag_part(cos_integral(-b*x)
)*tan(1/2*a)^2 - 2*b*x*sin_integral(b*x + a)*tan(1/2*a)^2 - 2*b*x*sin_integ
ral(b*x)*tan(1/2*a)^2 - a*b*x*real_part(cos_integral(b*x)) - a*b*x*real_par
t(cos_integral(-b*x)) + 2*b*x*real_part(cos_integral(b*x))*tan(1/2*a) + 2*b
*x*real_part(cos_integral(-b*x))*tan(1/2*a) - 4*a*tan(1/2*b*x)^2*tan(1/2*a)
 - 4*a*tan(1/2*b*x)*tan(1/2*a)^2 - b*x*imag_part(cos_integral(b*x + a)) + b
*x*imag_part(cos_integral(b*x)) + b*x*imag_part(cos_integral(-b*x - a)) - b
*x*imag_part(cos_integral(-b*x)) - 2*b*x*sin_integral(b*x + a) + 2*b*x*sin_
integral(b*x) + 4*a*tan(1/2*b*x) + 4*a*tan(1/2*a))*b/(a^2*x*tan(1/2*b*x)^2*
tan(1/2*a)^2 + a^2*x*tan(1/2*b*x)^2 + a^2*x*tan(1/2*a)^2 + a^2*x) - 1/2*sin
_integral(b*x + a)/x^2
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\operatorname{sinint}(a+b\,x)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)/x^3,x)
```

```
[Out] int(sinint(a + b*x)/x^3, x)
```

3.25 $\int x^m \mathbf{Si}(a+bx)^2\,dx$

<u>**Optimal**</u>. Leaf size=15

$$\operatorname{Int}\left(x^m \operatorname{Si}(a+bx)^2, x\right)$$

```
[Out] CannotIntegrate(x^m*Si(b*x+a)^2,x)
```

<u>**Rubi**</u> [A]
time = 0.03, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int x^m \operatorname{Si}(a+bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Int[x^m*SinIntegral[a + b*x]^2,x]
[Out] Defer[Int][x^m*SinIntegral[a + b*x]^2, x]
```

<u>Rubi steps</u>

$$\int x^m \operatorname{Si}(a+bx)^2\,dx = \int x^m \operatorname{Si}(a+bx)^2\,dx$$

<u>**Mathematica**</u> [A]
time = 5.18, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Si}(a+bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[x^m*SinIntegral[a + b*x]^2,x]
[Out] Integrate[x^m*SinIntegral[a + b*x]^2, x]
```

<u>**Maple**</u> [A]
time = 0.15, size = 0, normalized size = 0.00

$$\int x^m \operatorname{sinIntegral}\left(bx+a\right)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Si(b*x+a)^2,x)
```

```
[Out] int(x^m*Si(b*x+a)^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x+a)^2,x, algorithm="maxima")
[Out] integrate(x^m*sin_integral(b*x + a)^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x+a)^2,x, algorithm="fricas")
[Out] integral(x^m*sin_integral(b*x + a)^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Si}^2(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Si(b*x+a)**2,x)
[Out] Integral(x**m*Si(a + b*x)**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*sin_integral(b*x+a)^2,x, algorithm="giac")
[Out] integrate(x^m*sin_integral(b*x + a)^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int x^m \operatorname{sinint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*sinint(a + b*x)^2,x)
[Out] int(x^m*sinint(a + b*x)^2, x)
```

3.26 $\int x^2\mathbf{Si}(a+bx)^2\,dx$

Optimal. Leaf size=329

$$\frac{2x}{3b^2}-\frac{a\cos(2a+2bx)}{3b^3}+\frac{x\cos(2a+2bx)}{6b^2}+\frac{a\text{CosIntegral}(2a+2bx)}{b^3}-\frac{a\log(a+bx)}{b^3}-\frac{2\cos(a+bx)\sin(a+bx)}{3b^3}$$

```
[Out] 2/3*x/b^2+a*Ci(2*b*x+2*a)/b^3-1/3*a*cos(2*b*x+2*a)/b^3+1/6*x*cos(2*b*x+2*a)
/b^2-a*ln(b*x+a)/b^3-4/3*cos(b*x+a)*Si(b*x+a)/b^3+2/3*a^2*cos(b*x+a)*Si(b*x
+a)/b^3-2/3*a*x*cos(b*x+a)*Si(b*x+a)/b^2+2/3*x^2*cos(b*x+a)*Si(b*x+a)/b+1/3
*a^2*(b*x+a)*Si(b*x+a)^2/b^3-1/3*a*x*(b*x+a)*Si(b*x+a)^2/b^2+1/3*x^2*(b*x+a
)*Si(b*x+a)^2/b+2/3*Si(2*b*x+2*a)/b^3-a^2*Si(2*b*x+2*a)/b^3-2/3*cos(b*x+a)*
sin(b*x+a)/b^3+2/3*a*Si(b*x+a)*sin(b*x+a)/b^3-4/3*x*Si(b*x+a)*sin(b*x+a)/b^
2-1/12*sin(2*b*x+2*a)/b^3
```

Rubi [A]
time = 1.05, antiderivative size = 329, normalized size of antiderivative = 1.00, number of steps used = 39, number of rules used = 19, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 1.583$, Rules used = {6644, 6648, 4669, 6873, 6874, 2718, 3377, 2717, 3380, 6654, 2715, 8, 3393, 3383, 6646, 4491, 12, 6652, 6640}

$$\frac{a^2(a+bx)\text{Si}(a+bx)^2}{3b^3}-\frac{a^2\text{Si}(2a+2bx)}{b^3}+\frac{2a^2\text{Si}(a+bx)\cos(a+bx)}{3b^3}+\frac{a\text{CosIntegral}(2a+2bx)}{b^3}+\frac{2\text{Si}(2a+2bx)}{3b^3}+\frac{2a\text{Si}(a+bx)\sin(a+bx)}{3b^3}-\frac{4\text{Si}(a+bx)\cos(a+bx)}{3b^3}-\frac{a\log(a+bx)}{b^3}-\frac{\sin(2a+2bx)}{12b^3}-\frac{a\cos(2a+2bx)}{3b^3}-\frac{2\sin(a+bx)\cos(a+bx)}{3b^3}-\frac{ax(a+bx)\text{Si}(a+bx)^2}{3b^2}-\frac{4x\text{Si}(a+bx)\sin(a+bx)}{3b^2}-\frac{2ax\text{Si}(a+bx)\cos(a+bx)}{3b^2}+\frac{x\cos(2a+2bx)}{6b^2}+\frac{x^2(a+bx)\text{Si}(a+bx)^2}{3b}+\frac{2x^2\text{Si}(a+bx)\cos(a+bx)}{3b}+\frac{2x}{3b^2}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*SinIntegral[a + b*x]^2,x]
```

```
[Out] (2*x)/(3*b^2) - (a*Cos[2*a + 2*b*x])/(3*b^3) + (x*Cos[2*a + 2*b*x])/(6*b^2)
 + (a*CosIntegral[2*a + 2*b*x])/b^3 - (a*Log[a + b*x])/b^3 - (2*Cos[a + b*x
]*Sin[a + b*x])/(3*b^3) - Sin[2*a + 2*b*x]/(12*b^3) - (4*Cos[a + b*x]*SinIn
tegral[a + b*x])/(3*b^3) + (2*a^2*Cos[a + b*x]*SinIntegral[a + b*x])/(3*b^3
) - (2*a*x*Cos[a + b*x]*SinIntegral[a + b*x])/(3*b^2) + (2*x^2*Cos[a + b*x]
*SinIntegral[a + b*x])/(3*b) + (2*a*Sin[a + b*x]*SinIntegral[a + b*x])/(3*b
^3) - (4*x*Sin[a + b*x]*SinIntegral[a + b*x])/(3*b^2) + (a^2*(a + b*x)*SinI
ntegral[a + b*x]^2)/(3*b^3) - (a*x*(a + b*x)*SinIntegral[a + b*x]^2)/(3*b^2
) + (x^2*(a + b*x)*SinIntegral[a + b*x]^2)/(3*b) + (2*SinIntegral[2*a + 2*b
*x])/(3*b^3) - (a^2*SinIntegral[2*a + 2*b*x])/b^3
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6640

```
Int[SinIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(SinInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Sin[a + b*x]*SinIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6644

```
Int[((c_.) + (d_.)*(x_))^(m_.)*SinIntegral[(a_) + (b_.)*(x_)]^2, x_Symbol]
:> Simp[(a + b*x)*(c + d*x)^m*(SinIntegral[a + b*x]^2/(b*(m + 1))), x] + (-
Dist[2/(m + 1), Int[(c + d*x)^m*Sin[a + b*x]*SinIntegral[a + b*x], x], x] +
 Dist[(b*c - a*d)*(m/(b*(m + 1))), Int[(c + d*x)^(m - 1)*SinIntegral[a + b*
x]^2, x], x]) /; FreeQ[{a, b, c, d}, x] && IGtQ[m, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$
\begin{aligned}
\int x^2\text{Si}(a+bx)^2\,dx &= \frac{x^2(a+bx)\text{Si}(a+bx)^2}{3b} - \frac{2}{3}\int x^2\sin(a+bx)\text{Si}(a+bx)\,dx - \frac{(2a)\int x\text{Si}(a+bx)^2\,dx}{3b} \\
&= \frac{2x^2\cos(a+bx)\text{Si}(a+bx)}{3b} - \frac{ax(a+bx)\text{Si}(a+bx)^2}{3b^2} + \frac{x^2(a+bx)\text{Si}(a+bx)^2}{3b} - \frac{2}{3}\int x \\
&= -\frac{2ax\cos(a+bx)\text{Si}(a+bx)}{3b^2} + \frac{2x^2\cos(a+bx)\text{Si}(a+bx)}{3b} - \frac{4x\sin(a+bx)\text{Si}(a+bx)}{3b^2} - \\
&= -\frac{4\cos(a+bx)\text{Si}(a+bx)}{3b^3} + \frac{2a^2\cos(a+bx)\text{Si}(a+bx)}{3b^3} - \frac{2ax\cos(a+bx)\text{Si}(a+bx)}{3b^2} + \\
&= -\frac{4\cos(a+bx)\text{Si}(a+bx)}{3b^3} + \frac{2a^2\cos(a+bx)\text{Si}(a+bx)}{3b^3} - \frac{2ax\cos(a+bx)\text{Si}(a+bx)}{3b^2} + \\
&= -\frac{a\log(a+bx)}{3b^3} - \frac{2\cos(a+bx)\sin(a+bx)}{3b^3} - \frac{4\cos(a+bx)\text{Si}(a+bx)}{3b^3} + \frac{2a^2\cos(a+b}{3b} \\
&= \frac{2x}{3b^2} - \frac{a\cos(2a+2bx)}{6b^3} + \frac{x\cos(2a+2bx)}{6b^2} + \frac{a\text{Ci}(2a+2bx)}{3b^3} - \frac{a\log(a+bx)}{b^3} - \frac{2\cos(a}{} \\
&= \frac{2x}{3b^2} - \frac{a\cos(2a+2bx)}{3b^3} + \frac{x\cos(2a+2bx)}{6b^2} + \frac{a\text{Ci}(2a+2bx)}{b^3} - \frac{a\log(a+bx)}{b^3} - \frac{2\cos(a}{}
\end{aligned}
$$

Mathematica [A]
time = 1.18, size = 158, normalized size = 0.48

$$
\frac{8a+8bx-4a\cos(2(a+bx))+2bx\cos(2(a+bx))+12a\text{CosIntegral}(2(a+bx))-12a\log(a+bx)-5\sin(2(a+bx))+8((-2+a^2-abx+b^2x^2)\cos(a+bx)+(a-2bx)\sin(a+bx))\text{Si}(a+bx)+4(a^3+b^3x^3)\text{Si}(a+bx)^2+8\text{Si}(2(a+bx))-12a^2\text{Si}(2(a+bx))}{12b^3}
$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*SinIntegral[a + b*x]^2,x]
```

```
[Out] (8*a + 8*b*x - 4*a*Cos[2*(a + b*x)] + 2*b*x*Cos[2*(a + b*x)] + 12*a*CosInte
gral[2*(a + b*x)] - 12*a*Log[a + b*x] - 5*Sin[2*(a + b*x)] + 8*((-2 + a^2 -
```

```
 a*b*x + b^2*x^2)*Cos[a + b*x] + (a - 2*b*x)*Sin[a + b*x])*SinIntegral[a +
b*x] + 4*(a^3 + b^3*x^3)*SinIntegral[a + b*x]^2 + 8*SinIntegral[2*(a + b*x)
] - 12*a^2*SinIntegral[2*(a + b*x)])/(12*b^3)
```

Maple [**F**]
time = 0.15, size = 0, normalized size = 0.00

$$\int x^2 \operatorname{sinIntegral}(bx+a)^2\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x+a)^2,x)
```

```
[Out] int(x^2*Si(b*x+a)^2,x)
```

Maxima [**F**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)^2,x, algorithm="maxima")
```

```
[Out] integrate(x^2*sin_integral(b*x + a)^2, x)
```

Fricas [**A**]
time = 0.36, size = 163, normalized size = 0.50

$$\frac{2\,(bx-2\,a)\cos(bx+a)^2+4\,(b^2x^2-abx+a^2-2)\cos(bx+a)\,\mathrm{Si}(bx+a)+2\,(b^3x^3+a^3)\,\mathrm{Si}(bx+a)^2+3\,bx+3\,a\,\mathrm{Ci}(2\,bx+2\,a)+3\,a\,\mathrm{Ci}(-2\,bx-2\,a)-6\,a\log(bx+a)-(4\,(2\,bx-a)\,\mathrm{Si}(bx+a)+5\,\cos(bx+a))\sin(bx+a)-2\,(3\,a^2-2)\,\mathrm{Si}(2\,bx+2\,a)}{6\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)^2,x, algorithm="fricas")
```

```
[Out] 1/6*(2*(b*x - 2*a)*cos(b*x + a)^2 + 4*(b^2*x^2 - a*b*x + a^2 - 2)*cos(b*x +
 a)*sin_integral(b*x + a) + 2*(b^3*x^3 + a^3)*sin_integral(b*x + a)^2 + 3*b
*x + 3*a*cos_integral(2*b*x + 2*a) + 3*a*cos_integral(-2*b*x - 2*a) - 6*a*l
og(b*x + a) - (4*(2*b*x - a)*sin_integral(b*x + a) + 5*cos(b*x + a))*sin(b*
x + a) - 2*(3*a^2 - 2)*sin_integral(2*b*x + 2*a))/b^3
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2 \operatorname{Si}^2(a+bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x+a)**2,x)
```

```
[Out] Integral(x**2*Si(a + b*x)**2, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)^2,x, algorithm="giac")
[Out] integrate(x^2*sin_integral(b*x + a)^2, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.00

$$\int x^2\,\mathrm{sinint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(a + b*x)^2,x)
[Out] int(x^2*sinint(a + b*x)^2, x)
```

3.27 $\int x\mathbf{Si}(a+bx)^2\,dx$

Optimal. Leaf size=154

$$\frac{\cos(2a+2bx)}{4b^2}-\frac{\text{CosIntegral}(2a+2bx)}{2b^2}+\frac{\log(a+bx)}{2b^2}-\frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2}+\frac{x\cos(a+bx)\text{Si}(a+bx)}{b}-\text{s}$$

```
[Out] -1/2*Ci(2*b*x+2*a)/b^2+1/4*cos(2*b*x+2*a)/b^2+1/2*ln(b*x+a)/b^2-a*cos(b*x+a
)*Si(b*x+a)/b^2+x*cos(b*x+a)*Si(b*x+a)/b-1/2*a*(b*x+a)*Si(b*x+a)^2/b^2+1/2*
x*(b*x+a)*Si(b*x+a)^2/b+a*Si(2*b*x+2*a)/b^2-Si(b*x+a)*sin(b*x+a)/b^2
```

Rubi [A]
time = 0.22, antiderivative size = 154, normalized size of antiderivative = 1.00, number of steps used = 17, number of rules used = 14, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.400$, Rules used = {6644, 6648, 4669, 6873, 6874, 2718, 3380, 6652, 3393, 3383, 6640, 6646, 4491, 12}

$$-\frac{\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{a(a+bx)\text{Si}(a+bx)^2}{2b^2}+\frac{a\text{Si}(2a+2bx)}{b^2}-\frac{\text{Si}(a+bx)\sin(a+bx)}{b^2}-\frac{a\text{Si}(a+bx)\cos(a+bx)}{b^2}+\frac{\log(a+bx)}{2b^2}+\frac{\cos(2a+2bx)}{4b^2}+\frac{x(a+bx)\text{Si}(a+bx)^2}{2b}+\frac{x\text{Si}(a+bx)\cos(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*SinIntegral[a + b*x]^2,x]
```

```
[Out] Cos[2*a + 2*b*x]/(4*b^2) - CosIntegral[2*a + 2*b*x]/(2*b^2) + Log[a + b*x]/
(2*b^2) - (a*Cos[a + b*x]*SinIntegral[a + b*x])/b^2 + (x*Cos[a + b*x]*SinIn
tegral[a + b*x])/b - (Sin[a + b*x]*SinIntegral[a + b*x])/b^2 - (a*(a + b*x)
*SinIntegral[a + b*x]^2)/(2*b^2) + (x*(a + b*x)*SinIntegral[a + b*x]^2)/(2*
b) + (a*SinIntegral[2*a + 2*b*x])/b^2
```

Rule 12

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

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6640

```
Int[SinIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(SinInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Sin[a + b*x]*SinIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6644

```
Int[((c_.) + (d_.)*(x_))^(m_.)*SinIntegral[(a_) + (b_.)*(x_)]^2, x_Symbol]
:> Simp[(a + b*x)*(c + d*x)^m*(SinIntegral[a + b*x]^2/(b*(m + 1))), x] + (-
Dist[2/(m + 1), Int[(c + d*x)^m*Sin[a + b*x]*SinIntegral[a + b*x], x], x] +
 Dist[(b*c - a*d)*(m/(b*(m + 1))), Int[(c + d*x)^(m - 1)*SinIntegral[a + b*
x]^2, x], x]) /; FreeQ[{a, b, c, d}, x] && IGtQ[m, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
```

```
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\text{Si}(a+bx)^2\,dx = \frac{x(a+bx)\text{Si}(a+bx)^2}{2b} - \frac{a\int \text{Si}(a+bx)^2\,dx}{2b} - \int x\sin(a+bx)\text{Si}(a+bx)\,dx$$
$$= \frac{x\cos(a+bx)\text{Si}(a+bx)}{b} - \frac{a(a+bx)\text{Si}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Si}(a+bx)^2}{2b} - \frac{\int \cos(a+$$
$$= -\frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\cos(a+bx)\text{Si}(a+bx)}{b} - \frac{\sin(a+bx)\text{Si}(a+bx)}{b^2} - \frac{a(a+$$
$$= -\frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\cos(a+bx)\text{Si}(a+bx)}{b} - \frac{\sin(a+bx)\text{Si}(a+bx)}{b^2} - \frac{a(a+$$
$$= \frac{\log(a+bx)}{2b^2} - \frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\cos(a+bx)\text{Si}(a+bx)}{b} - \frac{\sin(a+bx)\text{Si}(a+$$
$$= -\frac{\text{Ci}(2a+2bx)}{2b^2} + \frac{\log(a+bx)}{2b^2} - \frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\cos(a+bx)\text{Si}(a+bx)}{b} -$$
$$= \frac{\cos(2a+2bx)}{4b^2} - \frac{\text{Ci}(2a+2bx)}{2b^2} + \frac{\log(a+bx)}{2b^2} - \frac{a\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\cos(a+$$

Mathematica [A]
time = 0.21, size = 95, normalized size = 0.62

$$\frac{\cos(2(a+bx)) - 2\text{CosIntegral}(2(a+bx)) + 2\log(a+bx) - 4((a-bx)\cos(a+bx)+\sin(a+bx))\text{Si}(a+bx) - 2(a^2-b^2x^2)\,\text{Si}(a+bx)^2 + 4a\text{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*SinIntegral[a + b*x]^2,x]
```

```
[Out] (Cos[2*(a + b*x)] - 2*CosIntegral[2*(a + b*x)] + 2*Log[a + b*x] - 4*((a - b
*x)*Cos[a + b*x] + Sin[a + b*x])*SinIntegral[a + b*x] - 2*(a^2 - b^2*x^2)*S
inIntegral[a + b*x]^2 + 4*a*SinIntegral[2*(a + b*x)])/(4*b^2)
```

Maple [A]
time = 0.57, size = 111, normalized size = 0.72

method	result
derivativedivides	$\frac{\operatorname{sinIntegral}(bx+a)^2\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-2\operatorname{sinIntegral}(bx+a)\left(a\cos(bx+a)+\frac{\sin(bx+a)}{2}-\frac{(bx+a)\cos(bx+a)}{2}\right)+a\operatorname{sinInteg}}{b^2}$
default	$\frac{\operatorname{sinIntegral}(bx+a)^2\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-2\operatorname{sinIntegral}(bx+a)\left(a\cos(bx+a)+\frac{\sin(bx+a)}{2}-\frac{(bx+a)\cos(bx+a)}{2}\right)+a\operatorname{sinInteg}}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(b*x+a)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Si(b*x+a)^2*(-a*(b*x+a)+1/2*(b*x+a)^2)-2*Si(b*x+a)*(a*cos(b*x+a)+1/2
*sin(b*x+a)-1/2*(b*x+a)*cos(b*x+a))+a*Si(2*b*x+2*a)+1/2*ln(b*x+a)-1/2*Ci(2*
b*x+2*a)+1/2*cos(b*x+a)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)^2,x, algorithm="maxima")
```

```
[Out] integrate(x*sin_integral(b*x + a)^2, x)
```

Fricas [A]
time = 0.39, size = 116, normalized size = 0.75

$$\frac{4\,(bx-a)\cos(bx+a)\,\mathrm{Si}\,(bx+a)+2\,(b^2x^2-a^2)\,\mathrm{Si}\,(bx+a)^2+2\,\cos(bx+a)^2+4\,a\,\mathrm{Si}\,(2\,bx+2\,a)-4\,\sin(bx+a)\,\mathrm{Si}\,(bx+a)-\mathrm{Ci}\,(2\,bx+2\,a)-\mathrm{Ci}\,(-2\,bx-2\,a)+2\,\log(bx+a)}{4\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)^2,x, algorithm="fricas")
```

```
[Out] 1/4*(4*(b*x - a)*cos(b*x + a)*sin_integral(b*x + a) + 2*(b^2*x^2 - a^2)*sin
_integral(b*x + a)^2 + 2*cos(b*x + a)^2 + 4*a*sin_integral(2*b*x + 2*a) - 4
*sin(b*x + a)*sin_integral(b*x + a) - cos_integral(2*b*x + 2*a) - cos_integ
ral(-2*b*x - 2*a) + 2*log(b*x + a))/b^2
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Si}^2\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(b*x+a)**2,x)
```

```
[Out] Integral(x*Si(a + b*x)**2, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)^2,x, algorithm="giac")
```

```
[Out] integrate(x*sin_integral(b*x + a)^2, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{sinint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(a + b*x)^2,x)
```

```
[Out] int(x*sinint(a + b*x)^2, x)
```

3.28 $\int \mathbf{Si}(a+bx)^2\,dx$

Optimal. Leaf size=49

$$\frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{(a+bx)\mathrm{Si}(a+bx)^2}{b}-\frac{\mathrm{Si}(2a+2bx)}{b}$$

```
[Out] 2*cos(b*x+a)*Si(b*x+a)/b+(b*x+a)*Si(b*x+a)^2/b-Si(2*b*x+2*a)/b
```

Rubi [A]
time = 0.04, antiderivative size = 49, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.625$, Rules used = {6640, 6646, 4491, 12, 3380}

$$\frac{(a+bx)\mathrm{Si}(a+bx)^2}{b}-\frac{\mathrm{Si}(2a+2bx)}{b}+\frac{2\mathrm{Si}(a+bx)\cos(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[a + b*x]^2,x]
```

```
[Out] (2*Cos[a + b*x]*SinIntegral[a + b*x])/b + ((a + b*x)*SinIntegral[a + b*x]^2
)/b - SinIntegral[2*a + 2*b*x]/b
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6640

```
Int[SinIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(SinInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Sin[a + b*x]*SinIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int \mathrm{Si}(a+bx)^2\,dx &= \frac{(a+bx)\mathrm{Si}(a+bx)^2}{b} - 2\int \sin(a+bx)\mathrm{Si}(a+bx)\,dx \\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{(a+bx)\mathrm{Si}(a+bx)^2}{b} - 2\int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx \\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{(a+bx)\mathrm{Si}(a+bx)^2}{b} - 2\int \frac{\sin(2a+2bx)}{2(a+bx)}\,dx \\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{(a+bx)\mathrm{Si}(a+bx)^2}{b} - \int \frac{\sin(2a+2bx)}{a+bx}\,dx \\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{(a+bx)\mathrm{Si}(a+bx)^2}{b} - \frac{\mathrm{Si}(2a+2bx)}{b}
\end{aligned}$$

Mathematica [A]
time = 0.01, size = 43, normalized size = 0.88

$$\frac{2\cos(a+bx)\mathrm{Si}(a+bx)+(a+bx)\mathrm{Si}(a+bx)^2-\mathrm{Si}(2(a+bx))}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[a + b*x]^2,x]
[Out] (2*Cos[a + b*x]*SinIntegral[a + b*x] + (a + b*x)*SinIntegral[a + b*x]^2 - S
inIntegral[2*(a + b*x)])/b
```

Maple [A]
time = 0.35, size = 45, normalized size = 0.92

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx+a)^2(bx+a)+2\cos(bx+a)\,\mathrm{sinIntegral}(bx+a)-\mathrm{sinIntegral}(2bx+2a)}{b}$	45
default	$\frac{\mathrm{sinIntegral}(bx+a)^2(bx+a)+2\cos(bx+a)\,\mathrm{sinIntegral}(bx+a)-\mathrm{sinIntegral}(2bx+2a)}{b}$	45

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)^2,x,method=_RETURNVERBOSE)
[Out] 1/b*(Si(b*x+a)^2*(b*x+a)+2*cos(b*x+a)*Si(b*x+a)-Si(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2,x, algorithm="maxima")
[Out] integrate(sin_integral(b*x + a)^2, x)
```

Fricas [A]
time = 0.38, size = 44, normalized size = 0.90

$$\frac{(bx+a)\operatorname{Si}(bx+a)^2 + 2\cos(bx+a)\operatorname{Si}(bx+a) - \operatorname{Si}(2bx+2a)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2,x, algorithm="fricas")
[Out] ((b*x + a)*sin_integral(b*x + a)^2 + 2*cos(b*x + a)*sin_integral(b*x + a) -
 sin_integral(2*b*x + 2*a))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \operatorname{Si}^2(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)**2,x)
[Out] Integral(Si(a + b*x)**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2,x, algorithm="giac")
[Out] integrate(sin_integral(b*x + a)^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \operatorname{sinint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)^2,x)
[Out] int(sinint(a + b*x)^2, x)
```

3.29 $\int \frac{\mathbf{Si}(a+bx)^2}{x}\,dx$

Optimal. Leaf size=15

$$\mathrm{Int}\left(\frac{\mathrm{Si}(a+bx)^2}{x},x\right)$$

```
[Out] CannotIntegrate(Si(b*x+a)^2/x,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {}

$$\int \frac{\mathrm{Si}(a+bx)^2}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[a + b*x]^2/x,x]
```

```
[Out] Defer[Int][SinIntegral[a + b*x]^2/x, x]
```

Rubi steps

$$\int \frac{\mathrm{Si}(a+bx)^2}{x}\,dx=\int \frac{\mathrm{Si}(a+bx)^2}{x}\,dx$$

Mathematica [A]
time = 2.37, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Si}(a+bx)^2}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[a + b*x]^2/x,x]
```

```
[Out] Integrate[SinIntegral[a + b*x]^2/x, x]
```

Maple [A]
time = 0.09, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{sinIntegral}\left(bx+a\right)^{2}}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)^2/x,x)
```

```
[Out] int(Si(b*x+a)^2/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)^2/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(sin_integral(b*x + a)^2/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}^{2}\left(a + bx\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)**2/x,x)
```

```
[Out] Integral(Si(a + b*x)**2/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)^2/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{{\mathrm{sinint}\left(a+b\,x\right)}^2}{x} \,d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)^2/x,x)
```

```
[Out] int(sinint(a + b*x)^2/x, x)
```

3.30 $\int \frac{\text{Si}(a+bx)^2}{x^2}\,dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{Si}(a+bx)^2}{x^2},x\right)$$

```
[Out] CannotIntegrate(Si(b*x+a)^2/x^2,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{Si}(a+bx)^2}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[a + b*x]^2/x^2,x]
[Out] Defer[Int][SinIntegral[a + b*x]^2/x^2, x]
```

Rubi steps

$$\int \frac{\text{Si}(a+bx)^2}{x^2}\,dx = \int \frac{\text{Si}(a+bx)^2}{x^2}\,dx$$

Mathematica [A]
time = 4.51, size = 0, normalized size = 0.00

$$\int \frac{\text{Si}(a+bx)^2}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[a + b*x]^2/x^2,x]
[Out] Integrate[SinIntegral[a + b*x]^2/x^2, x]
```

Maple [A]
time = 0.16, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\left(bx+a\right)^2}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)^2/x^2,x)
```

```
[Out] int(Si(b*x+a)^2/x^2,x)
```

Maxima [**A**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)^2/x^2, x)
```

Fricas [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(sin_integral(b*x + a)^2/x^2, x)
```

Sympy [**A**]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Si}^{2}\left(a + bx\right)}{x^{2}}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)**2/x**2,x)
```

```
[Out] Integral(Si(a + b*x)**2/x**2, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral(b*x + a)^2/x^2, x)
```

Mupad [**A**]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{{\mathrm{sinint}\left(a+b\,x\right)}^2}{x^2} \,d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)^2/x^2,x)
[Out] int(sinint(a + b*x)^2/x^2, x)
```

3.31 $\int \frac{\text{Si}(a+bx)^2}{x^3}\,dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{Si}(a+bx)^2}{x^3},x\right)$$

```
[Out] CannotIntegrate(Si(b*x+a)^2/x^3,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{Si}(a+bx)^2}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Int[SinIntegral[a + b*x]^2/x^3,x]
```

```
[Out] Defer[Int][SinIntegral[a + b*x]^2/x^3, x]
```

Rubi steps

$$\int \frac{\text{Si}(a+bx)^2}{x^3}\,dx=\int \frac{\text{Si}(a+bx)^2}{x^3}\,dx$$

Mathematica [A]
time = 1.89, size = 0, normalized size = 0.00

$$\int \frac{\text{Si}(a+bx)^2}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[SinIntegral[a + b*x]^2/x^3,x]
```

```
[Out] Integrate[SinIntegral[a + b*x]^2/x^3, x]
```

Maple [A]
time = 0.17, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\left(bx+a\right)^{2}}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)^2/x^3,x)
```

```
[Out] int(Si(b*x+a)^2/x^3,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2/x^3,x, algorithm="maxima")
```

```
[Out] integrate(sin_integral(b*x + a)^2/x^3, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2/x^3,x, algorithm="fricas")
```

```
[Out] integral(sin_integral(b*x + a)^2/x^3, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Si}^2(a+bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)**2/x**3,x)
```

```
[Out] Integral(Si(a + b*x)**2/x**3, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)^2/x^3,x, algorithm="giac")
```

```
[Out] integrate(sin_integral(b*x + a)^2/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{{\mathrm{sinint}\left(a+b\,x\right)}^2}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)^2/x^3,x)
```

```
[Out] int(sinint(a + b*x)^2/x^3, x)
```

3.32 $\int x^2\mathbf{Si}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=137

$$-\frac{1}{6}ie^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}\operatorname{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{6}ie^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}\operatorname{Ei}\left(\frac{(3+ibdn)(a+b\log(cx^n))}{bn}\right)$$

```
[Out] -1/6*I*x^3*Ei((3-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(3*a/b/n)/((c*x^n)^(3/n))
+1/6*I*x^3*Ei((3+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(3*a/b/n)/((c*x^n)^(3/n))
+1/3*x^3*Si(d*(a+b*ln(c*x^n)))
```

Rubi [A]
time = 0.18, antiderivative size = 137, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6661, 12, 4585, 2347, 2209}

$$-\frac{1}{6}ix^3e^{-\frac{3a}{bn}}(cx^n)^{-3/n}\operatorname{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{6}ix^3e^{-\frac{3a}{bn}}(cx^n)^{-3/n}\operatorname{Ei}\left(\frac{(ibdn+3)(a+b\log(cx^n))}{bn}\right)+\frac{1}{3}x^3\operatorname{Si}(d(a+b\log(cx^n)))$$

Antiderivative was successfully verified.

```
[In] Int[x^2*SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] ((-1/6*I)*x^3*ExpIntegralEi[((3 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(E^(
(3*a)/(b*n))*(c*x^n)^(3/n)) + ((I/6)*x^3*ExpIntegralEi[((3 + I*b*d*n)*(a +
b*Log[c*x^n]))/(b*n)])/(E^((3*a)/(b*n))*(c*x^n)^(3/n)) + (x^3*SinIntegral[d
*(a + b*Log[c*x^n])])/3
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4585

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.)*
Sin[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(i*x
```

```
)^r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*
n)*(h*(e + f*Log[g*x^m]))^q, x], x] - Dist[I*E^(I*a*d)*(i*x)^r*((c*x^n)^(I*
b*d)/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x]
, x] /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6661

```
Int[((e_.)*(x_))^(m_.)*SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d
_.)], x_Symbol] :> Simp[(e*x)^(m + 1)*(SinIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Sin[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$
\begin{aligned}
\int x^2\text{Si}(d(a+b\log(cx^n)))\,dx &= \frac{1}{3}x^3\text{Si}(d(a+b\log(cx^n)))-\frac{1}{3}(bdn)\int\frac{x^2\sin(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx\\
&= \frac{1}{3}x^3\text{Si}(d(a+b\log(cx^n)))-\frac{1}{3}(bn)\int\frac{x^2\sin(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx\\
&= \frac{1}{3}x^3\text{Si}(d(a+b\log(cx^n)))-\frac{1}{6}\left(ibe^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int\frac{x^{2-ibdn}}{a+b\log(cx^n)}\,d
\\
&= \frac{1}{3}x^3\text{Si}(d(a+b\log(cx^n)))-\frac{1}{6}\left(ibe^{-iad}x^3(cx^n)^{-ibd-\frac{3-ibdn}{n}}\right)\text{Subst}\left(\int\frac{e^{\frac{(3-ibd}{n}}}{a+b}\right.
\\
&= -\frac{1}{6}ie^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}\,\text{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{6}ie^{-\frac{3a}{bn}}x^3(cx^n)^{-3/}
\end{aligned}
$$

Mathematica [A]
time = 1.00, size = 106, normalized size = 0.77

$$\frac{1}{6}x^3\left(-ie^{-\frac{3a}{bn}}(cx^n)^{-3/n}\left(\text{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)-\text{Ei}\left(\frac{(3+ibdn)(a+b\log(cx^n))}{bn}\right)\right)+2\text{Si}(d(a+b\log(cx^n)))\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^3*(((-I)*(ExpIntegralEi[((3 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)] - ExpI
ntegralEi[((3 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(E^((3*a)/(b*n))*(c*x
^n)^(3/n)) + 2*SinIntegral[d*(a + b*Log[c*x^n])]))/6
```

Maple [F]
time = 0.17, size = 0, normalized size = 0.00

$$\int x^2\,\text{sinIntegral}\left(d(a+b\ln(c\,x^n))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(x^2*Si(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^2*sin_integral((b*log(c*x^n) + a)*d), x)
```

Fricas [A]
time = 0.38, size = 140, normalized size = 1.02

$$\frac{1}{3}\,x^{3}\,\mathrm{Si}\left(bd\log\left(cx^{n}\right)+ad\right)+\frac{1}{6}\left(i\,\mathrm{Ei}\left(\frac{i\,abdn+\left(i\,b^{2}dn+3\,b\right)\log\left(c\right)+\left(i\,b^{2}dn^{2}+3\,bn\right)\log\left(x\right)+3\,a}{bn}\right)-i\,\mathrm{Ei}\left(\frac{-i\,abdn+\left(-i\,b^{2}dn+3\,b\right)\log\left(c\right)+\left(-i\,b^{2}dn^{2}+3\,bn\right)\log\left(x\right)+3\,a}{bn}\right)\right)e^{\left(-\frac{3\,(b\log(c)+a)}{bn}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/3*x^3*sin_integral(b*d*log(c*x^n) + a*d) + 1/6*(I*Ei((I*a*b*d*n + (I*b^2*
d*n + 3*b)*log(c) + (I*b^2*d*n^2 + 3*b*n)*log(x) + 3*a)/(b*n)) - I*Ei((-I*a
*b*d*n + (-I*b^2*d*n + 3*b)*log(c) + (-I*b^2*d*n^2 + 3*b*n)*log(x) + 3*a)/(
b*n)))*e^(-3*(b*log(c) + a)/(b*n))
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{2}\,\mathrm{Si}\left(ad+bd\log\left(cx^{n}\right)\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(x**2*Si(a*d + b*d*log(c*x**n)), x)
```

Giac [F(-1)] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{sinint}(d\,(a+b\,\ln\left(c\,x^n\right)))\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(d*(a + b*log(c*x^n))),x)
```

```
[Out] int(x^2*sinint(d*(a + b*log(c*x^n))), x)
```

3.33 $\int x\mathbf{Si}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=137

$$-\frac{1}{4}ie^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\operatorname{Ei}\left(\frac{(2-ibdn)\,(a+b\log(cx^n))}{bn}\right)+\frac{1}{4}ie^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\operatorname{Ei}\left(\frac{(2+ibdn)\,(a+b\log(cx^n))}{bn}\right)$$

```
[Out] -1/4*I*x^2*Ei((2-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(2*a/b/n)/((c*x^n)^(2/n))
+1/4*I*x^2*Ei((2+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(2*a/b/n)/((c*x^n)^(2/n))
+1/2*x^2*Si(d*(a+b*ln(c*x^n)))
```

Rubi [A]
time = 0.18, antiderivative size = 137, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {6661, 12, 4585, 2347, 2209}

$$-\frac{1}{4}ix^2e^{-\frac{2a}{bn}}(cx^n)^{-2/n}\operatorname{Ei}\left(\frac{(2-ibdn)\,(a+b\log(cx^n))}{bn}\right)+\frac{1}{4}ix^2e^{-\frac{2a}{bn}}(cx^n)^{-2/n}\operatorname{Ei}\left(\frac{(ibdn+2)\,(a+b\log(cx^n))}{bn}\right)+\frac{1}{2}x^2\operatorname{Si}(d(a+b\log(cx^n)))$$

Antiderivative was successfully verified.

```
[In] Int[x*SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] ((-1/4*I)*x^2*ExpIntegralEi[((2 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(E^(
(2*a)/(b*n))*(c*x^n)^(2/n)) + ((I/4)*x^2*ExpIntegralEi[((2 + I*b*d*n)*(a +
b*Log[c*x^n]))/(b*n)])/(E^((2*a)/(b*n))*(c*x^n)^(2/n)) + (x^2*SinIntegral[d
*(a + b*Log[c*x^n])])/2
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4585

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.)*
Sin[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(i*x
```

```
)^r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*
n)*(h*(e + f*Log[g*x^m]))^q, x], x] - Dist[I*E^(I*a*d)*(i*x)^r*((c*x^n)^(I*
b*d)/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x]
, x] /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6661

```
Int[((e_.)*(x_))^(m_.)*SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d
_.)], x_Symbol] :> Simp[(e*x)^(m + 1)*(SinIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Sin[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int x\mathrm{Si}(d(a+b\log(cx^n)))\,dx &= \frac{1}{2}x^2\mathrm{Si}(d(a+b\log(cx^n)))-\frac{1}{2}(bdn)\int\frac{x\sin(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx\\ &= \frac{1}{2}x^2\mathrm{Si}(d(a+b\log(cx^n)))-\frac{1}{2}(bn)\int\frac{x\sin(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx\\ &= \frac{1}{2}x^2\mathrm{Si}(d(a+b\log(cx^n)))-\frac{1}{4}\left(ibe^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int\frac{x^{1-ibdn}}{a+b\log(cx^n)}\,dx\\ &= \frac{1}{2}x^2\mathrm{Si}(d(a+b\log(cx^n)))-\frac{1}{4}\left(ibe^{-iad}x^2(cx^n)^{-ibd-\frac{2-ibdn}{n}}\right)\mathrm{Subst}\left(\int\frac{e^{\frac{(2-ibdn)}{n}}}{a+bx}\right.\\ &= -\frac{1}{4}ie^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\,\mathrm{Ei}\left(\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{4}ie^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\end{aligned}$$

Mathematica [A]
time = 0.97, size = 106, normalized size = 0.77

$$\frac{1}{4}x^2\left(-ie^{-\frac{2a}{bn}}(cx^n)^{-2/n}\left(\mathrm{Ei}\left(\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)-\mathrm{Ei}\left(\frac{(2+ibdn)(a+b\log(cx^n))}{bn}\right)\right)+2\mathrm{Si}(d(a+b\log(cx^n)))\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[x*SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^2*(((-I)*(ExpIntegralEi[((2 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)] - ExpI
ntegralEi[((2 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(E^((2*a)/(b*n))*(c*x
^n)^(2/n)) + 2*SinIntegral[d*(a + b*Log[c*x^n])]))/4
```

Maple [F]
time = 0.17, size = 0, normalized size = 0.00

$$\int x\,\mathrm{sinIntegral}\left(d(a+b\ln(c\,x^n))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(x*Si(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x*sin_integral((b*log(c*x^n) + a)*d), x)
```

Fricas [A]
time = 0.37, size = 140, normalized size = 1.02

$$\frac{1}{2}\,x^2\operatorname{Si}\left(bd\log\left(cx^n\right)+ad\right)+\frac{1}{4}\left(i\operatorname{Ei}\left(\frac{i\,abdn+\left(i\,b^2dn+2\,b\right)\log\left(c\right)+\left(i\,b^2dn^2+2\,bn\right)\log\left(x\right)+2\,a}{bn}\right)-i\operatorname{Ei}\left(\frac{-i\,abdn+\left(-i\,b^2dn+2\,b\right)\log\left(c\right)+\left(-i\,b^2dn^2+2\,bn\right)\log\left(x\right)+2\,a}{bn}\right)\right)e^{\left(-\frac{2\,(b\log(c)+a)}{bn}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*x^2*sin_integral(b*d*log(c*x^n) + a*d) + 1/4*(I*Ei((I*a*b*d*n + (I*b^2*
d*n + 2*b)*log(c) + (I*b^2*d*n^2 + 2*b*n)*log(x) + 2*a)/(b*n)) - I*Ei((-I*a
*b*d*n + (-I*b^2*d*n + 2*b)*log(c) + (-I*b^2*d*n^2 + 2*b*n)*log(x) + 2*a)/(
b*n)))*e^(-2*(b*log(c) + a)/(b*n))
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\operatorname{Si}\left(ad+bd\log\left(cx^{n}\right)\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(x*Si(a*d + b*d*log(c*x**n)), x)
```

Giac [F(-1)] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x \operatorname{sinint}(d (a + b \ln (c x^n))) \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(d*(a + b*log(c*x^n))),x)
[Out] int(x*sinint(d*(a + b*log(c*x^n))), x)
```

3.34 $\int \mathbf{Si}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=128

$$-\frac{1}{2}ie^{-\frac{a}{bn}}x(cx^n)^{-1/n}\operatorname{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{2}ie^{-\frac{a}{bn}}x(cx^n)^{-1/n}\operatorname{Ei}\left(\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)+$$

```
[Out] -1/2*I*x*Ei((1-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a/b/n)/((c*x^n)^(1/n))+1/2
*I*x*Ei((1+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a/b/n)/((c*x^n)^(1/n))+x*Si(d*
(a+b*ln(c*x^n)))
```

Rubi [A]
time = 0.17, antiderivative size = 128, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6658, 12, 4583, 2347, 2209}

$$-\frac{1}{2}ixe^{-\frac{a}{bn}}(cx^n)^{-1/n}\operatorname{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{2}ixe^{-\frac{a}{bn}}(cx^n)^{-1/n}\operatorname{Ei}\left(\frac{(ibdn+1)(a+b\log(cx^n))}{bn}\right)+x\operatorname{Si}(d(a+b\log(cx^n)))$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] ((-1/2*I)*x*ExpIntegralEi[((1 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(E^(a/
(b*n))*(c*x^n)^n^(-1)) + ((I/2)*x*ExpIntegralEi[((1 + I*b*d*n)*(a + b*Log[c
*x^n]))/(b*n)])/(E^(a/(b*n))*(c*x^n)^n^(-1)) + x*SinIntegral[d*(a + b*Log[c
*x^n])]
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4583

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*Sin[((a_.) + Log[(c
_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(1/((c*x^n)^(I*b*d)*(2/
```

```
x^(I*b*d*n))))/E^(I*a*d), Int[(h*(e + f*Log[g*x^m]))^q/x^(I*b*d*n), x], x]
 - Dist[I*E^(I*a*d)*((c*x^n)^(I*b*d)/(2*x^(I*b*d*n))), Int[x^(I*b*d*n)*(h*(
e + f*Log[g*x^m]))^q, x], x] /; FreeQ[{a, b, c, d, e, f, g, h, m, n, q}, x]
```

Rule 6658

```
Int[SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :>
Simp[x*SinIntegral[d*(a + b*Log[c*x^n])], x] - Dist[b*d*n, Int[Sin[d*(a + b
*Log[c*x^n])]/(d*(a + b*Log[c*x^n])), x], x] /; FreeQ[{a, b, c, d, n}, x]
```

Rubi steps

$$\begin{aligned}\int \operatorname{Si}(d(a+b\log(cx^n)))\,dx &= x\operatorname{Si}(d(a+b\log(cx^n)))-(bdn)\int \frac{\sin(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx\\ &= x\operatorname{Si}(d(a+b\log(cx^n)))-(bn)\int \frac{\sin(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx\\ &= x\operatorname{Si}(d(a+b\log(cx^n)))-\frac{1}{2}\left(ibe^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int \frac{x^{-ibdn}}{a+b\log(cx^n)}\,dx+\frac{1}{2}\\ &= x\operatorname{Si}(d(a+b\log(cx^n)))-\frac{1}{2}\left(ibe^{-iad}x(cx^n)^{-ibd-\frac{1-ibdn}{n}}\right)\operatorname{Subst}\left(\int \frac{e^{\frac{(1-ibdn)x}{n}}}{a+bx}\,dx,\right.\\ &= -\frac{1}{2}ie^{-\frac{a}{bn}}x(cx^n)^{-1/n}\operatorname{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)+\frac{1}{2}ie^{-\frac{a}{bn}}x(cx^n)^{-1/n}\operatorname{Ei}\end{aligned}$$

Mathematica [A]
time = 0.93, size = 102, normalized size = 0.80

$$-\frac{1}{2}ie^{-\frac{a}{bn}}x(cx^n)^{-1/n}\left(\operatorname{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)-\operatorname{Ei}\left(\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)\right)+x\operatorname{Si}(d(a+b\log(cx^n)))$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] ((-1/2*I)*x*(ExpIntegralEi[((1 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)] - ExpI
ntegralEi[((1 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(E^(a/(b*n))*(c*x^n)^
n^(-1)) + x*SinIntegral[d*(a + b*Log[c*x^n])]
```

Maple [F]
time = 0.16, size = 0, normalized size = 0.00

$$\int \operatorname{sinIntegral}(d(a+b\ln(c\,x^n)))\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(Si(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral((b*log(c*x^n) + a)*d), x)
```

Fricas [A]
time = 0.35, size = 127, normalized size = 0.99

$$\frac{1}{2}\left(i\,\mathrm{Ei}\left(\frac{i\,abdn+(i\,b^2dn+b)\log(c)+(i\,b^2dn^2+bn)\log(x)+a}{bn}\right)-i\,\mathrm{Ei}\left(\frac{-i\,abdn+(-i\,b^2dn+b)\log(c)+(-i\,b^2dn^2+bn)\log(x)+a}{bn}\right)\right)e^{\left(-\frac{b\log(c)+a}{bn}\right)}+x\,\mathrm{Si}\left(bd\log(cx^n)+ad\right)$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \mathrm{Si}\left(d(a+b\log(cx^n))\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(Si(d*(a + b*log(c*x**n))), x)
```

Giac [F(-1)] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{sinint}(d\,(a+b\,\ln\left(c\,x^n\right)))\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(d*(a + b*log(c*x^n))),x)
[Out] int(sinint(d*(a + b*log(c*x^n))), x)
```

3.35 $\int \frac{\mathbf{Si}(d(a+b\log(cx^n)))}{x}\,dx$

Optimal. Leaf size=54

$$\frac{\cos\left(d(a+b\log\left(cx^n\right))\right)}{bdn}+\frac{\left(a+b\log\left(cx^n\right)\right)\mathrm{Si}(d(a+b\log\left(cx^n\right)))}{bn}$$

[Out] cos(d*(a+b*ln(c*x^n)))/b/d/n+(a+b*ln(c*x^n))*Si(d*(a+b*ln(c*x^n)))/b/n

Rubi [A]
time = 0.02, antiderivative size = 54, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.059$, Rules used = $\{6634\}$

$$\frac{\left(a+b\log\left(cx^n\right)\right)\mathrm{Si}(d(a+b\log\left(cx^n\right)))}{bn}+\frac{\cos\left(d(a+b\log\left(cx^n\right))\right)}{bdn}$$

Antiderivative was successfully verified.

[In] Int[SinIntegral[d*(a + b*Log[c*x^n])]/x,x]

[Out] Cos[d*(a + b*Log[c*x^n])]/(b*d*n) + ((a + b*Log[c*x^n])*SinIntegral[d*(a + b*Log[c*x^n])])/(b*n)

Rule 6634

```
Int[SinIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(SinIntegr
al[a + b*x]/b), x] + Simp[Cos[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\begin{aligned}\int \frac{\mathrm{Si}(d(a+b\log\left(cx^n\right)))}{x}\,dx &= \frac{\mathrm{Subst}\left(\int \mathrm{Si}(d(a+bx))\,dx, x, \log\left(cx^n\right)\right)}{n}\\ &= \frac{\mathrm{Subst}\left(\int \mathrm{Si}(x)\,dx, x, ad+bd\log\left(cx^n\right)\right)}{bdn}\\ &= \frac{\cos\left(ad+bd\log\left(cx^n\right)\right)}{bdn}+\frac{\left(a+b\log\left(cx^n\right)\right)\mathrm{Si}(ad+bd\log\left(cx^n\right))}{bn}\end{aligned}$$

Mathematica [A]
time = 0.05, size = 95, normalized size = 1.76

$$\frac{\cos(ad)\cos\left(bd\log\left(cx^n\right)\right)}{bdn}-\frac{\sin(ad)\sin\left(bd\log\left(cx^n\right)\right)}{bdn}+\frac{\log\left(cx^n\right)\mathrm{Si}(d(a+b\log\left(cx^n\right)))}{n}+\frac{a\mathrm{Si}(ad+bd\log\left(cx^n\right))}{bn}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[d*(a + b*Log[c*x^n])]/x,x]
```

```
[Out] (Cos[a*d]*Cos[b*d*Log[c*x^n]])/(b*d*n) - (Sin[a*d]*Sin[b*d*Log[c*x^n]])/(b*
d*n) + (Log[c*x^n]*SinIntegral[d*(a + b*Log[c*x^n])])/n + (a*SinIntegral[a*
d + b*d*Log[c*x^n]])/(b*n)
```

Maple [A]
time = 1.07, size = 54, normalized size = 1.00

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(ad+bd\ln(c\,x^{n}))(ad+bd\ln(c\,x^{n}))+\cos(ad+bd\ln(c\,x^{n}))}{nbd}$	54
default	$\frac{\mathrm{sinIntegral}(ad+bd\ln(c\,x^{n}))(ad+bd\ln(c\,x^{n}))+\cos(ad+bd\ln(c\,x^{n}))}{nbd}$	54

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*(a+b*ln(c*x^n)))/x,x,method=_RETURNVERBOSE)
```

```
[Out] 1/n/b/d*(Si(a*d+b*d*ln(c*x^n))*(a*d+b*d*ln(c*x^n))+cos(a*d+b*d*ln(c*x^n)))
```

Maxima [A]
time = 0.27, size = 49, normalized size = 0.91

$$\frac{(b\log(cx^n)+a)d\,\mathrm{Si}\left((b\log(cx^n)+a)d\right)+\cos\left((b\log(cx^n)+a)d\right)}{bdn}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((b*log(c*x^n) + a)*d*sin_integral((b*log(c*x^n) + a)*d) + cos((b*log(c*x^n
) + a)*d))/(b*d*n)
```

Fricas [A]
time = 0.34, size = 57, normalized size = 1.06

$$\frac{(bdn\log(x)+bd\log(c)+ad)\,\mathrm{Si}\left(bd\log(cx^n)+ad\right)+\cos\left(bdn\log(x)+bd\log(c)+ad\right)}{bdn}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((b*d*n*log(x) + b*d*log(c) + a*d)*sin_integral(b*d*log(c*x^n) + a*d) + cos
(b*d*n*log(x) + b*d*log(c) + a*d))/(b*d*n)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\frac{\mathrm{Si}\left(ad+bd\log(cx^n)\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(d*(a+b*ln(c*x**n)))/x,x)
```

```
[Out] Integral(Si(a*d + b*d*log(c*x**n))/x, x)
```

Giac [A]
time = 0.40, size = 59, normalized size = 1.09

$$\frac{(bdn\log(x) + bd\log(c) + ad)\operatorname{Si}(bdn\log(x) + bd\log(c) + ad) + \cos(bdn\log(x) + bd\log(c) + ad)}{bdn}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((b*d*n*log(x) + b*d*log(c) + a*d)*sin_integral(b*d*n*log(x) + b*d*log(c) +
 a*d) + cos(b*d*n*log(x) + b*d*log(c) + a*d))/(b*d*n)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{\operatorname{sinint}(d\,(a + b\,\ln(c\,x^n)))\,\ln(c\,x^n)}{n} + \frac{a\operatorname{sinint}(d\,(a + b\,\ln(c\,x^n)))}{b\,n} + \frac{\cos(d\,(a + b\,\ln(c\,x^n)))}{b\,d\,n}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(d*(a + b*log(c*x^n)))/x,x)
```

```
[Out] (sinint(d*(a + b*log(c*x^n)))*log(c*x^n))/n + (a*sinint(d*(a + b*log(c*x^n)
)))/(b*n) + cos(d*(a + b*log(c*x^n)))/(b*d*n)
```

3.36 $\int \frac{\mathbf{Si}(d(a+b\log(cx^n)))}{x^2}\,dx$

Optimal. Leaf size=131

$$-\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}-\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}$$

```
[Out] -1/2*I*exp(a/b/n)*(c*x^n)^(1/n)*Ei(-(1-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/x+1/2*
I*exp(a/b/n)*(c*x^n)^(1/n)*Ei(-(1+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/x-Si(d*(a+b
*ln(c*x^n)))/x
```

Rubi [A]
time = 0.17, antiderivative size = 131, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6661, 12, 4585, 2347, 2209}

$$-\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2x}-\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[d*(a + b*Log[c*x^n])]/x^2,x]
```

```
[Out] ((-1/2*I)*E^(a/(b*n))*(c*x^n)^n^(-1)*ExpIntegralEi[-(((1 - I*b*d*n)*(a + b*
Log[c*x^n]))/(b*n))])/x + ((I/2)*E^(a/(b*n))*(c*x^n)^n^(-1)*ExpIntegralEi[-
(((1 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n))])/x - SinIntegral[d*(a + b*Log[c
*x^n])]/x
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4585

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.)*
Sin[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(i*x
)^r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*
n)*(h*(e + f*Log[g*x^m]))^q, x], x] - Dist[I*E^(I*a*d)*(i*x)^r*((c*x^n)^(I*
b*d)/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x]
, x] /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6661

```
Int[((e_.)*(x_))^(m_.)*SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d
_.)], x_Symbol] :> Simp[(e*x)^(m + 1)*(SinIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Sin[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x^2}\,dx &= -\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}+(bdn)\int \frac{\sin(d(a+b\log(cx^n)))}{dx^2(a+b\log(cx^n))}\,dx\\ &= -\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}+(bn)\int \frac{\sin(d(a+b\log(cx^n)))}{x^2(a+b\log(cx^n))}\,dx\\ &= -\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}+\frac{1}{2}\left(ibe^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int \frac{x^{-2-ibdn}}{a+b\log(cx^n)}\,dx-\frac{1}{2}\\ &= -\frac{\operatorname{Si}(d(a+b\log(cx^n)))}{x}+\frac{\left(ibe^{-iad}(cx^n)^{-ibd-\frac{-1-ibdn}{n}}\right)\operatorname{Subst}\left(\int \frac{e^{\frac{(-1-ibdn)x}{n}}}{a+bx}\,dx,x\right.}{2x}\\ &= -\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\operatorname{Ei}\left(-\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}\end{aligned}$$

Mathematica [A]
time = 0.99, size = 107, normalized size = 0.82

$$\frac{ie^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\left(\operatorname{Ei}\left(-\frac{i(-i+bdn)(a+b\log(cx^n))}{bn}\right)-\operatorname{Ei}\left(\frac{i(i+bdn)(a+b\log(cx^n))}{bn}\right)\right)-2\operatorname{Si}(d(a+b\log(cx^n)))}{2x}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[d*(a + b*Log[c*x^n])]/x^2,x]
```

```
[Out] (I*E^(a/(b*n))*(c*x^n)^n^(-1)*(ExpIntegralEi[((-I)*(-I + b*d*n)*(a + b*Log[
c*x^n]))/(b*n)] - ExpIntegralEi[(I*(I + b*d*n)*(a + b*Log[c*x^n]))/(b*n)])
- 2*SinIntegral[d*(a + b*Log[c*x^n])])/(2*x)
```

Maple [F]
time = 0.15, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{sinIntegral}\left(d(a+b\ln\left(c\,x^{n}\right))\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*(a+b*ln(c*x^n)))/x^2,x)
```

```
[Out] int(Si(d*(a+b*ln(c*x^n)))/x^2,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral((b*log(c*x^n) + a)*d)/x^2, x)
```

Fricas [A]
time = 0.36, size = 142, normalized size = 1.08

$$\frac{\left(-i\,x\mathrm{Ei}\left(\frac{i\,abdn+(i\,b^{2}dn-b)\log(c)+(i\,b^{2}dn^{2}-bn)\log(x)-a}{bn}\right)+i\,x\mathrm{Ei}\left(\frac{-i\,abdn+(-i\,b^{2}dn-b)\log(c)+(-i\,b^{2}dn^{2}-bn)\log(x)-a}{bn}\right)\right)e^{\left(\frac{b\log(c)+a}{bn}\right)}-2\,\mathrm{Si}\left(bd\log\left(cx^{n}\right)+ad\right)}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Si}\left(ad+bd\log\left(cx^{n}\right)\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(d*(a+b*ln(c*x**n)))/x**2,x)
```

```
[Out] Integral(Si(a*d + b*d*log(c*x**n))/x**2, x)
```

Giac [**F(-1)**] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{sinint}(d\,(a+b\,\ln\left(c\,x^n\right)))}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(d*(a + b*log(c*x^n)))/x^2,x)
```

```
[Out] int(sinint(d*(a + b*log(c*x^n)))/x^2, x)
```

3.37 $\int \frac{\mathbf{Si}(d(a+b\log(cx^n)))}{x^3}\,dx$

Optimal. Leaf size=139

$$-\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(2+ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}-\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}$$

```
[Out] -1/4*I*exp(2*a/b/n)*(c*x^n)^(2/n)*Ei(-(2-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/x^2+
1/4*I*exp(2*a/b/n)*(c*x^n)^(2/n)*Ei(-(2+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/x^2-1
/2*Si(d*(a+b*ln(c*x^n)))/x^2
```

Rubi [A]
time = 0.17, antiderivative size = 139, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6661, 12, 4585, 2347, 2209}

$$-\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(ibdn+2)(a+b\log(cx^n))}{bn}\right)}{4x^2}-\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}$$

Antiderivative was successfully verified.

```
[In] Int[SinIntegral[d*(a + b*Log[c*x^n])]/x^3,x]
```

```
[Out] ((-1/4*I)*E^((2*a)/(b*n))*(c*x^n)^(2/n)*ExpIntegralEi[-(((2 - I*b*d*n)*(a +
 b*Log[c*x^n]))/(b*n))])/x^2 + ((I/4)*E^((2*a)/(b*n))*(c*x^n)^(2/n)*ExpInte
gralEi[-(((2 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n))])/x^2 - SinIntegral[d*(a
 + b*Log[c*x^n])]/(2*x^2)
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4585

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.)*
Sin[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(i*x
)^r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*
n)*(h*(e + f*Log[g*x^m]))^q, x], x] - Dist[I*E^(I*a*d)*(i*x)^r*((c*x^n)^(I*
b*d)/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x]
, x] /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6661

```
Int[((e_.)*(x_))^(m_.)*SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d
_.)], x_Symbol] :> Simp[(e*x)^(m + 1)*(SinIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Sin[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\mathrm{Si}(d(a+b\log(cx^n)))}{x^3}\,dx &= -\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{2}(bdn)\int\frac{\sin(d(a+b\log(cx^n)))}{dx^3(a+b\log(cx^n))}\,dx\\
&= -\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{2}(bn)\int\frac{\sin(d(a+b\log(cx^n)))}{x^3(a+b\log(cx^n))}\,dx\\
&= -\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{4}\left(ibe^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int\frac{x^{-3-ibdn}}{a+b\log(cx^n)}\,dx-\frac{1}{4}\\
&= -\frac{\mathrm{Si}(d(a+b\log(cx^n)))}{2x^2}+\frac{\left(ibe^{-iad}(cx^n)^{-ibd-\frac{-2-ibdn}{n}}\right)\mathrm{Subst}\left(\int\frac{e^{\frac{(-2-ibdn)x}{n}}}{a+bx}\,dx,x\right.}{4x^2}\\
&= -\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{ie^{\frac{2a}{bn}}(cx^n)^{2/n}\,\mathrm{Ei}\left(-\frac{(2+ibdn)(a+b\log(cx^n))}{bn}\right.}{4x^2}\end{aligned}$$

Mathematica [A]
time = 1.00, size = 111, normalized size = 0.80

$$\frac{i\left(e^{\frac{2a}{bn}}(cx^n)^{2/n}\left(\mathrm{Ei}\left(-\frac{i(-2i+bdn)(a+b\log(cx^n))}{bn}\right)-\mathrm{Ei}\left(\frac{i(2i+bdn)(a+b\log(cx^n))}{bn}\right)\right)+2i\mathrm{Si}(d(a+b\log(cx^n)))\right)}{4x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[SinIntegral[d*(a + b*Log[c*x^n])]/x^3,x]
```

```
[Out] ((I/4)*(E^((2*a)/(b*n))*(c*x^n)^(2/n)*(ExpIntegralEi[((-I)*(-2*I + b*d*n)*(
a + b*Log[c*x^n]))/(b*n)] - ExpIntegralEi[(I*(2*I + b*d*n)*(a + b*Log[c*x^n
]))/(b*n)]) + (2*I)*SinIntegral[d*(a + b*Log[c*x^n])]))/x^2
```

Maple [F]
time = 0.15, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\left(d(a+b\ln\left(c\,x^{n}\right))\right)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*(a+b*ln(c*x^n)))/x^3,x)
```

```
[Out] int(Si(d*(a+b*ln(c*x^n)))/x^3,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin_integral((b*log(c*x^n) + a)*d)/x^3, x)
```

Fricas [A]
time = 0.36, size = 147, normalized size = 1.06

$$\frac{\left(-i\,x^{2}\text{Ei}\left(\frac{i\,abdn+(i\,b^{2}dn-2\,b)\,\log(c)+(i\,b^{2}dn^{2}-2\,bn)\,\log(x)-2\,a}{bn}\right)+i\,x^{2}\text{Ei}\left(\frac{-i\,abdn+(-i\,b^{2}dn-2\,b)\,\log(c)+(-i\,b^{2}dn^{2}-2\,bn)\,\log(x)-2\,a}{bn}\right)\right)e^{\left(\frac{2\,(b\log(c)+a)}{bn}\right)}-2\,\text{Si}\left(bd\log\left(cx^{n}\right)+ad\right)}{4\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/4*((-I*x^2*Ei((I*a*b*d*n + (I*b^2*d*n - 2*b)*log(c) + (I*b^2*d*n^2 - 2*b*
n)*log(x) - 2*a)/(b*n)) + I*x^2*Ei((-I*a*b*d*n + (-I*b^2*d*n - 2*b)*log(c)
+ (-I*b^2*d*n^2 - 2*b*n)*log(x) - 2*a)/(b*n)))*e^(2*(b*log(c) + a)/(b*n)) -
 2*sin_integral(b*d*log(c*x^n) + a*d))/x^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\text{Si}\left(ad+bd\log\left(cx^{n}\right)\right)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(d*(a+b*ln(c*x**n)))/x**3,x)
```

```
[Out] Integral(Si(a*d + b*d*log(c*x**n))/x**3, x)
```

Giac [**F(-1)**] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{sinint}(d\,(a+b\,\ln(c\,x^n)))}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(d*(a + b*log(c*x^n)))/x^3,x)
```

```
[Out] int(sinint(d*(a + b*log(c*x^n)))/x^3, x)
```

3.38 $\int (ex)^m \mathbf{Si}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=176

$$-\frac{ie^{-\frac{a(1+m)}{bn}}x(ex)^m(cx^n)^{-\frac{1+m}{n}}\operatorname{Ei}\left(\frac{(1+m-ibdn)(a+b\log(cx^n))}{bn}\right)}{2(1+m)}+\frac{ie^{-\frac{a(1+m)}{bn}}x(ex)^m(cx^n)^{-\frac{1+m}{n}}\operatorname{Ei}\left(\frac{(1+m+ibdn)(a+b\log(cx^n))}{bn}\right)}{2(1+m)}$$

```
[Out] -1/2*I*x*(e*x)^m*Ei((1+m-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a*(1+m)/b/n)/(1+
m)/((c*x^n)^((1+m)/n))+1/2*I*x*(e*x)^m*Ei((1+m+I*b*d*n)*(a+b*ln(c*x^n))/b/n
)/exp(a*(1+m)/b/n)/(1+m)/((c*x^n)^((1+m)/n))+(e*x)^(1+m)*Si(d*(a+b*ln(c*x^n
)))/e/(1+m)
```

Rubi [A]
time = 0.21, antiderivative size = 176, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}} = 0.263$, Rules used = {6661, 12, 4585, 2347, 2209}

$$-\frac{ix(ex)^m e^{-\frac{a(m+1)}{bn}}(cx^n)^{-\frac{m+1}{n}}\operatorname{Ei}\left(\frac{(m-ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2(m+1)}+\frac{ix(ex)^m e^{-\frac{a(m+1)}{bn}}(cx^n)^{-\frac{m+1}{n}}\operatorname{Ei}\left(\frac{(m+ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2(m+1)}+\frac{(ex)^{m+1}\operatorname{Si}(d(a+b\log(cx^n)))}{e(m+1)}$$

Antiderivative was successfully verified.

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

```
[Out] ((-1/2*I)*x*(e*x)^m*ExpIntegralEi[((1 + m - I*b*d*n)*(a + b*Log[c*x^n]))/(b
*n)])/(E^((a*(1 + m))/(b*n))*(1 + m)*(c*x^n)^((1 + m)/n)) + ((I/2)*x*(e*x)^
m*ExpIntegralEi[((1 + m + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(E^((a*(1 +
m))/(b*n))*(1 + m)*(c*x^n)^((1 + m)/n)) + ((e*x)^(1 + m)*SinIntegral[d*(a +
 b*Log[c*x^n])])/(e*(1 + m))
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4585

```
Int[(((e_.) + Log[(g_.)*(x_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.)*
Sin[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Dist[(I*(i*x
)^r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*
n)*(h*(e + f*Log[g*x^m]))^q, x], x] - Dist[I*E^(I*a*d)*(i*x)^r*((c*x^n)^(I*
b*d)/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x]
, x] /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6661

```
Int[((e_.)*(x_))^(m_.)*SinIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d
_.)], x_Symbol] :> Simp[(e*x)^(m + 1)*(SinIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Sin[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\int (ex)^m \text{Si}(d(a+b\log(cx^n)))\,dx = \frac{(ex)^{1+m}\text{Si}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{(bdn)\int \frac{(ex)^m \sin(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx}{1+m}$$

$$= \frac{(ex)^{1+m}\text{Si}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{(bn)\int \frac{(ex)^m \sin(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx}{1+m}$$

$$= \frac{(ex)^{1+m}\text{Si}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{\left(ibe^{-iad}nx^{-m+ibdn}(ex)^m\left(cx^n\right)^{-ibd}\right)\int \frac{x}{a+}$$

$$= \frac{(ex)^{1+m}\text{Si}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{\left(ibe^{-iad}x(ex)^m\left(cx^n\right)^{-ibd-\frac{1+m-ibdn}{n}}\right)\text{Subs}}{2(1+m}$$

$$= -\frac{ie^{-\frac{a(1+m)}{bn}}x(ex)^m\left(cx^n\right)^{-\frac{1+m}{n}}\text{Ei}\left(\frac{(1+m-ibdn)(a+b\log(cx^n))}{bn}\right)}{2(1+m)} + \frac{ie^{-\frac{a(1+m)}{bn}}x(ex}{}$$

Mathematica [A]
time = 1.74, size = 128, normalized size = 0.73

$$\frac{(ex)^m\left(-ie^{-\frac{(1+m)(a-bn\log(x)+b\log(cx^n))}{bn}}x^{-m}\left(\text{Ei}\left(\frac{(1+m-ibdn)(a+b\log(cx^n))}{bn}\right)-\text{Ei}\left(\frac{(1+m+ibdn)(a+b\log(cx^n))}{bn}\right)\right)+2x\text{Si}(d(a+b\log(cx^n)))\right)}{2(1+m)}$$

Antiderivative was successfully verified.

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

```
[Out] ((e*x)^m*(((-I)*(ExpIntegralEi[((1 + m - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)
] - ExpIntegralEi[((1 + m + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(E^(((1 +
 m)*(a - b*n*Log[x] + b*Log[c*x^n]))/(b*n))*x^m) + 2*x*SinIntegral[d*(a + b
*Log[c*x^n])]))/(2*(1 + m))
```

Maple [F]
time = 0.14, size = 0, normalized size = 0.00

$$\int (ex)^m \operatorname{sinIntegral}\left(d(a+b\ln\left(c\,x^n\right))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

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

Fricas [A]
time = 0.38, size = 175, normalized size = 0.99

$$\frac{2\,xe^{(m\log(x)+m)}\operatorname{Si}\left(bd\log\left(cx^n\right)+ad\right)+\left(i\operatorname{Ei}\left(\frac{i\,abdn+am+(i\,b^2dn+bm+b)\log(c)+(i\,b^2dn^2+(bm+b)n)\log(x)+a}{bn}\right)-i\operatorname{Ei}\left(\frac{-i\,abdn+am+(-i\,b^2dn+bm+b)\log(c)+(-i\,b^2dn^2+(bm+b)n)\log(x)+a}{bn}\right)\right)e^{\left(\frac{bmn-am-(bm+b)\log(c)-a}{bn}\right)}}{2\,(m+1)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*(2*x*e^(m*log(x) + m)*sin_integral(b*d*log(c*x^n) + a*d) + (I*Ei((I*a*b
*d*n + a*m + (I*b^2*d*n + b*m + b)*log(c) + (I*b^2*d*n^2 + (b*m + b)*n)*log
(x) + a)/(b*n)) - I*Ei((-I*a*b*d*n + a*m + (-I*b^2*d*n + b*m + b)*log(c) +
(-I*b^2*d*n^2 + (b*m + b)*n)*log(x) + a)/(b*n)))*e^((b*m*n - a*m - (b*m + b
)*log(c) - a)/(b*n)))/(m + 1)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int (ex)^m \operatorname{Si}\left(ad+bd\log\left(cx^n\right)\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Integral((e*x)**m*Si(a*d + b*d*log(c*x**n)), x)
```

Giac [**F(-1)**] Timed out
time = 0.00, size = 0, normalized size = 0.00

Timed out

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Timed out
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{sinint}(d\,(a+b\,\ln\left(c\,x^n\right)))\,\left(e\,x\right)^m\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

3.39 $\int \frac{\sin(bx)\textbf{Si}(bx)}{x^3}\,dx$

Optimal. Leaf size=96

$$b^2\text{CosIntegral}(2bx)-\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\sin(2bx)}{4x}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}(bx)}{2x^2}-\frac{1}{4}b^2\text{Si}(bx)^2$$

```
[Out] b^2*Ci(2*b*x)-1/2*b*cos(b*x)*Si(b*x)/x-1/4*b^2*Si(b*x)^2-1/2*b*cos(b*x)*sin
(b*x)/x-1/2*Si(b*x)*sin(b*x)/x^2-1/4*sin(b*x)^2/x^2-1/4*b*sin(2*b*x)/x
```

Rubi [A]
time = 0.14, antiderivative size = 96, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {6650, 6656, 6818, 12, 4491, 3378, 3383, 3395, 29, 3393}

$$b^2\text{CosIntegral}(2bx)-\frac{1}{4}b^2\text{Si}(bx)^2-\frac{\text{Si}(bx)\sin(bx)}{2x^2}-\frac{b\text{Si}(bx)\cos(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\sin(2bx)}{4x}-\frac{b\sin(bx)\cos(bx)}{2x}$$

Antiderivative was successfully verified.

```
[In] Int[(Sin[b*x]*SinIntegral[b*x])/x^3,x]
```

```
[Out] b^2*CosIntegral[2*b*x] - (b*Cos[b*x]*Sin[b*x])/(2*x) - Sin[b*x]^2/(4*x^2) -
 (b*Sin[2*b*x])/(4*x) - (b*Cos[b*x]*SinIntegral[b*x])/(2*x) - (Sin[b*x]*Sin
Integral[b*x])/(2*x^2) - (b^2*SinIntegral[b*x]^2)/4
```

Rule 12

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

Rule 29

```
Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]
```

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3395

```
Int[((c_.) + (d_.)*(x_))^(m_)*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbo
l] :> Simp[(c + d*x)^(m + 1)*((b*Sin[e + f*x])^n/(d*(m + 1))), x] + (Dist[b
^2*f^2*n*((n - 1)/(d^2*(m + 1)*(m + 2))), Int[(c + d*x)^(m + 2)*(b*Sin[e +
f*x])^(n - 2), x], x] - Dist[f^2*(n^2/(d^2*(m + 1)*(m + 2))), Int[(c + d*x)
^(m + 2)*(b*Sin[e + f*x])^n, x], x] - Simp[b*f*n*(c + d*x)^(m + 2)*Cos[e +
f*x]*((b*Sin[e + f*x])^(n - 1)/(d^2*(m + 1)*(m + 2))), x]) /; FreeQ[{b, c,
d, e, f}, x] && GtQ[n, 1] && LtQ[m, -2]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6650

```
Int[((e_.) + (f_.)*(x_))^(m_)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (
d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^(m + 1)*Sin[a + b*x]*(SinIntegral[c
 + d*x]/(f*(m + 1))), x] + (-Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Cos[
a + b*x]*SinIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6656

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^(m + 1)*Cos[a + b*x]*(SinIntegral[
c + d*x]/(f*(m + 1))), x] + (Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Sin[
a + b*x]*SinIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Cos[a + b*x]*(Sin[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\sin(bx)\text{Si}(bx)}{x^3}\,dx &= -\frac{\sin(bx)\text{Si}(bx)}{2x^2}+\frac{1}{2}b\int \frac{\sin^2(bx)}{bx^3}\,dx+\frac{1}{2}b\int \frac{\cos(bx)\text{Si}(bx)}{x^2}\,dx\\
&= -\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}(bx)}{2x^2}+\frac{1}{2}\int \frac{\sin^2(bx)}{x^3}\,dx+\frac{1}{2}b^2\int \frac{\cos(bx)\sin(bx)}{bx^2}\,dx-\\
&= -\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}(bx)}{2x^2}-\frac{1}{4}b^2\text{Si}(bx)^2+\frac{1}{2}b\\
&= \frac{1}{2}b^2\log(x)-\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}(bx)}{2x^2}-\frac{1}{4}b^2\text{Si}\\
&= -\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}(bx)}{2x^2}-\frac{1}{4}b^2\text{Si}(bx)^2+\frac{1}{4}b\\
&= \frac{1}{2}b^2\text{Ci}(2bx)-\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\sin(2bx)}{4x}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{S}}{2x}\\
&= b^2\text{Ci}(2bx)-\frac{b\cos(bx)\sin(bx)}{2x}-\frac{\sin^2(bx)}{4x^2}-\frac{b\sin(2bx)}{4x}-\frac{b\cos(bx)\text{Si}(bx)}{2x}-\frac{\sin(bx)\text{Si}}{2x^2}\end{aligned}$$

Mathematica [F]
time = 0.69, size = 0, normalized size = 0.00

$$\int \frac{\sin(bx)\text{Si}(bx)}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Sin[b*x]*SinIntegral[b*x])/x^3,x]
[Out] Integrate[(Sin[b*x]*SinIntegral[b*x])/x^3, x]
```

Maple [F]
time = 0.07, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\,(bx)\sin\,(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)*sin(b*x)/x^3,x)
[Out] int(Si(b*x)*sin(b*x)/x^3,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^3,x, algorithm="maxima")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x)/x^3, x)
```

Fricas [A]
time = 0.37, size = 85, normalized size = 0.89

$$-\frac{b^{2}x^{2}\operatorname{Si}(bx)^{2}-2\,b^{2}x^{2}\operatorname{Ci}(2\,bx)-2\,b^{2}x^{2}\operatorname{Ci}(-2\,bx)+2\,bx\cos(bx)\operatorname{Si}(bx)-\cos(bx)^{2}+2\,(2\,bx\cos(bx)+\operatorname{Si}(bx))\sin(bx)+1}{4\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^3,x, algorithm="fricas")
```

```
[Out] -1/4*(b^2*x^2*sin_integral(b*x)^2 - 2*b^2*x^2*cos_integral(2*b*x) - 2*b^2*x
^2*cos_integral(-2*b*x) + 2*b*x*cos(b*x)*sin_integral(b*x) - cos(b*x)^2 + 2
*(2*b*x*cos(b*x) + sin_integral(b*x))*sin(b*x) + 1)/x^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\frac{\sin(bx)\operatorname{Si}(bx)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)*sin(b*x)/x**3,x)
```

```
[Out] Integral(sin(b*x)*Si(b*x)/x**3, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^3,x, algorithm="giac")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x)/x^3, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int\frac{\operatorname{sinint}(b\,x)\,\sin(b\,x)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*sin(b*x))/x^3,x)
```

```
[Out] int((sinint(b*x)*sin(b*x))/x^3, x)
```

3.40 $\int \frac{\sin(bx)\mathrm{Si}(bx)}{x^2}\,dx$

Optimal. Leaf size=49

$$-\frac{\sin^2(bx)}{x}-\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\mathrm{Si}(2bx)+b\mathrm{Int}\left(\frac{\cos(bx)\mathrm{Si}(bx)}{x},x\right)$$

```
[Out] b*CannotIntegrate(cos(b*x)*Si(b*x)/x,x)+b*Si(2*b*x)-Si(b*x)*sin(b*x)/x-sin(
b*x)^2/x
```

Rubi [A]
time = 0.11, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {}

$$\int \frac{\sin(bx)\mathrm{Si}(bx)}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Sin[b*x]*SinIntegral[b*x])/x^2,x]
```

```
[Out] -(Sin[b*x]^2/x) - (Sin[b*x]*SinIntegral[b*x])/x + b*SinIntegral[2*b*x] + b*
Defer[Int][(Cos[b*x]*SinIntegral[b*x])/x, x]
```

Rubi steps

$$\begin{aligned}
\int \frac{\sin(bx)\mathrm{Si}(bx)}{x^2}\,dx &= -\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\int \frac{\sin^2(bx)}{bx^2}\,dx+b\int \frac{\cos(bx)\mathrm{Si}(bx)}{x}\,dx\\
&= -\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\int \frac{\cos(bx)\mathrm{Si}(bx)}{x}\,dx+\int \frac{\sin^2(bx)}{x^2}\,dx\\
&= -\frac{\sin^2(bx)}{x}-\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\int \frac{\cos(bx)\mathrm{Si}(bx)}{x}\,dx+(2b)\int \frac{\sin(2bx)}{2x}\,dx\\
&= -\frac{\sin^2(bx)}{x}-\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\int \frac{\sin(2bx)}{x}\,dx+b\int \frac{\cos(bx)\mathrm{Si}(bx)}{x}\,dx\\
&= -\frac{\sin^2(bx)}{x}-\frac{\sin(bx)\mathrm{Si}(bx)}{x}+b\mathrm{Si}(2bx)+b\int \frac{\cos(bx)\mathrm{Si}(bx)}{x}\,dx
\end{aligned}$$

Mathematica [A]
time = 0.58, size = 0, normalized size = 0.00

$$\int \frac{\sin(bx)\mathrm{Si}(bx)}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Sin[b*x]*SinIntegral[b*x])/x^2,x]
```

```
[Out] Integrate[(Sin[b*x]*SinIntegral[b*x])/x^2, x]
```

Maple [A]
time = 0.07, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{sinIntegral}\,(bx)\sin\,(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)*sin(b*x)/x^2,x)
```

```
[Out] int(Si(b*x)*sin(b*x)/x^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^2,x, algorithm="maxima")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x)/x^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^2,x, algorithm="fricas")
```

```
[Out] integral(sin(b*x)*sin_integral(b*x)/x^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin\,(bx)\,\mathrm{Si}\,(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)*sin(b*x)/x**2,x)
```

```
[Out] Integral(sin(b*x)*Si(b*x)/x**2, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x^2,x, algorithm="giac")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x)/x^2, x)
```

Mupad [**A**]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{sinint}(b\,x)\,\sin\left(b\,x\right)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*sin(b*x))/x^2,x)
```

```
[Out] int((sinint(b*x)*sin(b*x))/x^2, x)
```

3.41 $\int \frac{\sin(bx)\mathbf{Si}(bx)}{x}\,dx$

Optimal. Leaf size=10

$$\frac{\text{Si}(bx)^2}{2}$$

```
[Out] 1/2*Si(b*x)^2
```

Rubi [A]
time = 0.01, antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.083$, Rules used = {6818}

$$\frac{\text{Si}(bx)^2}{2}$$

Antiderivative was successfully verified.

```
[In] Int[(Sin[b*x]*SinIntegral[b*x])/x,x]
```

```
[Out] SinIntegral[b*x]^2/2
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\int \frac{\sin(bx)\text{Si}(bx)}{x}\,dx = \frac{\text{Si}(bx)^2}{2}$$

Mathematica [C] Result contains higher order function than in optimal. Order 9 vs. order 4 in optimal.
time = 0.01, size = 26, normalized size = 2.60

$$\frac{\sin(bx)\text{Si}(bx)^2}{2bx\,\text{sinc}(bx)}$$

Antiderivative was successfully verified.

```
[In] Integrate[(Sin[b*x]*SinIntegral[b*x])/x,x]
```

```
[Out] (Sin[b*x]*SinIntegral[b*x]^2)/(2*b*x*Sinc[b*x])
```

Maple [A]
time = 0.07, size = 9, normalized size = 0.90

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)^2}{2}$	9
default	$\frac{\mathrm{sinIntegral}(bx)^2}{2}$	9

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)*sin(b*x)/x,x,method=_RETURNVERBOSE)
```

```
[Out] 1/2*Si(b*x)^2
```

Maxima [A]
time = 0.26, size = 8, normalized size = 0.80

$$\frac{1}{2}\,\mathrm{Si}\,(bx)^2$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x,x, algorithm="maxima")
```

```
[Out] 1/2*sin_integral(b*x)^2
```

Fricas [A]
time = 0.34, size = 8, normalized size = 0.80

$$\frac{1}{2}\,\mathrm{Si}\,(bx)^2$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x,x, algorithm="fricas")
```

```
[Out] 1/2*sin_integral(b*x)^2
```

Sympy [A]
time = 0.23, size = 7, normalized size = 0.70

$$\frac{\mathrm{Si}^2\,(bx)}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)*sin(b*x)/x,x)
```

```
[Out] Si(b*x)**2/2
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x)/x,x, algorithm="giac")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x)/x, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.10

$$\frac{\mathrm{sinint}(b\,x)^2}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*sin(b*x))/x,x)
```

```
[Out] sinint(b*x)^2/2
```

3.42 $\int \sin(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=26

$$-\frac{\cos(bx)\text{Si}(bx)}{b}+\frac{\text{Si}(2bx)}{2b}$$

```
[Out] -cos(b*x)*Si(b*x)/b+1/2*Si(2*b*x)/b
```

Rubi [A]
time = 0.03, antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.444, Rules used = {6646, 12, 4491, 3380}

$$\frac{\text{Si}(2bx)}{2b}-\frac{\text{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sin[b*x]*SinIntegral[b*x],x]
```

```
[Out] -((Cos[b*x]*SinIntegral[b*x])/b) + SinIntegral[2*b*x]/(2*b)
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \sin(bx)\mathrm{Si}(bx)\,dx &= -\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \int \frac{\cos(bx)\sin(bx)}{bx}\,dx\\ &= -\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \frac{\int \frac{\cos(bx)\sin(bx)}{x}\,dx}{b}\\ &= -\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \frac{\int \frac{\sin(2bx)}{2x}\,dx}{b}\\ &= -\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \frac{\int \frac{\sin(2bx)}{x}\,dx}{2b}\\ &= -\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \frac{\mathrm{Si}(2bx)}{2b}\end{aligned}$$

Mathematica [A]
time = 0.01, size = 26, normalized size = 1.00

$$-\frac{\cos(bx)\mathrm{Si}(bx)}{b} + \frac{\mathrm{Si}(2bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sin[b*x]*SinIntegral[b*x],x]
[Out] -((Cos[b*x]*SinIntegral[b*x])/b) + SinIntegral[2*b*x]/(2*b)
```

Maple [A]
time = 0.15, size = 23, normalized size = 0.88

method	result	size
derivativedivides	$\frac{-\cos(bx)\,\mathrm{sinIntegral}(bx)+\frac{\mathrm{sinIntegral}(2bx)}{2}}{b}$	23
default	$\frac{-\cos(bx)\,\mathrm{sinIntegral}(bx)+\frac{\mathrm{sinIntegral}(2bx)}{2}}{b}$	23

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b*(-cos(b*x)*Si(b*x)+1/2*Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(sin(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.35, size = 23, normalized size = 0.88

$$-\frac{2\cos(bx)\,\mathrm{Si}(bx)-\mathrm{Si}(2\,bx)}{2\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*cos(b*x)*sin_integral(b*x) - sin_integral(2*b*x))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\sin(bx)\,\mathrm{Si}(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x)*sin(b*x),x)
```

```
[Out] Integral(sin(b*x)*Si(b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 41, normalized size = 1.58

$$-\frac{\cos(bx)\,\mathrm{Si}(bx)}{b}+\frac{\Im(\mathrm{Ci}(2\,bx))-\Im(\mathrm{Ci}(-2\,bx))+2\,\mathrm{Si}(2\,bx)}{4\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] -cos(b*x)*sin_integral(b*x)/b + 1/4*(imag_part(cos_integral(2*b*x)) - imag_
part(cos_integral(-2*b*x)) + 2*sin_integral(2*b*x))/b
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.04

$$\int\mathrm{sinint}(b\,x)\,\sin(b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)*sin(b*x),x)
```

```
[Out] int(sinint(b*x)*sin(b*x), x)
```

3.43 $\int x \sin(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=61

$$\frac{\text{CosIntegral}(2bx)}{2b^2}-\frac{\log(x)}{2b^2}+\frac{\sin^2(bx)}{2b^2}-\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}$$

```
[Out] 1/2*Ci(2*b*x)/b^2-1/2*ln(x)/b^2-x*cos(b*x)*Si(b*x)/b+Si(b*x)*sin(b*x)/b^2+1
/2*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.06, antiderivative size = 61, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}}=0.700$, Rules used = {6648, 12, 2644, 30, 6652, 3393, 3383}

$$\frac{\text{CosIntegral}(2bx)}{2b^2}+\frac{\text{Si}(bx)\sin(bx)}{b^2}-\frac{\log(x)}{2b^2}+\frac{\sin^2(bx)}{2b^2}-\frac{x\text{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*Sin[b*x]*SinIntegral[b*x],x]
```

```
[Out] CosIntegral[2*b*x]/(2*b^2) - Log[x]/(2*b^2) + Sin[b*x]^2/(2*b^2) - (x*Cos[b
*x]*SinIntegral[b*x])/b + (Sin[b*x]*SinIntegral[b*x])/b^2
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] && !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int x\sin(bx)\text{Si}(bx)\,dx &= -\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\int\cos(bx)\text{Si}(bx)\,dx}{b}+\int\frac{\cos(bx)\sin(bx)}{b}\,dx\\
&= -\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{\int\cos(bx)\sin(bx)\,dx}{b}-\frac{\int\frac{\sin^2(bx)}{bx}\,dx}{b}\\
&= -\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}-\frac{\int\frac{\sin^2(bx)}{x}\,dx}{b^2}+\frac{\text{Subst}(\int x\,dx,x,\sin(bx))}{b^2}\\
&= \frac{\sin^2(bx)}{2b^2}-\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}-\frac{\int\left(\frac{1}{2x}-\frac{\cos(2bx)}{2x}\right)dx}{b^2}\\
&= -\frac{\log(x)}{2b^2}+\frac{\sin^2(bx)}{2b^2}-\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}+\frac{\int\frac{\cos(2bx)}{x}\,dx}{2b^2}\\
&= \frac{\text{Ci}(2bx)}{2b^2}-\frac{\log(x)}{2b^2}+\frac{\sin^2(bx)}{2b^2}-\frac{x\cos(bx)\text{Si}(bx)}{b}+\frac{\sin(bx)\text{Si}(bx)}{b^2}
\end{aligned}$$

Mathematica [A]
time = 0.06, size = 44, normalized size = 0.72

$$-\frac{\cos(2bx)-2\text{CosIntegral}(2bx)+2\log(x)+4(bx\cos(bx)-\sin(bx))\text{Si}(bx)}{4b^2}$$

Antiderivative was successfully verified.

[In] Integrate[x*Sin[b*x]*SinIntegral[b*x],x]

[Out] -1/4*(Cos[2*b*x] - 2*CosIntegral[2*b*x] + 2*Log[x] + 4*(b*x*Cos[b*x] - Sin[b*x])*SinIntegral[b*x])/b^2

Maple [A]
time = 0.35, size = 45, normalized size = 0.74

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)(\sin(bx)-bx\cos(bx))-\frac{\ln(bx)}{2}+\frac{\mathrm{cosineIntegral}(2bx)}{2}-\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	45
default	$\frac{\mathrm{sinIntegral}(bx)(\sin(bx)-bx\cos(bx))-\frac{\ln(bx)}{2}+\frac{\mathrm{cosineIntegral}(2bx)}{2}-\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	45

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x*Si(b*x)*sin(b*x),x,method=_RETURNVERBOSE)

[Out] 1/b^2*(Si(b*x)*(sin(b*x)-b*x*cos(b*x))-1/2*ln(b*x)+1/2*Ci(2*b*x)-1/2*cos(b*x)^2)

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*sin_integral(b*x)*sin(b*x),x, algorithm="maxima")

[Out] integrate(x*sin(b*x)*sin_integral(b*x), x)

Fricas [A]
time = 0.36, size = 54, normalized size = 0.89

$$-\frac{4\,bx\cos\left(bx\right)\mathrm{Si}\left(bx\right)+2\,\cos\left(bx\right)^{2}-4\,\sin\left(bx\right)\mathrm{Si}\left(bx\right)-\mathrm{Ci}\left(2\,bx\right)-\mathrm{Ci}\left(-2\,bx\right)+2\,\log\left(x\right)}{4\,b^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x*sin_integral(b*x)*sin(b*x),x, algorithm="fricas")

[Out] -1/4*(4*b*x*cos(b*x)*sin_integral(b*x) + 2*cos(b*x)^2 - 4*sin(b*x)*sin_integral(b*x) - cos_integral(2*b*x) - cos_integral(-2*b*x) + 2*log(x))/b^2

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\sin\left(bx\right)\mathrm{Si}\left(bx\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(b*x)*sin(b*x),x)
```

```
[Out] Integral(x*sin(b*x)*Si(b*x), x)
```

Giac [A]
time = 0.42, size = 55, normalized size = 0.90

$$-\left(\frac{x\cos(bx)}{b}-\frac{\sin(bx)}{b^2}\right)\operatorname{Si}(bx)-\frac{\cos(2\,bx)-\operatorname{Ci}(2\,bx)-\operatorname{Ci}(-2\,bx)+2\,\log(x)}{4\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] -(x*cos(b*x)/b - sin(b*x)/b^2)*sin_integral(b*x) - 1/4*(cos(2*b*x) - cos_in
tegral(2*b*x) - cos_integral(-2*b*x) + 2*log(x))/b^2
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int x\,\mathrm{sinint}(b\,x)\,\sin(b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(b*x)*sin(b*x),x)
```

```
[Out] int(x*sinint(b*x)*sin(b*x), x)
```

3.44 $\int x^2 \sin(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=91

$$-\frac{5x}{4b^2}+\frac{5\cos(bx)\sin(bx)}{4b^3}+\frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\sin(bx)\mathrm{Si}(bx)}{b^2}-\frac{\mathrm{Si}(2bx)}{b^3}$$

```
[Out] -5/4*x/b^2+2*cos(b*x)*Si(b*x)/b^3-x^2*cos(b*x)*Si(b*x)/b-Si(2*b*x)/b^3+5/4*
cos(b*x)*sin(b*x)/b^3+2*x*Si(b*x)*sin(b*x)/b^2+1/2*x*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.08, antiderivative size = 91, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {6648, 12, 3524, 2715, 8, 6654, 6646, 4491, 3380}

$$-\frac{\mathrm{Si}(2bx)}{b^3}+\frac{2\mathrm{Si}(bx)\cos(bx)}{b^3}+\frac{5\sin(bx)\cos(bx)}{4b^3}+\frac{2x\mathrm{Si}(bx)\sin(bx)}{b^2}-\frac{5x}{4b^2}+\frac{x\sin^2(bx)}{2b^2}-\frac{x^2\mathrm{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Sin[b*x]*SinIntegral[b*x],x]
```

```
[Out] (-5*x)/(4*b^2) + (5*Cos[b*x]*Sin[b*x])/(4*b^3) + (x*Sin[b*x]^2)/(2*b^2) + (
2*Cos[b*x]*SinIntegral[b*x])/b^3 - (x^2*Cos[b*x]*SinIntegral[b*x])/b + (2*x
*Sin[b*x]*SinIntegral[b*x])/b^2 - SinIntegral[2*b*x]/b^3
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\sin(bx)\mathrm{Si}(bx)\,dx = -\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2\int x\cos(bx)\mathrm{Si}(bx)\,dx}{b}+\int\frac{x\cos(bx)\sin(bx)}{b}\,dx$$
$$= -\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\sin(bx)\mathrm{Si}(bx)}{b^2}-\frac{2\int\sin(bx)\mathrm{Si}(bx)\,dx}{b^2}+\frac{\int x\cos(bx)\sin(bx)\,d}{b}$$
$$= \frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\sin(bx)\mathrm{Si}(bx)}{b^2}-\frac{\int\sin^2(bx)\,dx}{2b^2}$$
$$= \frac{5\cos(bx)\sin(bx)}{4b^3}+\frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\sin(bx)\mathrm{Si}(}{b^2}$$
$$= -\frac{5x}{4b^2}+\frac{5\cos(bx)\sin(bx)}{4b^3}+\frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\,\mathrm{si}}{}$$
$$= -\frac{5x}{4b^2}+\frac{5\cos(bx)\sin(bx)}{4b^3}+\frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\,\mathrm{si}}{}$$
$$= -\frac{5x}{4b^2}+\frac{5\cos(bx)\sin(bx)}{4b^3}+\frac{x\sin^2(bx)}{2b^2}+\frac{2\cos(bx)\mathrm{Si}(bx)}{b^3}-\frac{x^2\cos(bx)\mathrm{Si}(bx)}{b}+\frac{2x\,\mathrm{si}}{}$$

Mathematica [**A**]
time = 0.07, size = 64, normalized size = 0.70

$$-\frac{8bx+2bx\cos(2bx)-5\sin(2bx)+8\left(\left(-2+b^2x^2\right)\cos(bx)-2bx\sin(bx)\right)\mathrm{Si}(bx)+8\mathrm{Si}(2bx)}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*Sin[b*x]*SinIntegral[b*x],x]
```

```
[Out] -1/8*(8*b*x + 2*b*x*Cos[2*b*x] - 5*Sin[2*b*x] + 8*((-2 + b^2*x^2)*Cos[b*x]
- 2*b*x*Sin[b*x])*SinIntegral[b*x] + 8*SinIntegral[2*b*x])/b^3
```

Maple [**A**]
time = 0.41, size = 69, normalized size = 0.76

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)\left(-b^2x^2\cos(bx)+2\cos(bx)+2bx\sin(bx)\right)-\frac{bx\left(\cos^2(bx)\right)}{2}+\frac{5\sin(bx)\cos(bx)}{4}-\frac{3bx}{4}-\mathrm{sinIntegral}(2bx)}{b^3}$	69
default	$\frac{\mathrm{sinIntegral}(bx)\left(-b^2x^2\cos(bx)+2\cos(bx)+2bx\sin(bx)\right)-\frac{bx\left(\cos^2(bx)\right)}{2}+\frac{5\sin(bx)\cos(bx)}{4}-\frac{3bx}{4}-\mathrm{sinIntegral}(2bx)}{b^3}$	69

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Si(b*x)*(-b^2*x^2*cos(b*x)+2*cos(b*x)+2*b*x*sin(b*x))-1/2*b*x*cos(b*
x)^2+5/4*sin(b*x)*cos(b*x)-3/4*b*x-Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^2*sin(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.36, size = 67, normalized size = 0.74

$$-\frac{2\,bx\cos\left(bx\right)^{2}+4\,\left(b^{2}x^{2}-2\right)\cos\left(bx\right)\mathrm{Si}\left(bx\right)+3\,bx-\left(8\,bx\,\mathrm{Si}\left(bx\right)+5\,\cos\left(bx\right)\right)\sin\left(bx\right)+4\,\mathrm{Si}\left(2\,bx\right)}{4\,b^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/4*(2*b*x*cos(b*x)^2 + 4*(b^2*x^2 - 2)*cos(b*x)*sin_integral(b*x) + 3*b*x
 - (8*b*x*sin_integral(b*x) + 5*cos(b*x))*sin(b*x) + 4*sin_integral(2*b*x))
/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{2}\sin\left(bx\right)\mathrm{Si}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x)*sin(b*x),x)
```

```
[Out] Integral(x**2*sin(b*x)*Si(b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 138, normalized size = 1.52

$$\left(\frac{2\,x\sin\left(bx\right)}{b^{2}}-\frac{\left(b^{2}x^{2}-2\right)\cos\left(bx\right)}{b^{3}}\right)\mathrm{Si}\left(bx\right)-\frac{3\,bx\tan\left(bx\right)^{2}+2\,\Im\left(\mathrm{Ci}\left(2\,bx\right)\right)\tan\left(bx\right)^{2}-2\,\Im\left(\mathrm{Ci}\left(-2\,bx\right)\right)\tan\left(bx\right)^{2}+4\,\mathrm{Si}\left(2\,bx\right)\tan\left(bx\right)^{2}+5\,bx+2\,\Im\left(\mathrm{Ci}\left(2\,bx\right)\right)-2\,\Im\left(\mathrm{Ci}\left(-2\,bx\right)\right)+4\,\mathrm{Si}\left(2\,bx\right)-5\,\tan\left(bx\right)}{4\,\left(b^{3}\tan\left(bx\right)^{2}+b^{3}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] (2*x*sin(b*x)/b^2 - (b^2*x^2 - 2)*cos(b*x)/b^3)*sin_integral(b*x) - 1/4*(3*
b*x*tan(b*x)^2 + 2*imag_part(cos_integral(2*b*x))*tan(b*x)^2 - 2*imag_part(
cos_integral(-2*b*x))*tan(b*x)^2 + 4*sin_integral(2*b*x)*tan(b*x)^2 + 5*b*x
 + 2*imag_part(cos_integral(2*b*x)) - 2*imag_part(cos_integral(-2*b*x)) + 4
*sin_integral(2*b*x) - 5*tan(b*x))/(b^3*tan(b*x)^2 + b^3)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{sinint}(b\,x)\,\sin\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(b*x)*sin(b*x),x)
[Out] int(x^2*sinint(b*x)*sin(b*x), x)
```

3.45 $\int x^3 \sin(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=126

$$-\frac{x^2}{b^2}-\frac{3\text{CosIntegral}(2bx)}{b^4}+\frac{3\log(x)}{b^4}+\frac{2x\cos(bx)\sin(bx)}{b^3}-\frac{4\sin^2(bx)}{b^4}+\frac{x^2\sin^2(bx)}{2b^2}+\frac{6x\cos(bx)\text{Si}(bx)}{b^3}-\frac{x^3\cos$$

[Out] -x^2/b^2-3*Ci(2*b*x)/b^4+3*ln(x)/b^4+6*x*cos(b*x)*Si(b*x)/b^3-x^3*cos(b*x)*Si(b*x)/b+2*x*cos(b*x)*sin(b*x)/b^3-6*Si(b*x)*sin(b*x)/b^4+3*x^2*Si(b*x)*sin(b*x)/b^2-4*sin(b*x)^2/b^4+1/2*x^2*sin(b*x)^2/b^2

Rubi [A]
time = 0.14, antiderivative size = 126, normalized size of antiderivative = 1.00, number of steps used = 18, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {6648, 12, 3524, 3391, 30, 6654, 2644, 6652, 3393, 3383}

$$-\frac{3\text{CosIntegral}(2bx)}{b^4}-\frac{6\text{Si}(bx)\sin(bx)}{b^4}+\frac{3\log(x)}{b^4}-\frac{4\sin^2(bx)}{b^4}+\frac{6x\text{Si}(bx)\cos(bx)}{b^3}+\frac{2x\sin(bx)\cos(bx)}{b^3}+\frac{3x^2\text{Si}(bx)\sin(bx)}{b^2}-\frac{x^2}{b^2}+\frac{x^2\sin^2(bx)}{2b^2}-\frac{x^3\text{Si}(bx)\cos(bx)}{b}$$

Antiderivative was successfully verified.

[In] Int[x^3*Sin[b*x]*SinIntegral[b*x],x]

[Out] -(x^2/b^2) - (3*CosIntegral[2*b*x])/b^4 + (3*Log[x])/b^4 + (2*x*Cos[b*x]*Sin[b*x])/b^3 - (4*Sin[b*x]^2)/b^4 + (x^2*Sin[b*x]^2)/(2*b^2) + (6*x*Cos[b*x]*SinIntegral[b*x])/b^3 - (x^3*Cos[b*x]*SinIntegral[b*x])/b - (6*Sin[b*x]*SinIntegral[b*x])/b^4 + (3*x^2*Sin[b*x]*SinIntegral[b*x])/b^2

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^3 \sin(bx)\text{Si}(bx)\,dx = -\frac{x^3\cos(bx)\text{Si}(bx)}{b} + \frac{3\int x^2\cos(bx)\text{Si}(bx)\,dx}{b} + \int \frac{x^2\cos(bx)\sin(bx)}{b}\,dx$$

$$= -\frac{x^3\cos(bx)\text{Si}(bx)}{b} + \frac{3x^2\sin(bx)\text{Si}(bx)}{b^2} - \frac{6\int x\sin(bx)\text{Si}(bx)\,dx}{b^2} + \frac{\int x^2\cos(bx)\sin}{b}$$

$$= \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x\cos(bx)\text{Si}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Si}(bx)}{b} + \frac{3x^2\sin(bx)\text{Si}(bx)}{b^2} - \frac{6\int\cos(}{}$$

$$= \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{\sin^2(bx)}{b^4} + \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x\cos(bx)\text{Si}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Si}(bx}{b}$$

$$= -\frac{x^2}{b^2} + \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{\sin^2(bx)}{b^4} + \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x\cos(bx)\text{Si}(bx)}{b^3} - \frac{x^3\cos(b}{b}$$

$$= -\frac{x^2}{b^2} + \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{4\sin^2(bx)}{b^4} + \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x\cos(bx)\text{Si}(bx)}{b^3} - \frac{x^3\cos(}{}$$

$$= -\frac{x^2}{b^2} + \frac{3\log(x)}{b^4} + \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{4\sin^2(bx)}{b^4} + \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x\cos(bx)\text{Si}(bx}{b^3}$$

$$= -\frac{x^2}{b^2} - \frac{3\text{Ci}(2bx)}{b^4} + \frac{3\log(x)}{b^4} + \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{4\sin^2(bx)}{b^4} + \frac{x^2\sin^2(bx)}{2b^2} + \frac{6x}{}$$

Mathematica [A]
time = 0.12, size = 93, normalized size = 0.74

$$-\frac{3b^2x^2 - 8\cos(2bx) + b^2x^2\cos(2bx) + 12\text{CosIntegral}(2bx) - 12\log(x) - 4bx\sin(2bx) + 4(bx(-6+b^2x^2)\cos(bx) - 3(-2+b^2x^2)\sin(bx))\,\text{Si}(bx)}{4b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*Sin[b*x]*SinIntegral[b*x],x]
[Out] -1/4*(3*b^2*x^2 - 8*Cos[2*b*x] + b^2*x^2*Cos[2*b*x] + 12*CosIntegral[2*b*x]
 - 12*Log[x] - 4*b*x*Sin[2*b*x] + 4*(b*x*(-6 + b^2*x^2)*Cos[b*x] - 3*(-2 +
b^2*x^2)*Sin[b*x])*SinIntegral[b*x])/b^4
```

Maple [A]
time = 0.30, size = 138, normalized size = 1.10

method	result
derivativedivides	$\frac{\text{sinIntegral}(bx)\left(-b^3x^3\cos(bx)+3b^2x^2\sin(bx)-6\sin(bx)+6bx\cos(bx)\right)-\frac{b^2x^2\left(\cos^2(bx)\right)}{2}+bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+\frac{b^2x^2}{2}}{b^4}$
default	$\frac{\text{sinIntegral}(bx)\left(-b^3x^3\cos(bx)+3b^2x^2\sin(bx)-6\sin(bx)+6bx\cos(bx)\right)-\frac{b^2x^2\left(\cos^2(bx)\right)}{2}+bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+\frac{b^2x^2}{2}}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Si(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(Si(b*x)*(-b^3*x^3*cos(b*x)+3*b^2*x^2*sin(b*x)-6*sin(b*x)+6*b*x*cos(b
*x))-1/2*b^2*x^2*cos(b*x)^2+b*x*(1/2*sin(b*x)*cos(b*x)+1/2*b*x)+1/2*b^2*x^2
-sin(b*x)^2-3*b*x*(-1/2*sin(b*x)*cos(b*x)+1/2*b*x)+3*ln(b*x)-3*Ci(2*b*x)+3*
cos(b*x)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^3*sin(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.38, size = 99, normalized size = 0.79

$$-\frac{b^2x^2 + (b^2x^2 - 8)\cos(bx)^2 + 2\,(b^3x^3 - 6\,bx)\cos(bx)\,\mathrm{Si}(bx) - 2\,(2\,bx\cos(bx) + 3\,(b^2x^2 - 2)\,\mathrm{Si}(bx))\sin(bx) + 3\,\mathrm{Ci}(2\,bx) + 3\,\mathrm{Ci}(-2\,bx) - 6\,\log(x)}{2\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(b^2*x^2 + (b^2*x^2 - 8)*cos(b*x)^2 + 2*(b^3*x^3 - 6*b*x)*cos(b*x)*sin
_integral(b*x) - 2*(2*b*x*cos(b*x) + 3*(b^2*x^2 - 2)*sin_integral(b*x))*sin
(b*x) + 3*cos_integral(2*b*x) + 3*cos_integral(-2*b*x) - 6*log(x))/b^4
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3\sin(bx)\,\mathrm{Si}(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Si(b*x)*sin(b*x),x)
```

```
[Out] Integral(x**3*sin(b*x)*Si(b*x), x)
```

Giac [A]
time = 0.42, size = 106, normalized size = 0.84

$$-\left(\frac{(b^3x^3 - 6\,bx)\cos(bx)}{b^4} - \frac{3\,(b^2x^2 - 2)\sin(bx)}{b^4}\right)\mathrm{Si}(bx) - \frac{b^2x^2\cos(2\,bx) + 3\,b^2x^2 - 4\,bx\sin(2\,bx) - 8\,\cos(2\,bx) + 6\,\mathrm{Ci}(2\,bx) + 6\,\mathrm{Ci}(-2\,bx) - 12\,\log(x)}{4\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*sin_integral(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] -((b^3*x^3 - 6*b*x)*cos(b*x)/b^4 - 3*(b^2*x^2 - 2)*sin(b*x)/b^4)*sin_integr
al(b*x) - 1/4*(b^2*x^2*cos(2*b*x) + 3*b^2*x^2 - 4*b*x*sin(2*b*x) - 8*cos(2*
b*x) + 6*cos_integral(2*b*x) + 6*cos_integral(-2*b*x) - 12*log(x))/b^4
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3 \operatorname{sinint}(b\,x)\,\sin\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*sinint(b*x)*sin(b*x),x)
```

```
[Out] int(x^3*sinint(b*x)*sin(b*x), x)
```

3.46 $\int \frac{\cos(bx)\mathbf{Si}(bx)}{x^3}\,dx$

Optimal. Leaf size=103

$$-\frac{b\cos(2bx)}{4x}+\frac{b\sin^2(bx)}{2x}-\frac{\sin(2bx)}{8x^2}-\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}-b^2\mathrm{Si}(2bx)-\frac{1}{2}b^2\mathrm{Int}\left(\frac{\cos(bx)\mathrm{Si}(bx)}{x},x\right)$$

```
[Out] -1/2*b^2*CannotIntegrate(cos(b*x)*Si(b*x)/x,x)-1/4*b*cos(2*b*x)/x-1/2*cos(b
*x)*Si(b*x)/x^2-b^2*Si(2*b*x)+1/2*b*Si(b*x)*sin(b*x)/x+1/2*b*sin(b*x)^2/x-1
/8*sin(2*b*x)/x^2
```

Rubi [A]
time = 0.14, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(bx)\mathrm{Si}(bx)}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[b*x]*SinIntegral[b*x])/x^3,x]
```

```
[Out] -1/4*(b*Cos[2*b*x])/x + (b*Sin[b*x]^2)/(2*x) - Sin[2*b*x]/(8*x^2) - (Cos[b*
x]*SinIntegral[b*x])/(2*x^2) + (b*Sin[b*x]*SinIntegral[b*x])/(2*x) - b^2*Si
nIntegral[2*b*x] - (b^2*Defer[Int][(Cos[b*x]*SinIntegral[b*x])/x, x])/2
```

Rubi steps

$$\begin{aligned}
\int \frac{\cos(bx)\mathrm{Si}(bx)}{x^3}\,dx &= -\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{1}{2}b\int \frac{\cos(bx)\sin(bx)}{bx^3}\,dx-\frac{1}{2}b\int \frac{\sin(bx)\mathrm{Si}(bx)}{x^2}\,dx\\
&= -\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}+\frac{1}{2}\int \frac{\cos(bx)\sin(bx)}{x^3}\,dx-\frac{1}{2}b^2\int \frac{\sin^2(bx)}{bx^2}\,dx-\frac{1}{2}\\
&= -\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}+\frac{1}{2}\int \frac{\sin(2bx)}{2x^3}\,dx-\frac{1}{2}b\int \frac{\sin^2(bx)}{x^2}\,dx-\frac{1}{2}b^2\int \frac{\mathrm{co}}{}\\
&= \frac{b\sin^2(bx)}{2x}-\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}+\frac{1}{4}\int \frac{\sin(2bx)}{x^3}\,dx-\frac{1}{2}b^2\int \frac{\cos(bx)\mathrm{Si}(b}{x}\\
&= \frac{b\sin^2(bx)}{2x}-\frac{\sin(2bx)}{8x^2}-\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}+\frac{1}{4}b\int \frac{\cos(2bx)}{x^2}\,dx-\frac{1}{2}b^2\int\\
&= -\frac{b\cos(2bx)}{4x}+\frac{b\sin^2(bx)}{2x}-\frac{\sin(2bx)}{8x^2}-\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}-\frac{1}{2}b^2\mathrm{Si}(2bx)\\
&= -\frac{b\cos(2bx)}{4x}+\frac{b\sin^2(bx)}{2x}-\frac{\sin(2bx)}{8x^2}-\frac{\cos(bx)\mathrm{Si}(bx)}{2x^2}+\frac{b\sin(bx)\mathrm{Si}(bx)}{2x}-b^2\mathrm{Si}(2bx)-
\end{aligned}$$

Mathematica [A]
time = 0.58, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\text{Si}(bx)}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[b*x]*SinIntegral[b*x])/x^3,x]
```

```
[Out] Integrate[(Cos[b*x]*SinIntegral[b*x])/x^3, x]
```

Maple [A]
time = 0.21, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\,\text{sinIntegral}\,(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x)*Si(b*x)/x^3,x)
```

```
[Out] int(cos(b*x)*Si(b*x)/x^3,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^3,x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x)*sin_integral(b*x)/x^3, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^3,x, algorithm="fricas")
```

```
[Out] integral(cos(b*x)*sin_integral(b*x)/x^3, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\,\text{Si}\,(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*Si(b*x)/x**3,x)
```

```
[Out] Integral(cos(b*x)*Si(b*x)/x**3, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^3,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x)*sin_integral(b*x)/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{sinint}(b\,x)\,\cos\left(b\,x\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*cos(b*x))/x^3,x)
```

```
[Out] int((sinint(b*x)*cos(b*x))/x^3, x)
```

3.47 $\int \frac{\cos(bx)\mathbf{Si}(bx)}{x^2}\,dx$

Optimal. Leaf size=44

$$b\text{CosIntegral}(2bx) - \frac{\sin(2bx)}{2x} - \frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2$$

```
[Out] b*Ci(2*b*x)-cos(b*x)*Si(b*x)/x-1/2*b*Si(b*x)^2-1/2*sin(2*b*x)/x
```

Rubi [A]
time = 0.07, antiderivative size = 44, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6656, 6818, 12, 4491, 3378, 3383}

$$b\text{CosIntegral}(2bx) - \frac{1}{2}b\text{Si}(bx)^2 - \frac{\text{Si}(bx)\cos(bx)}{x} - \frac{\sin(2bx)}{2x}$$

Antiderivative was successfully verified.

```
[In] Int[(Cos[b*x]*SinIntegral[b*x])/x^2,x]
```

```
[Out] b*CosIntegral[2*b*x] - Sin[2*b*x]/(2*x) - (Cos[b*x]*SinIntegral[b*x])/x - (
b*SinIntegral[b*x]^2)/2
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
```

```
tQ[p, 0]
```

Rule 6656

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^(m + 1)*Cos[a + b*x]*(SinIntegral[
c + d*x]/(f*(m + 1))), x] + (Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Sin[
a + b*x]*SinIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Cos[a + b*x]*(Sin[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cos(bx)\text{Si}(bx)}{x^2}\,dx &= -\frac{\cos(bx)\text{Si}(bx)}{x} + b\int \frac{\cos(bx)\sin(bx)}{bx^2}\,dx - b\int \frac{\sin(bx)\text{Si}(bx)}{x}\,dx \\
&= -\frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2 + \int \frac{\cos(bx)\sin(bx)}{x^2}\,dx \\
&= -\frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2 + \int \frac{\sin(2bx)}{2x^2}\,dx \\
&= -\frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2 + \frac{1}{2}\int \frac{\sin(2bx)}{x^2}\,dx \\
&= -\frac{\sin(2bx)}{2x} - \frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2 + b\int \frac{\cos(2bx)}{x}\,dx \\
&= b\text{Ci}(2bx) - \frac{\sin(2bx)}{2x} - \frac{\cos(bx)\text{Si}(bx)}{x} - \frac{1}{2}b\text{Si}(bx)^2
\end{aligned}$$

Mathematica [F]
time = 0.44, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\text{Si}(bx)}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[b*x]*SinIntegral[b*x])/x^2,x]
[Out] Integrate[(Cos[b*x]*SinIntegral[b*x])/x^2, x]
```

Maple [F]
time = 0.19, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\,\mathrm{sinIntegral}(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x)*Si(b*x)/x^2,x)
```

```
[Out] int(cos(b*x)*Si(b*x)/x^2,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^2,x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x)*sin_integral(b*x)/x^2, x)
```

Fricas [A]
time = 0.38, size = 53, normalized size = 1.20

$$-\frac{bx\,\mathrm{Si}(bx)^2 - bx\,\mathrm{Ci}(2\,bx) - bx\,\mathrm{Ci}(-2\,bx) + 2\,\cos(bx)\sin(bx) + 2\,\cos(bx)\,\mathrm{Si}(bx)}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^2,x, algorithm="fricas")
```

```
[Out] -1/2*(b*x*sin_integral(b*x)^2 - b*x*cos_integral(2*b*x) - b*x*cos_integral(
-2*b*x) + 2*cos(b*x)*sin(b*x) + 2*cos(b*x)*sin_integral(b*x))/x
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\,\mathrm{Si}(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*Si(b*x)/x**2,x)
```

```
[Out] Integral(cos(b*x)*Si(b*x)/x**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x^2,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x)*sin_integral(b*x)/x^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{sinint}(b\,x)\,\cos\left(b\,x\right)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*cos(b*x))/x^2,x)
```

```
[Out] int((sinint(b*x)*cos(b*x))/x^2, x)
```

3.48 $\int \frac{\cos(bx)\mathbf{Si}(bx)}{x} \, dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\cos(bx)\text{Si}(bx)}{x},x\right)$$

[Out] CannotIntegrate(cos(b*x)*Si(b*x)/x,x)

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(bx)\text{Si}(bx)}{x} \, dx$$

Verification is not applicable to the result.

[In] Int[(Cos[b*x]*SinIntegral[b*x])/x,x]

[Out] Defer[Int][(Cos[b*x]*SinIntegral[b*x])/x, x]

Rubi steps

$$\int \frac{\cos(bx)\text{Si}(bx)}{x} \, dx = \int \frac{\cos(bx)\text{Si}(bx)}{x} \, dx$$

Mathematica [A]
time = 0.66, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\text{Si}(bx)}{x} \, dx$$

Verification is not applicable to the result.

[In] Integrate[(Cos[b*x]*SinIntegral[b*x])/x,x]

[Out] Integrate[(Cos[b*x]*SinIntegral[b*x])/x, x]

Maple [A]
time = 0.22, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\,\text{sinIntegral}(bx)}{x} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x)*Si(b*x)/x,x)
[Out] int(cos(b*x)*Si(b*x)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x,x, algorithm="maxima")
[Out] integrate(cos(b*x)*sin_integral(b*x)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x,x, algorithm="fricas")
[Out] integral(cos(b*x)*sin_integral(b*x)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\operatorname{Si}(bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*Si(b*x)/x,x)
[Out] Integral(cos(b*x)*Si(b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x)/x,x, algorithm="giac")
[Out] integrate(cos(b*x)*sin_integral(b*x)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{\mathrm{sinint}(b\,x)\,\cos(b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(b*x)*cos(b*x))/x,x)
[Out] int((sinint(b*x)*cos(b*x))/x, x)
```

3.49 $\int \cos(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=34

$$\frac{\text{CosIntegral}(2bx)}{2b}-\frac{\log(x)}{2b}+\frac{\sin(bx)\text{Si}(bx)}{b}$$

```
[Out] 1/2*Ci(2*b*x)/b-1/2*ln(x)/b+Si(b*x)*sin(b*x)/b
```

Rubi [A]
time = 0.04, antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.444, Rules used = {6652, 12, 3393, 3383}

$$\frac{\text{CosIntegral}(2bx)}{2b}+\frac{\text{Si}(bx)\sin(bx)}{b}-\frac{\log(x)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] CosIntegral[2*b*x]/(2*b) - Log[x]/(2*b) + (Sin[b*x]*SinIntegral[b*x])/b
```

Rule 12

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

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\int \cos(bx)\mathrm{Si}(bx)\,dx = \frac{\sin(bx)\mathrm{Si}(bx)}{b} - \int \frac{\sin^2(bx)}{bx}\,dx$$
$$= \frac{\sin(bx)\mathrm{Si}(bx)}{b} - \frac{\int \frac{\sin^2(bx)}{x}\,dx}{b}$$
$$= \frac{\sin(bx)\mathrm{Si}(bx)}{b} - \frac{\int \left(\frac{1}{2x} - \frac{\cos(2bx)}{2x}\right)dx}{b}$$
$$= -\frac{\log(x)}{2b} + \frac{\sin(bx)\mathrm{Si}(bx)}{b} + \frac{\int \frac{\cos(2bx)}{x}\,dx}{2b}$$
$$= \frac{\mathrm{Ci}(2bx)}{2b} - \frac{\log(x)}{2b} + \frac{\sin(bx)\mathrm{Si}(bx)}{b}$$

Mathematica [A]
time = 0.01, size = 36, normalized size = 1.06

$$\frac{\mathrm{CosIntegral}(2bx)}{2b} - \frac{\log(bx)}{2b} + \frac{\sin(bx)\mathrm{Si}(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[b*x]*SinIntegral[b*x],x]
[Out] CosIntegral[2*b*x]/(2*b) - Log[b*x]/(2*b) + (Sin[b*x]*SinIntegral[b*x])/b
```

Maple [A]
time = 0.36, size = 28, normalized size = 0.82

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)\sin(bx) - \frac{\ln(bx)}{2} + \frac{\mathrm{cosineIntegral}(2bx)}{2}}{b}$	28
default	$\frac{\mathrm{sinIntegral}(bx)\sin(bx) - \frac{\ln(bx)}{2} + \frac{\mathrm{cosineIntegral}(2bx)}{2}}{b}$	28

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x)*Si(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b*(Si(b*x)*sin(b*x)-1/2*ln(b*x)+1/2*Ci(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.36, size = 30, normalized size = 0.88

$$\frac{4\,\sin\left(bx\right)\operatorname{Si}\left(bx\right)+\operatorname{Ci}\left(2\,bx\right)+\operatorname{Ci}\left(-2\,bx\right)-2\,\log\left(x\right)}{4\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] 1/4*(4*sin(b*x)*sin_integral(b*x) + cos_integral(2*b*x) + cos_integral(-2*b
*x) - 2*log(x))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\cos\left(bx\right)\operatorname{Si}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*Si(b*x),x)
```

```
[Out] Integral(cos(b*x)*Si(b*x), x)
```

Giac [A]
time = 0.41, size = 33, normalized size = 0.97

$$\frac{\sin\left(bx\right)\operatorname{Si}\left(bx\right)}{b}+\frac{\operatorname{Ci}\left(2\,bx\right)+\operatorname{Ci}\left(-2\,bx\right)-2\,\log\left(x\right)}{4\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x)*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] sin(b*x)*sin_integral(b*x)/b + 1/4*(cos_integral(2*b*x) + cos_integral(-2*b
*x) - 2*log(x))/b
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\frac{\mathrm{cosint}(2\,b\,x)-\ln\left(x\right)+2\,\mathrm{sinint}(b\,x)\,\sin\left(b\,x\right)}{2\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(b*x)*cos(b*x),x)
```

```
[Out] (cosint(2*b*x) - log(x) + 2*sinint(b*x)*sin(b*x))/(2*b)
```

3.50 $\int x\cos(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=61

$$-\frac{x}{2b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\text{Si}(2bx)}{2b^2}$$

```
[Out] -1/2*x/b+cos(b*x)*Si(b*x)/b^2-1/2*Si(2*b*x)/b^2+1/2*cos(b*x)*sin(b*x)/b^2+x
*Si(b*x)*sin(b*x)/b
```

Rubi [A]
time = 0.05, antiderivative size = 61, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}}=0.700$, Rules used = {6654, 12, 2715, 8, 6646, 4491, 3380}

$$-\frac{\text{Si}(2bx)}{2b^2}+\frac{\text{Si}(bx)\cos(bx)}{b^2}+\frac{\sin(bx)\cos(bx)}{2b^2}+\frac{x\text{Si}(bx)\sin(bx)}{b}-\frac{x}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] -1/2*x/b + (Cos[b*x]*Sin[b*x])/(2*b^2) + (Cos[b*x]*SinIntegral[b*x])/b^2 +
(x*Sin[b*x]*SinIntegral[b*x])/b - SinIntegral[2*b*x]/(2*b^2)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\begin{aligned}
\int x\cos(bx)\text{Si}(bx)\,dx &= \frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\int \sin(bx)\text{Si}(bx)\,dx}{b}-\int \frac{\sin^2(bx)}{b}\,dx\\
&= \frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\int \frac{\cos(bx)\sin(bx)}{bx}\,dx}{b}-\frac{\int \sin^2(bx)\,dx}{b}\\
&= \frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\int \frac{\cos(bx)\sin(bx)}{x}\,dx}{b^2}-\frac{\int 1\,dx}{2b}\\
&= -\frac{x}{2b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\int \frac{\sin(2bx)}{2x}\,dx}{b^2}\\
&= -\frac{x}{2b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\int \frac{\sin(2bx)}{x}\,dx}{2b^2}\\
&= -\frac{x}{2b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\cos(bx)\text{Si}(bx)}{b^2}+\frac{x\sin(bx)\text{Si}(bx)}{b}-\frac{\text{Si}(2bx)}{2b^2}
\end{aligned}$$

Mathematica [A]
time = 0.04, size = 42, normalized size = 0.69

$$\frac{-2bx+\sin(2bx)+4(\cos(bx)+bx\sin(bx))\text{Si}(bx)-2\text{Si}(2bx)}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] (-2*b*x + Sin[2*b*x] + 4*(Cos[b*x] + b*x*Sin[b*x])*SinIntegral[b*x] - 2*Sin
Integral[2*b*x])/(4*b^2)
```

Maple [A]
time = 0.45, size = 44, normalized size = 0.72

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)(\cos(bx)+bx\sin(bx))-\frac{\mathrm{sinIntegral}(2bx)}{2}+\frac{\sin(bx)\cos(bx)}{2}-\frac{bx}{2}}{b^2}$	44
default	$\frac{\mathrm{sinIntegral}(bx)(\cos(bx)+bx\sin(bx))-\frac{\mathrm{sinIntegral}(2bx)}{2}+\frac{\sin(bx)\cos(bx)}{2}-\frac{bx}{2}}{b^2}$	44

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cos(b*x)*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Si(b*x)*(cos(b*x)+b*x*sin(b*x))-1/2*Si(2*b*x)+1/2*sin(b*x)*cos(b*x)-
1/2*b*x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x)*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.37, size = 43, normalized size = 0.70

$$-\frac{bx-(2\,bx\,\mathrm{Si}\,(bx)+\cos{(bx)})\sin{(bx)}-2\,\cos{(bx)}\,\mathrm{Si}\,(bx)+\mathrm{Si}\,(2\,bx)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x)*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(b*x - (2*b*x*sin_integral(b*x) + cos(b*x))*sin(b*x) - 2*cos(b*x)*sin_
integral(b*x) + sin_integral(2*b*x))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos{(bx)}\,\mathrm{Si}\,(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x)*Si(b*x),x)
```

```
[Out] Integral(x*cos(b*x)*Si(b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.41, size = 124, normalized size = 2.03

$$\left(\frac{x\sin\left(bx\right)}{b}+\frac{\cos\left(bx\right)}{b^2}\right)\mathrm{Si}\left(bx\right)-\frac{2\,bx\tan\left(bx\right)^2+\Im(\mathrm{Ci}\left(2\,bx\right))\tan\left(bx\right)^2-\Im(\mathrm{Ci}\left(-2\,bx\right))\tan\left(bx\right)^2+2\,\mathrm{Si}\left(2\,bx\right)\tan\left(bx\right)^2+2\,bx+\Im(\mathrm{Ci}\left(2\,bx\right))-\Im(\mathrm{Ci}\left(-2\,bx\right))+2\,\mathrm{Si}\left(2\,bx\right)-2\,\tan\left(bx\right)}{4\left(b^2\tan\left(bx\right)^2+b^2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x)*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] (x*sin(b*x)/b + cos(b*x)/b^2)*sin_integral(b*x) - 1/4*(2*b*x*tan(b*x)^2 + i
mag_part(cos_integral(2*b*x))*tan(b*x)^2 - imag_part(cos_integral(-2*b*x))*
tan(b*x)^2 + 2*sin_integral(2*b*x)*tan(b*x)^2 + 2*b*x + imag_part(cos_integ
ral(2*b*x)) - imag_part(cos_integral(-2*b*x)) + 2*sin_integral(2*b*x) - 2*t
an(b*x))/(b^2*tan(b*x)^2 + b^2)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int x\,\mathrm{sinint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(b*x)*cos(b*x),x)
```

```
[Out] int(x*sinint(b*x)*cos(b*x), x)
```

3.51 $\int x^2 \cos(bx)\mathbf{Si}(bx)\, dx$

Optimal. Leaf size=98

$$-\frac{x^2}{4b}-\frac{\text{CosIntegral}(2bx)}{b^3}+\frac{\log(x)}{b^3}+\frac{x\cos(bx)\sin(bx)}{2b^2}-\frac{5\sin^2(bx)}{4b^3}+\frac{2x\cos(bx)\text{Si}(bx)}{b^2}-\frac{2\sin(bx)\text{Si}(bx)}{b^3}+\frac{x^2\sin(bx)\text{Si}(bx)}{b}$$

```
[Out] -1/4*x^2/b-Ci(2*b*x)/b^3+ln(x)/b^3+2*x*cos(b*x)*Si(b*x)/b^2+1/2*x*cos(b*x)*
sin(b*x)/b^2-2*Si(b*x)*sin(b*x)/b^3+x^2*Si(b*x)*sin(b*x)/b-5/4*sin(b*x)^2/b
^3
```

Rubi [A]
time = 0.09, antiderivative size = 98, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {6654, 12, 3391, 30, 6648, 2644, 6652, 3393, 3383}

$$-\frac{\text{CosIntegral}(2bx)}{b^3}-\frac{2\text{Si}(bx)\sin(bx)}{b^3}+\frac{\log(x)}{b^3}-\frac{5\sin^2(bx)}{4b^3}+\frac{2x\text{Si}(bx)\cos(bx)}{b^2}+\frac{x\sin(bx)\cos(bx)}{2b^2}+\frac{x^2\text{Si}(bx)\sin(bx)}{b}-\frac{x^2}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] -1/4*x^2/b - CosIntegral[2*b*x]/b^3 + Log[x]/b^3 + (x*Cos[b*x]*Sin[b*x])/(2
*b^2) - (5*Sin[b*x]^2)/(4*b^3) + (2*x*Cos[b*x]*SinIntegral[b*x])/b^2 - (2*S
in[b*x]*SinIntegral[b*x])/b^3 + (x^2*Sin[b*x]*SinIntegral[b*x])/b
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\cos(bx)\mathrm{Si}(bx)\,dx = \frac{x^2\sin(bx)\mathrm{Si}(bx)}{b} - \frac{2\int x\sin(bx)\mathrm{Si}(bx)\,dx}{b} - \int \frac{x\sin^2(bx)}{b}\,dx$$
$$= \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} + \frac{x^2\sin(bx)\mathrm{Si}(bx)}{b} - \frac{2\int\cos(bx)\mathrm{Si}(bx)\,dx}{b^2} - \frac{\int x\sin^2(bx)\,dx}{b} - 2$$
$$= \frac{x\cos(bx)\sin(bx)}{2b^2} - \frac{\sin^2(bx)}{4b^3} + \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} - \frac{2\sin(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^2\sin(bx)\mathrm{Si}(}{b}$$
$$= -\frac{x^2}{4b} + \frac{x\cos(bx)\sin(bx)}{2b^2} - \frac{\sin^2(bx)}{4b^3} + \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} - \frac{2\sin(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^2\sin}{}$$
$$= -\frac{x^2}{4b} + \frac{x\cos(bx)\sin(bx)}{2b^2} - \frac{5\sin^2(bx)}{4b^3} + \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} - \frac{2\sin(bx)\mathrm{Si}(bx)}{b^3} + \frac{x^2 s}{}$$
$$= -\frac{x^2}{4b} + \frac{\log(x)}{b^3} + \frac{x\cos(bx)\sin(bx)}{2b^2} - \frac{5\sin^2(bx)}{4b^3} + \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} - \frac{2\sin(bx)\mathrm{Si}(}{b^3}$$
$$= -\frac{x^2}{4b} - \frac{\mathrm{Ci}(2bx)}{b^3} + \frac{\log(x)}{b^3} + \frac{x\cos(bx)\sin(bx)}{2b^2} - \frac{5\sin^2(bx)}{4b^3} + \frac{2x\cos(bx)\mathrm{Si}(bx)}{b^2} - 2$$

Mathematica [A]
time = 0.07, size = 72, normalized size = 0.73

$$\frac{-2b^2x^2 + 5\cos(2bx) - 8\mathrm{CosIntegral}(2bx) + 8\log(x) + 2bx\sin(2bx) + 8(2bx\cos(bx) + (-2+b^2x^2)\sin(bx))\,\mathrm{Si}(bx)}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] (-2*b^2*x^2 + 5*Cos[2*b*x] - 8*CosIntegral[2*b*x] + 8*Log[x] + 2*b*x*Sin[2*
b*x] + 8*(2*b*x*Cos[b*x] + (-2 + b^2*x^2)*Sin[b*x])*SinIntegral[b*x])/(8*b^
3)
```

Maple [A]
time = 0.37, size = 89, normalized size = 0.91

method	result
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)(b^2x^2\sin(bx)-2\sin(bx)+2bx\cos(bx))-bx\left(-\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+\frac{b^2x^2}{4}-\frac{(\sin^2(bx))}{4}+\ln(bx)-\mathrm{cosineInte}}{b^3}$
default	$\frac{\mathrm{sinIntegral}(bx)(b^2x^2\sin(bx)-2\sin(bx)+2bx\cos(bx))-bx\left(-\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+\frac{b^2x^2}{4}-\frac{(\sin^2(bx))}{4}+\ln(bx)-\mathrm{cosineInte}}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cos(b*x)*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Si(b*x)*(b^2*x^2*sin(b*x)-2*sin(b*x)+2*b*x*cos(b*x))-b*x*(-1/2*sin(b
*x)*cos(b*x)+1/2*b*x)+1/4*b^2*x^2-1/4*sin(b*x)^2+ln(b*x)-Ci(2*b*x)+cos(b*x)
^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*cos(b*x)*sin_integral(b*x),x, algorithm="maxima")
[Out] integrate(x^2*cos(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.35, size = 80, normalized size = 0.82

$$-\frac{b^2x^2 - 8\,bx\cos(bx)\operatorname{Si}(bx) - 5\,\cos(bx)^2 - 2\,(bx\cos(bx) + 2\,(b^2x^2 - 2)\operatorname{Si}(bx))\sin(bx) + 2\,\operatorname{Ci}(2\,bx) + 2\,\operatorname{Ci}(-2\,bx) - 4\,\log(x)}{4\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*cos(b*x)*sin_integral(b*x),x, algorithm="fricas")
[Out] -1/4*(b^2*x^2 - 8*b*x*cos(b*x)*sin_integral(b*x) - 5*cos(b*x)^2 - 2*(b*x*co
s(b*x) + 2*(b^2*x^2 - 2)*sin_integral(b*x))*sin(b*x) + 2*cos_integral(2*b*x
) + 2*cos_integral(-2*b*x) - 4*log(x))/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\cos(bx)\operatorname{Si}(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*cos(b*x)*Si(b*x),x)
[Out] Integral(x**2*cos(b*x)*Si(b*x), x)
```

Giac [A]
time = 0.42, size = 82, normalized size = 0.84

$$\left(\frac{2\,x\cos(bx)}{b^2} + \frac{(b^2x^2 - 2)\sin(bx)}{b^3}\right)\operatorname{Si}(bx) - \frac{2\,b^2x^2 - 2\,bx\sin(2\,bx) - 5\,\cos(2\,bx) + 4\,\operatorname{Ci}(2\,bx) + 4\,\operatorname{Ci}(-2\,bx) - 8\,\log(x)}{8\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*cos(b*x)*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] (2*x*cos(b*x)/b^2 + (b^2*x^2 - 2)*sin(b*x)/b^3)*sin_integral(b*x) - 1/8*(2*
b^2*x^2 - 2*b*x*sin(2*b*x) - 5*cos(2*b*x) + 4*cos_integral(2*b*x) + 4*cos_i
ntegral(-2*b*x) - 8*log(x))/b^3
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{sinint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(b*x)*cos(b*x),x)
```

```
[Out] int(x^2*sinint(b*x)*cos(b*x), x)
```

3.52 $\int x^3 \cos(bx)\mathbf{Si}(bx)\,dx$

Optimal. Leaf size=128

$$\frac{4x}{b^3}-\frac{x^3}{6b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}+\frac{3x^2\cos(bx)\mathrm{Si}(bx)}{b^2}-\frac{6x\sin(bx)}{b^3}$$

```
[Out] 4*x/b^3-1/6*x^3/b-6*cos(b*x)*Si(b*x)/b^4+3*x^2*cos(b*x)*Si(b*x)/b^2+3*Si(2*
b*x)/b^4-4*cos(b*x)*sin(b*x)/b^4+1/2*x^2*cos(b*x)*sin(b*x)/b^2-6*x*Si(b*x)*
sin(b*x)/b^3+x^3*Si(b*x)*sin(b*x)/b-2*x*sin(b*x)^2/b^3
```

Rubi [A]
time = 0.14, antiderivative size = 128, normalized size of antiderivative = 1.00, number of steps used = 20, number of rules used = 11, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.917$, Rules used = {6654, 12, 3392, 30, 2715, 8, 6648, 3524, 6646, 4491, 3380}

$$\frac{3\mathrm{Si}(2bx)}{b^4}-\frac{6\mathrm{Si}(bx)\cos(bx)}{b^4}-\frac{4\sin(bx)\cos(bx)}{b^4}-\frac{6x\mathrm{Si}(bx)\sin(bx)}{b^3}+\frac{4x}{b^3}-\frac{2x\sin^2(bx)}{b^3}+\frac{3x^2\mathrm{Si}(bx)\cos(bx)}{b^2}+\frac{x^2\sin(bx)\cos(bx)}{2b^2}+\frac{x^3\mathrm{Si}(bx)\sin(bx)}{b}-\frac{x^3}{6b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*Cos[b*x]*SinIntegral[b*x],x]
```

```
[Out] (4*x)/b^3 - x^3/(6*b) - (4*Cos[b*x]*Sin[b*x])/b^4 + (x^2*Cos[b*x]*Sin[b*x])
/(2*b^2) - (2*x*Sin[b*x]^2)/b^3 - (6*Cos[b*x]*SinIntegral[b*x])/b^4 + (3*x^
2*Cos[b*x]*SinIntegral[b*x])/b^2 - (6*x*Sin[b*x]*SinIntegral[b*x])/b^3 + (x
^3*Sin[b*x]*SinIntegral[b*x])/b + (3*SinIntegral[2*b*x])/b^4
```

Rule 8

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

Rule 12

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

Rule 30

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3392

```
Int[((c_.) + (d_.)*(x_))^(m_)*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbo
l] :> Simp[d*m*(c + d*x)^(m - 1)*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist
[b^2*((n - 1)/n), Int[(c + d*x)^m*(b*Sin[e + f*x])^(n - 2), x], x] - Dist[d
^2*m*((m - 1)/(f^2*n^2)), Int[(c + d*x)^(m - 2)*(b*Sin[e + f*x])^n, x], x]
- Simp[b*(c + d*x)^m*Cos[e + f*x]*((b*Sin[e + f*x])^(n - 1)/(f*n)), x]) /;
FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 1]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
```

```
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\begin{aligned}
\int x^3\cos(bx)\mathrm{Si}(bx)\,dx &= \frac{x^3\sin(bx)\mathrm{Si}(bx)}{b}-\frac{3\int x^2\sin(bx)\mathrm{Si}(bx)\,dx}{b}-\int\frac{x^2\sin^2(bx)}{b}\,dx\\
&= \frac{3x^2\cos(bx)\mathrm{Si}(bx)}{b^2}+\frac{x^3\sin(bx)\mathrm{Si}(bx)}{b}-\frac{6\int x\cos(bx)\mathrm{Si}(bx)\,dx}{b^2}-\frac{\int x^2\sin^2(bx)\,dx}{b}-\\
&= \frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{x\sin^2(bx)}{2b^3}+\frac{3x^2\cos(bx)\mathrm{Si}(bx)}{b^2}-\frac{6x\sin(bx)\mathrm{Si}(bx)}{b^3}+\frac{x^3\sin(bx}{b}\\
&= -\frac{x^3}{6b}-\frac{\cos(bx)\sin(bx)}{4b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}+\frac{3x^2}{}\\
&= \frac{x}{4b^3}-\frac{x^3}{6b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}\\
&= \frac{4x}{b^3}-\frac{x^3}{6b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}-\\
&= \frac{4x}{b^3}-\frac{x^3}{6b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}-\\
&= \frac{4x}{b^3}-\frac{x^3}{6b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(bx)\sin(bx)}{2b^2}-\frac{2x\sin^2(bx)}{b^3}-\frac{6\cos(bx)\mathrm{Si}(bx)}{b^4}-
\end{aligned}$$

Mathematica [**A**]
time = 0.08, size = 94, normalized size = 0.73

$$\frac{36bx-2b^3x^3+12bx\cos(2bx)-24\sin(2bx)+3b^2x^2\sin(2bx)+12(3(-2+b^2x^2)\cos(bx)+bx(-6+b^2x^2)\sin(bx))\,\mathrm{Si}(bx)+36\mathrm{Si}(2bx)}{12b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*Cos[b*x]*SinIntegral[b*x],x]
[Out] (36*b*x - 2*b^3*x^3 + 12*b*x*Cos[2*b*x] - 24*Sin[2*b*x] + 3*b^2*x^2*Sin[2*b
*x] + 12*(3*(-2 + b^2*x^2)*Cos[b*x] + b*x*(-6 + b^2*x^2)*Sin[b*x])*SinInteg
ral[b*x] + 36*SinIntegral[2*b*x])/(12*b^4)
```

Maple [**A**]
time = 0.53, size = 111, normalized size = 0.87

method	result
derivativedivides	$\frac{\mathrm{sinIntegral}(bx)\left(b^3x^3\sin(bx)+3b^2x^2\cos(bx)-6\cos(bx)-6bx\sin(bx)\right)-b^2x^2\left(-\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+2bx\left(\cos^2(bx)\right)-4\sin(}{b^4}$

default	$\frac{\text{sinIntegral}(bx)\left(b^3x^3\sin(bx)+3b^2x^2\cos(bx)-6\cos(bx)-6bx\sin(bx)\right)-b^2x^2\left(-\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+2bx\left(\cos^2(bx)\right)-4\sin}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cos(b*x)*Si(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(Si(b*x)*(b^3*x^3*sin(b*x)+3*b^2*x^2*cos(b*x)-6*cos(b*x)-6*b*x*sin(b*
x))-b^2*x^2*(-1/2*sin(b*x)*cos(b*x)+1/2*b*x)+2*b*x*cos(b*x)^2-4*sin(b*x)*co
s(b*x)+2*b*x+1/3*b^3*x^3+3*Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*cos(b*x)*sin_integral(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^3*cos(b*x)*sin_integral(b*x), x)
```

Fricas [A]
time = 0.35, size = 92, normalized size = 0.72

$$-\frac{b^3x^3-12\,bx\cos(bx)^2-18\left(b^2x^2-2\right)\cos(bx)\operatorname{Si}(bx)-12\,bx-3\left(\left(b^2x^2-8\right)\cos(bx)+2\left(b^3x^3-6\,bx\right)\operatorname{Si}(bx)\right)\sin(bx)-18\operatorname{Si}(2\,bx)}{6\,b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*cos(b*x)*sin_integral(b*x),x, algorithm="fricas")
```

```
[Out] -1/6*(b^3*x^3 - 12*b*x*cos(b*x)^2 - 18*(b^2*x^2 - 2)*cos(b*x)*sin_integral(
b*x) - 12*b*x - 3*((b^2*x^2 - 8)*cos(b*x) + 2*(b^3*x^3 - 6*b*x)*sin_integra
l(b*x))*sin(b*x) - 18*sin_integral(2*b*x))/b^4
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3\cos(bx)\operatorname{Si}(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*cos(b*x)*Si(b*x),x)
```

```
[Out] Integral(x**3*cos(b*x)*Si(b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.42, size = 180, normalized size = 1.41

$$\left(\frac{3\left(b^2x^2-2\right)\cos(bx)}{b^4}+\frac{\left(b^3x^3-6\,bx\right)\sin(bx)}{b^4}\right)\operatorname{Si}(bx)-\frac{b^3x^3\tan(bx)^2+b^3x^3-3\,b^2x^2\tan(bx)-12\,bx\tan(bx)^2-9\,\Im(\operatorname{Ci}(2\,bx))\tan(bx)^2+9\,\Im(\operatorname{Ci}(-2\,bx))\tan(bx)^2-18\operatorname{Si}(2\,bx)\tan(bx)^2-24\,bx-9\,\Im(\operatorname{Ci}(2\,bx))+9\,\Im(\operatorname{Ci}(-2\,bx))-18\operatorname{Si}(2\,bx)+24\tan(bx)}{6\left(b^4\tan(bx)^2+b^4\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*cos(b*x)*sin_integral(b*x),x, algorithm="giac")
```

```
[Out] (3*(b^2*x^2 - 2)*cos(b*x)/b^4 + (b^3*x^3 - 6*b*x)*sin(b*x)/b^4)*sin_integra
l(b*x) - 1/6*(b^3*x^3*tan(b*x)^2 + b^3*x^3 - 3*b^2*x^2*tan(b*x) - 12*b*x*ta
n(b*x)^2 - 9*imag_part(cos_integral(2*b*x))*tan(b*x)^2 + 9*imag_part(cos_in
tegral(-2*b*x))*tan(b*x)^2 - 18*sin_integral(2*b*x)*tan(b*x)^2 - 24*b*x - 9
*imag_part(cos_integral(2*b*x)) + 9*imag_part(cos_integral(-2*b*x)) - 18*si
n_integral(2*b*x) + 24*tan(b*x))/(b^4*tan(b*x)^2 + b^4)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3 \operatorname{sinint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*sinint(b*x)*cos(b*x),x)
```

```
[Out] int(x^3*sinint(b*x)*cos(b*x), x)
```

3.53 $\int \sin(5x)\mathbf{Si}(2x)\,dx$

Optimal. Leaf size=29

$$-\frac{1}{5}\cos(5x)\text{Si}(2x)-\frac{\text{Si}(3x)}{10}+\frac{\text{Si}(7x)}{10}$$

```
[Out] -1/5*cos(5*x)*Si(2*x)-1/10*Si(3*x)+1/10*Si(7*x)
```

Rubi [A]
time = 0.04, antiderivative size = 29, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {6646, 12, 4515, 3380}

$$-\frac{\text{Si}(3x)}{10}+\frac{\text{Si}(7x)}{10}-\frac{1}{5}\text{Si}(2x)\cos(5x)$$

Antiderivative was successfully verified.

```
[In] Int[Sin[5*x]*SinIntegral[2*x],x]
```

```
[Out] -1/5*(Cos[5*x]*SinIntegral[2*x]) - SinIntegral[3*x]/10 + SinIntegral[7*x]/1
0
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int \sin(5x)\text{Si}(2x)\,dx &= -\frac{1}{5}\cos(5x)\text{Si}(2x) + \frac{2}{5}\int \frac{\cos(5x)\sin(2x)}{2x}\,dx \\
&= -\frac{1}{5}\cos(5x)\text{Si}(2x) + \frac{1}{5}\int \frac{\cos(5x)\sin(2x)}{x}\,dx \\
&= -\frac{1}{5}\cos(5x)\text{Si}(2x) + \frac{1}{5}\int \left(-\frac{\sin(3x)}{2x} + \frac{\sin(7x)}{2x}\right)dx \\
&= -\frac{1}{5}\cos(5x)\text{Si}(2x) - \frac{1}{10}\int \frac{\sin(3x)}{x}\,dx + \frac{1}{10}\int \frac{\sin(7x)}{x}\,dx \\
&= -\frac{1}{5}\cos(5x)\text{Si}(2x) - \frac{\text{Si}(3x)}{10} + \frac{\text{Si}(7x)}{10}
\end{aligned}
$$

Mathematica [A]
time = 0.02, size = 25, normalized size = 0.86

$$\frac{1}{10}(-2\cos(5x)\text{Si}(2x) - \text{Si}(3x) + \text{Si}(7x))$$

Antiderivative was successfully verified.

```
[In] Integrate[Sin[5*x]*SinIntegral[2*x],x]
[Out] (-2*Cos[5*x]*SinIntegral[2*x] - SinIntegral[3*x] + SinIntegral[7*x])/10
```

Maple [A]
time = 0.90, size = 24, normalized size = 0.83

method	result	size
default	$-\frac{\cos(5x)\,\text{sinIntegral}(2x)}{5} - \frac{\text{sinIntegral}(3x)}{10} + \frac{\text{sinIntegral}(7x)}{10}$	24

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(2*x)*sin(5*x),x,method=_RETURNVERBOSE)
[Out] -1/5*cos(5*x)*Si(2*x)-1/10*Si(3*x)+1/10*Si(7*x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(2*x)*sin(5*x),x, algorithm="maxima")
[Out] integrate(sin(5*x)*sin_integral(2*x), x)
```

Fricas [A]
time = 0.35, size = 41, normalized size = 1.41

$$-\frac{16}{5}\cos\left(x\right)^{5}\operatorname{Si}\left(2\,x\right)+4\,\cos\left(x\right)^{3}\operatorname{Si}\left(2\,x\right)-\cos\left(x\right)\operatorname{Si}\left(2\,x\right)+\frac{1}{10}\,\operatorname{Si}\left(7\,x\right)-\frac{1}{10}\,\operatorname{Si}\left(3\,x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(2*x)*sin(5*x),x, algorithm="fricas")
```

```
[Out] -16/5*cos(x)^5*sin_integral(2*x) + 4*cos(x)^3*sin_integral(2*x) - cos(x)*si
n_integral(2*x) + 1/10*sin_integral(7*x) - 1/10*sin_integral(3*x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \sin\left(5x\right)\operatorname{Si}\left(2x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(2*x)*sin(5*x),x)
```

```
[Out] Integral(sin(5*x)*Si(2*x), x)
```

Giac [A]
time = 0.40, size = 23, normalized size = 0.79

$$-\frac{1}{5}\cos\left(5\,x\right)\operatorname{Si}\left(2\,x\right)+\frac{1}{10}\,\operatorname{Si}\left(7\,x\right)-\frac{1}{10}\,\operatorname{Si}\left(3\,x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(2*x)*sin(5*x),x, algorithm="giac")
```

```
[Out] -1/5*cos(5*x)*sin_integral(2*x) + 1/10*sin_integral(7*x) - 1/10*sin_integra
l(3*x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int \mathrm{sinint}(2\,x)\,\sin\left(5\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(2*x)*sin(5*x),x)
```

```
[Out] int(sinint(2*x)*sin(5*x), x)
```

3.54 $\int \cos(5x)\mathbf{Si}(2x)\,dx$

Optimal. Leaf size=29

$$-\frac{1}{10}\text{CosIntegral}(3x)+\frac{1}{10}\text{CosIntegral}(7x)+\frac{1}{5}\sin(5x)\text{Si}(2x)$$

```
[Out] -1/10*Ci(3*x)+1/10*Ci(7*x)+1/5*Si(2*x)*sin(5*x)
```

Rubi [A]
time = 0.04, antiderivative size = 29, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {6652, 12, 4513, 3383}

$$-\frac{1}{10}\text{CosIntegral}(3x)+\frac{1}{10}\text{CosIntegral}(7x)+\frac{1}{5}\text{Si}(2x)\sin(5x)$$

Antiderivative was successfully verified.

```
[In] Int[Cos[5*x]*SinIntegral[2*x],x]
```

```
[Out] -1/10*CosIntegral[3*x] + CosIntegral[7*x]/10 + (Sin[5*x]*SinIntegral[2*x])/
5
```

Rule 12

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

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 4513

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]^(p_.)*Sin[(c_.) + (d
_.)*(x_)]^(q_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Sin[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int \cos(5x)\text{Si}(2x)\,dx &= \frac{1}{5}\sin(5x)\text{Si}(2x) - \frac{2}{5}\int \frac{\sin(2x)\sin(5x)}{2x}\,dx\\
&= \frac{1}{5}\sin(5x)\text{Si}(2x) - \frac{1}{5}\int \frac{\sin(2x)\sin(5x)}{x}\,dx\\
&= \frac{1}{5}\sin(5x)\text{Si}(2x) - \frac{1}{5}\int \left(\frac{\cos(3x)}{2x} - \frac{\cos(7x)}{2x}\right)\,dx\\
&= \frac{1}{5}\sin(5x)\text{Si}(2x) - \frac{1}{10}\int \frac{\cos(3x)}{x}\,dx + \frac{1}{10}\int \frac{\cos(7x)}{x}\,dx\\
&= -\frac{\text{Ci}(3x)}{10} + \frac{\text{Ci}(7x)}{10} + \frac{1}{5}\sin(5x)\text{Si}(2x)
\end{aligned}
$$

Mathematica [**A**]
time = 0.02, size = 25, normalized size = 0.86

$$\frac{1}{10}(-\text{CosIntegral}(3x) + \text{CosIntegral}(7x) + 2\sin(5x)\text{Si}(2x))$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[5*x]*SinIntegral[2*x],x]
[Out] (-CosIntegral[3*x] + CosIntegral[7*x] + 2*Sin[5*x]*SinIntegral[2*x])/10
```

Maple [**A**]
time = 0.93, size = 24, normalized size = 0.83

method	result	size
default	$-\frac{\text{cosineIntegral}(3x)}{10}+\frac{\text{cosineIntegral}(7x)}{10}+\frac{\text{sinIntegral}(2x)\sin(5x)}{5}$	24

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(5*x)*Si(2*x),x,method=_RETURNVERBOSE)
[Out] -1/10*Ci(3*x)+1/10*Ci(7*x)+1/5*Si(2*x)*sin(5*x)
```

Maxima [**F**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(5*x)*sin_integral(2*x),x, algorithm="maxima")
```

```
[Out] integrate(cos(5*x)*sin_integral(2*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 54 vs. $2(23) = 46$.
time = 0.36, size = 54, normalized size = 1.86

$$\frac{1}{5}\left(16\cos\left(x\right)^{4}\mathrm{Si}\left(2x\right)-12\cos\left(x\right)^{2}\mathrm{Si}\left(2x\right)+\mathrm{Si}\left(2x\right)\right)\sin\left(x\right)+\frac{1}{20}\mathrm{Ci}\left(7x\right)-\frac{1}{20}\mathrm{Ci}\left(3x\right)-\frac{1}{20}\mathrm{Ci}\left(-3x\right)+\frac{1}{20}\mathrm{Ci}\left(-7x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(5*x)*sin_integral(2*x),x, algorithm="fricas")
```

```
[Out] 1/5*(16*cos(x)^4*sin_integral(2*x) - 12*cos(x)^2*sin_integral(2*x) + sin_in
tegral(2*x))*sin(x) + 1/20*cos_integral(7*x) - 1/20*cos_integral(3*x) - 1/2
0*cos_integral(-3*x) + 1/20*cos_integral(-7*x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\cos\left(5x\right)\mathrm{Si}\left(2x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(5*x)*Si(2*x),x)
```

```
[Out] Integral(cos(5*x)*Si(2*x), x)
```

Giac [A]
time = 0.41, size = 23, normalized size = 0.79

$$\frac{1}{5}\sin\left(5x\right)\mathrm{Si}\left(2x\right)+\frac{1}{10}\mathrm{Ci}\left(7x\right)-\frac{1}{10}\mathrm{Ci}\left(3x\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(5*x)*sin_integral(2*x),x, algorithm="giac")
```

```
[Out] 1/5*sin(5*x)*sin_integral(2*x) + 1/10*cos_integral(7*x) - 1/10*cos_integral
(3*x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int\mathrm{sinint}(2x)\,\cos\left(5x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(2*x)*cos(5*x),x)
```

```
[Out] int(sinint(2*x)*cos(5*x), x)
```

3.55 $\int x^2 \sin(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=187

$$-\frac{x}{b^2}+\frac{a\cos(2a+2bx)}{4b^3}-\frac{x\cos(2a+2bx)}{4b^2}-\frac{a\text{CosIntegral}(2a+2bx)}{b^3}+\frac{a\log(a+bx)}{b^3}+\frac{\cos(a+bx)\sin(a+bx)}{b^3}$$

```
[Out] -x/b^2-a*Ci(2*b*x+2*a)/b^3+1/4*a*cos(2*b*x+2*a)/b^3-1/4*x*cos(2*b*x+2*a)/b^
2+a*ln(b*x+a)/b^3+2*cos(b*x+a)*Si(b*x+a)/b^3-x^2*cos(b*x+a)*Si(b*x+a)/b-Si(
2*b*x+2*a)/b^3+1/2*a^2*Si(2*b*x+2*a)/b^3+cos(b*x+a)*sin(b*x+a)/b^3+2*x*Si(b
*x+a)*sin(b*x+a)/b^2+1/8*sin(2*b*x+2*a)/b^3
```

Rubi [A]
time = 0.58, antiderivative size = 187, normalized size of antiderivative = 1.00, number of steps used = 21, number of rules used = 16, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {6648, 4669, 6873, 6874, 2718, 3377, 2717, 3380, 6654, 2715, 8, 3393, 3383, 6646, 4491, 12}

$$\frac{a^2\text{Si}(2a+2bx)}{2b^3}-\frac{a\text{CosIntegral}(2a+2bx)}{b^3}-\frac{\text{Si}(2a+2bx)}{b^3}+\frac{2\text{Si}(a+bx)\cos(a+bx)}{b^3}+\frac{a\log(a+bx)}{b^3}+\frac{\sin(2a+2bx)}{8b^3}+\frac{a\cos(2a+2bx)}{4b^3}+\frac{\sin(a+bx)\cos(a+bx)}{b^3}+\frac{2x\text{Si}(a+bx)\sin(a+bx)}{b^2}-\frac{x\cos(2a+2bx)}{4b^2}-\frac{x^2\text{Si}(a+bx)\cos(a+bx)}{b}-\frac{x}{b^2}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Sin[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] -(x/b^2) + (a*Cos[2*a + 2*b*x])/(4*b^3) - (x*Cos[2*a + 2*b*x])/(4*b^2) - (a
*CosIntegral[2*a + 2*b*x])/b^3 + (a*Log[a + b*x])/b^3 + (Cos[a + b*x]*Sin[a
 + b*x])/b^3 + Sin[2*a + 2*b*x]/(8*b^3) + (2*Cos[a + b*x]*SinIntegral[a + b
*x])/b^3 - (x^2*Cos[a + b*x]*SinIntegral[a + b*x])/b + (2*x*Sin[a + b*x]*Si
nIntegral[a + b*x])/b^2 - SinIntegral[2*a + 2*b*x]/b^3 + (a^2*SinIntegral[2
*a + 2*b*x])/(2*b^3)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
```

```
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$
\begin{aligned}
\int x^2 \sin(a+bx)\mathrm{Si}(a+bx)\,dx &= -\frac{x^2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{2\int x\cos(a+bx)\mathrm{Si}(a+bx)\,dx}{b} + \int \frac{x^2\cos(a+
\\
&= -\frac{x^2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{2x\sin(a+bx)\mathrm{Si}(a+bx)}{b^2} + \frac{1}{2}\int \frac{x^2\sin(2(a+}{a+bx}
\\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b^3} - \frac{x^2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{2x\sin(a+bx)\mathrm{Si}(a+}{b^2}
\\
&= \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b^3} - \frac{x^2\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{2x\sin(a+bx)\mathrm{Si}(a+}{b^2}
\\
&= \frac{\cos(a+bx)\sin(a+bx)}{b^3} + \frac{2\cos(a+bx)\mathrm{Si}(a+bx)}{b^3} - \frac{x^2\cos(a+bx)\mathrm{Si}(a+b}{b}
\\
&= -\frac{x}{b^2} + \frac{a\cos(2a+2bx)}{4b^3} - \frac{x\cos(2a+2bx)}{4b^2} + \frac{a\log(a+bx)}{b^3} + \frac{\cos(a+bx)\sin}{b^3}
\\
&= -\frac{x}{b^2} + \frac{a\cos(2a+2bx)}{4b^3} - \frac{x\cos(2a+2bx)}{4b^2} - \frac{a\mathrm{Ci}(2a+2bx)}{b^3} + \frac{a\log(a+bx)}{b^3}
\end{aligned}
$$

Mathematica [A]
time = 0.23, size = 123, normalized size = 0.66

$$
\frac{-8bx+2a\cos(2(a+bx))-2bx\cos(2(a+bx))-8a\mathrm{CosIntegral}(2(a+bx))+8a\log(a+bx)+5\sin(2(a+bx))-8((-2+b^2x^2)\cos(a+bx)-2bx\sin(a+bx))\,\mathrm{Si}(a+bx)-8\mathrm{Si}(2(a+bx))+4a^2\mathrm{Si}(2(a+bx))}{8b^3}
$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*Sin[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] (-8*b*x + 2*a*Cos[2*(a + b*x)] - 2*b*x*Cos[2*(a + b*x)] - 8*a*CosIntegral[2
*(a + b*x)] + 8*a*Log[a + b*x] + 5*Sin[2*(a + b*x)] - 8*((-2 + b^2*x^2)*Cos
[a + b*x] - 2*b*x*Sin[a + b*x])*SinIntegral[a + b*x] - 8*SinIntegral[2*(a +
 b*x)] + 4*a^2*SinIntegral[2*(a + b*x)])/(8*b^3)
```

Maple [A]
time = 0.56, size = 175, normalized size = 0.94

method	result
derivativedivides	$\mathrm{sinIntegral}(bx+a)\left(-a^2\cos(bx+a)-2a(\sin(bx+a)-(bx+a)\cos(bx+a))-(bx+a)^2\cos(bx+a)+2\cos(bx+a)+2(bx+a)\sin(b\right.$
default	$\mathrm{sinIntegral}(bx+a)\left(-a^2\cos(bx+a)-2a(\sin(bx+a)-(bx+a)\cos(bx+a))-(bx+a)^2\cos(bx+a)+2\cos(bx+a)+2(bx+a)\sin(b\right.$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Si(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Si(b*x+a)*(-a^2*cos(b*x+a)-2*a*(sin(b*x+a)-(b*x+a)*cos(b*x+a))-(b*x+
a)^2*cos(b*x+a)+2*cos(b*x+a)+2*(b*x+a)*sin(b*x+a))+1/2*a^2*Si(2*b*x+2*a)+a*
cos(b*x+a)^2-1/2*(b*x+a)*cos(b*x+a)^2+5/4*sin(b*x+a)*cos(b*x+a)-3/4*b*x-3/4
*a+a*ln(b*x+a)-a*Ci(2*b*x+2*a)-Si(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x^2*sin(b*x + a)*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.37, size = 126, normalized size = 0.67

$$-\frac{2\,(bx-a)\cos\left(bx+a\right)^{2}+4\,(b^{2}x^{2}-2)\cos\left(bx+a\right)\mathrm{Si}\left(bx+a\right)+3\,bx+2\,a\,\mathrm{Ci}\left(2\,bx+2\,a\right)+2\,a\,\mathrm{Ci}\left(-2\,bx-2\,a\right)-4\,a\log\left(bx+a\right)-\left(8\,bx\,\mathrm{Si}\left(bx+a\right)+5\,\cos\left(bx+a\right)\right)\sin\left(bx+a\right)-2\,(a^{2}-2)\,\mathrm{Si}\left(2\,bx+2\,a\right)}{4\,b^{3}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/4*(2*(b*x - a)*cos(b*x + a)^2 + 4*(b^2*x^2 - 2)*cos(b*x + a)*sin_integra
l(b*x + a) + 3*b*x + 2*a*cos_integral(2*b*x + 2*a) + 2*a*cos_integral(-2*b*
x - 2*a) - 4*a*log(b*x + a) - (8*b*x*sin_integral(b*x + a) + 5*cos(b*x + a)
)*sin(b*x + a) - 2*(a^2 - 2)*sin_integral(2*b*x + 2*a))/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{2}\sin\left(a+bx\right)\mathrm{Si}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Si(b*x+a)*sin(b*x+a),x)
```

```
[Out] Integral(x**2*sin(a + b*x)*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.44, size = 398, normalized size = 2.13

$$\left(\frac{2\,x\sin\left(bx+a\right)}{b^{2}}-\frac{(b^{2}x^{2}-2)\cos\left(bx+a\right)}{b^{3}}\right)\mathrm{Si}\left(bx+a\right)+\frac{a^{2}\Im\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)\tan\left(bx+a\right)^{2}-a^{2}\Im\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)\tan\left(bx+a\right)^{2}+2\,a^{2}\,\mathrm{Si}\left(2\,bx+2\,a\right)\tan\left(bx+a\right)^{2}-3\,bx\tan\left(bx+a\right)^{2}+4\,a\log\left(|bx+a|\right)\tan\left(bx+a\right)^{2}-2\,a\Re\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)\tan\left(bx+a\right)^{2}-2\,a\Re\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)\tan\left(bx+a\right)^{2}+a^{2}\Im\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)-a^{2}\Im\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)+2\,a^{2}\,\mathrm{Si}\left(2\,bx+2\,a\right)-a\tan\left(bx+a\right)^{2}-2\,\Im\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)\tan\left(bx+a\right)^{2}+2\,\Im\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)\tan\left(bx+a\right)^{2}-4\,\mathrm{Si}\left(2\,bx+2\,a\right)\tan\left(bx+a\right)^{2}-5\,bx+4\,a\log\left(|bx+a|\right)-2\,a\Re\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)-2\,a\Re\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)+a-2\,\Im\left(\mathrm{Ci}\left(2\,bx+2\,a\right)\right)+2\,\Im\left(\mathrm{Ci}\left(-2\,bx-2\,a\right)\right)-4\,\mathrm{Si}\left(2\,bx+2\,a\right)+5\,\tan\left(bx+a\right)}{4\,\left(b^{3}\tan\left(bx+a\right)^{2}+b^{3}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] (2*x*sin(b*x + a)/b^2 - (b^2*x^2 - 2)*cos(b*x + a)/b^3)*sin_integral(b*x +
a) + 1/4*(a^2*imag_part(cos_integral(2*b*x + 2*a))*tan(b*x + a)^2 - a^2*ima
g_part(cos_integral(-2*b*x - 2*a))*tan(b*x + a)^2 + 2*a^2*sin_integral(2*b*
x + 2*a)*tan(b*x + a)^2 - 3*b*x*tan(b*x + a)^2 + 4*a*log(abs(b*x + a))*tan(
b*x + a)^2 - 2*a*real_part(cos_integral(2*b*x + 2*a))*tan(b*x + a)^2 - 2*a*
real_part(cos_integral(-2*b*x - 2*a))*tan(b*x + a)^2 + a^2*imag_part(cos_in
tegral(2*b*x + 2*a)) - a^2*imag_part(cos_integral(-2*b*x - 2*a)) + 2*a^2*si
n_integral(2*b*x + 2*a) - a*tan(b*x + a)^2 - 2*imag_part(cos_integral(2*b*x
 + 2*a))*tan(b*x + a)^2 + 2*imag_part(cos_integral(-2*b*x - 2*a))*tan(b*x +
 a)^2 - 4*sin_integral(2*b*x + 2*a)*tan(b*x + a)^2 - 5*b*x + 4*a*log(abs(b*
x + a)) - 2*a*real_part(cos_integral(2*b*x + 2*a)) - 2*a*real_part(cos_inte
gral(-2*b*x - 2*a)) + a - 2*imag_part(cos_integral(2*b*x + 2*a)) + 2*imag_p
art(cos_integral(-2*b*x - 2*a)) - 4*sin_integral(2*b*x + 2*a) + 5*tan(b*x +
 a))/(b^3*tan(b*x + a)^2 + b^3)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{sinint}(a + b\,x)\,\sin\left(a + b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(a + b*x)*sin(a + b*x),x)
```

```
[Out] int(x^2*sinint(a + b*x)*sin(a + b*x), x)
```

3.56 $\int x \sin(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=97

$$-\frac{\cos(2a+2bx)}{4b^2}+\frac{\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{\log(a+bx)}{2b^2}-\frac{x\cos(a+bx)\text{Si}(a+bx)}{b}+\frac{\sin(a+bx)\text{Si}(a+bx)}{b^2}-a$$

```
[Out] 1/2*Ci(2*b*x+2*a)/b^2-1/4*cos(2*b*x+2*a)/b^2-1/2*ln(b*x+a)/b^2-x*cos(b*x+a)
*Si(b*x+a)/b-1/2*a*Si(2*b*x+2*a)/b^2+Si(b*x+a)*sin(b*x+a)/b^2
```

Rubi [A]
time = 0.20, antiderivative size = 97, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 9, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.643$, Rules used = {6648, 4669, 6873, 6874, 2718, 3380, 6652, 3393, 3383}

$$\frac{\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{a\text{Si}(2a+2bx)}{2b^2}+\frac{\text{Si}(a+bx)\sin(a+bx)}{b^2}-\frac{\log(a+bx)}{2b^2}-\frac{\cos(2a+2bx)}{4b^2}-\frac{x\text{Si}(a+bx)\cos(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*Sin[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] -1/4*Cos[2*a + 2*b*x]/b^2 + CosIntegral[2*a + 2*b*x]/(2*b^2) - Log[a + b*x]
/(2*b^2) - (x*Cos[a + b*x]*SinIntegral[a + b*x])/b + (Sin[a + b*x]*SinInteg
ral[a + b*x])/b^2 - (a*SinIntegral[2*a + 2*b*x])/(2*b^2)
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\sin(a+bx)\mathrm{Si}(a+bx)\,dx = -\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{\int\cos(a+bx)\mathrm{Si}(a+bx)\,dx}{b}+\int\frac{x\cos(a+bx)\,\mathrm{s}}{a+b}$$

$$= -\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b^2}+\frac{1}{2}\int\frac{x\sin(2(a+bx))}{a+bx}\,d$$

$$= -\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b^2}+\frac{1}{2}\int\frac{x\sin(2a+2bx)}{a+bx}\,dx$$

$$= -\frac{\log(a+bx)}{2b^2}-\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b^2}+\frac{1}{2}\int\Big(\mathrm{si}$$

$$= \frac{\mathrm{Ci}(2a+2bx)}{2b^2}-\frac{\log(a+bx)}{2b^2}-\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(a+}{b^2}$$

$$= -\frac{\cos(2a+2bx)}{4b^2}+\frac{\mathrm{Ci}(2a+2bx)}{2b^2}-\frac{\log(a+bx)}{2b^2}-\frac{x\cos(a+bx)\mathrm{Si}(a+bx)}{b}+$$

Mathematica [A]
time = 0.17, size = 71, normalized size = 0.73

$$-\frac{\cos(2(a+bx))-2\text{CosIntegral}(2(a+bx))+2\log(a+bx)+4(bx\cos(a+bx)-\sin(a+bx))\text{Si}(a+bx)+2a\text{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Sin[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] -1/4*(Cos[2*(a + b*x)] - 2*CosIntegral[2*(a + b*x)] + 2*Log[a + b*x] + 4*(b
*x*Cos[a + b*x] - Sin[a + b*x])*SinIntegral[a + b*x] + 2*a*SinIntegral[2*(a
 + b*x)])/b^2
```

Maple [A]
time = 0.52, size = 82, normalized size = 0.85

method	result
derivativedivides	$\frac{\text{sinIntegral}(bx+a)(a\cos(bx+a)+\sin(bx+a)-(bx+a)\cos(bx+a))-\frac{a\,\text{sinIntegral}(2bx+2a)}{2}-\frac{\ln(bx+a)}{2}+\frac{\text{cosineIntegral}(2bx+2a)}{2}}{b^2}$
default	$\frac{\text{sinIntegral}(bx+a)(a\cos(bx+a)+\sin(bx+a)-(bx+a)\cos(bx+a))-\frac{a\,\text{sinIntegral}(2bx+2a)}{2}-\frac{\ln(bx+a)}{2}+\frac{\text{cosineIntegral}(2bx+2a)}{2}}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Si(b*x+a)*(a*cos(b*x+a)+sin(b*x+a)-(b*x+a)*cos(b*x+a))-1/2*a*Si(2*b*
x+2*a)-1/2*ln(b*x+a)+1/2*Ci(2*b*x+2*a)-1/2*cos(b*x+a)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*sin(b*x + a)*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.37, size = 88, normalized size = 0.91

$$-\frac{4\,bx\cos\left(bx+a\right)\text{Si}\left(bx+a\right)+2\,\cos\left(bx+a\right)^{2}+2\,a\,\text{Si}\left(2\,bx+2\,a\right)-4\,\sin\left(bx+a\right)\text{Si}\left(bx+a\right)-\text{Ci}\left(2\,bx+2\,a\right)-\text{Ci}\left(-2\,bx-2\,a\right)+2\,\log\left(bx+a\right)}{4\,b^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/4*(4*b*x*cos(b*x + a)*sin_integral(b*x + a) + 2*cos(b*x + a)^2 + 2*a*sin
_integral(2*b*x + 2*a) - 4*sin(b*x + a)*sin_integral(b*x + a) - cos_integra
l(2*b*x + 2*a) - cos_integral(-2*b*x - 2*a) + 2*log(b*x + a))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x \sin(a+bx) \operatorname{Si}(a+bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(b*x+a)*sin(b*x+a),x)
```

```
[Out] Integral(x*sin(a + b*x)*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.42, size = 507, normalized size = 5.23

$$-\left(\frac{x\cos(bx+a)}{b}-\frac{\sin(bx+a)}{b^2}\right)\operatorname{Si}(bx+a)-\frac{a\Im(\operatorname{Ci}(2bx+2a))\tan(bx)^2\tan(a)^2-a\Im(\operatorname{Ci}(-2bx-2a))\tan(bx)^2\tan(a)^2+2a\operatorname{Si}(2bx+2a)\tan(bx)^2\tan(a)^2+2\log(|bx+a|)\tan(bx)^2\tan(a)^2-\Re(\operatorname{Ci}(2bx+2a))\tan(bx)^2\tan(a)^2-\Re(\operatorname{Ci}(-2bx-2a))\tan(bx)^2\tan(a)^2+a\Im(\operatorname{Ci}(2bx+2a))\tan(bx)^2-a\Im(\operatorname{Ci}(-2bx-2a))\tan(bx)^2+2a\operatorname{Si}(2bx+2a)\tan(bx)^2+a\Im(\operatorname{Ci}(2bx+2a))\tan(a)^2-a\Im(\operatorname{Ci}(-2bx-2a))\tan(a)^2+2a\operatorname{Si}(2bx+2a)\tan(a)^2+\tan(bx)^2\tan(a)^2+2\log(|bx+a|)\tan(bx)^2-\Re(\operatorname{Ci}(2bx+2a))\tan(bx)^2-\Re(\operatorname{Ci}(-2bx-2a))\tan(bx)^2+2\log(|bx+a|)\tan(a)^2-\Re(\operatorname{Ci}(2bx+2a))\tan(a)^2-\Re(\operatorname{Ci}(-2bx-2a))\tan(a)^2+a\Im(\operatorname{Ci}(2bx+2a))-a\Im(\operatorname{Ci}(-2bx-2a))+2a\operatorname{Si}(2bx+2a)-\tan(bx)^2-4\tan(bx)\tan(a)-\tan(a)^2+2\log(|bx+a|)-\Re(\operatorname{Ci}(2bx+2a))-\Re(\operatorname{Ci}(-2bx-2a))+1}{4\left(b^2\tan(bx)^2\tan(a)^2+b^2\tan(bx)^2+b^2\tan(a)^2+b^2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(b*x+a)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] -(x*cos(b*x + a)/b - sin(b*x + a)/b^2)*sin_integral(b*x + a) - 1/4*(a*imag_
part(cos_integral(2*b*x + 2*a))*tan(b*x)^2*tan(a)^2 - a*imag_part(cos_integ
ral(-2*b*x - 2*a))*tan(b*x)^2*tan(a)^2 + 2*a*sin_integral(2*b*x + 2*a)*tan(
b*x)^2*tan(a)^2 + 2*log(abs(b*x + a))*tan(b*x)^2*tan(a)^2 - real_part(cos_i
ntegral(2*b*x + 2*a))*tan(b*x)^2*tan(a)^2 - real_part(cos_integral(-2*b*x -
 2*a))*tan(b*x)^2*tan(a)^2 + a*imag_part(cos_integral(2*b*x + 2*a))*tan(b*x
)^2 - a*imag_part(cos_integral(-2*b*x - 2*a))*tan(b*x)^2 + 2*a*sin_integral
(2*b*x + 2*a)*tan(b*x)^2 + a*imag_part(cos_integral(2*b*x + 2*a))*tan(a)^2
- a*imag_part(cos_integral(-2*b*x - 2*a))*tan(a)^2 + 2*a*sin_integral(2*b*x
 + 2*a)*tan(a)^2 + tan(b*x)^2*tan(a)^2 + 2*log(abs(b*x + a))*tan(b*x)^2 - r
eal_part(cos_integral(2*b*x + 2*a))*tan(b*x)^2 - real_part(cos_integral(-2*
b*x - 2*a))*tan(b*x)^2 + 2*log(abs(b*x + a))*tan(a)^2 - real_part(cos_integ
ral(2*b*x + 2*a))*tan(a)^2 - real_part(cos_integral(-2*b*x - 2*a))*tan(a)^2
 + a*imag_part(cos_integral(2*b*x + 2*a)) - a*imag_part(cos_integral(-2*b*x
 - 2*a)) + 2*a*sin_integral(2*b*x + 2*a) - tan(b*x)^2 - 4*tan(b*x)*tan(a) -
 tan(a)^2 + 2*log(abs(b*x + a)) - real_part(cos_integral(2*b*x + 2*a)) - re
al_part(cos_integral(-2*b*x - 2*a)) + 1)/(b^2*tan(b*x)^2*tan(a)^2 + b^2*tan
(b*x)^2 + b^2*tan(a)^2 + b^2)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\, \mathrm{sinint}(a+b\,x)\, \sin\left(a+b\,x\right)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(a + b*x)*sin(a + b*x),x)
[Out] int(x*sinint(a + b*x)*sin(a + b*x), x)
```

3.57 $\int \sin(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=34

$$-\frac{\cos(a+bx)\text{Si}(a+bx)}{b}+\frac{\text{Si}(2a+2bx)}{2b}$$

```
[Out] -cos(b*x+a)*Si(b*x+a)/b+1/2*Si(2*b*x+2*a)/b
```

Rubi [A]
time = 0.04, antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.308$, Rules used = {6646, 4491, 12, 3380}

$$\frac{\text{Si}(2a+2bx)}{2b}-\frac{\text{Si}(a+bx)\cos(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[Sin[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] -((Cos[a + b*x]*SinIntegral[a + b*x])/b) + SinIntegral[2*a + 2*b*x]/(2*b)
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\int \sin(a+bx)\mathrm{Si}(a+bx)\,dx = -\frac{\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx$$
$$= -\frac{\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \int \frac{\sin(2a+2bx)}{2(a+bx)}\,dx$$
$$= -\frac{\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{1}{2}\int \frac{\sin(2a+2bx)}{a+bx}\,dx$$
$$= -\frac{\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{\mathrm{Si}(2a+2bx)}{2b}$$

Mathematica [A]
time = 0.01, size = 33, normalized size = 0.97

$$-\frac{\cos(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{\mathrm{Si}(2(a+bx))}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sin[a + b*x]*SinIntegral[a + b*x],x]
[Out] -((Cos[a + b*x]*SinIntegral[a + b*x])/b) + SinIntegral[2*(a + b*x)]/(2*b)
```

Maple [A]
time = 0.19, size = 31, normalized size = 0.91

method	result	size
derivativedivides	$\frac{-\cos(bx+a)\,\mathrm{sinIntegral}(bx+a)+\frac{\mathrm{sinIntegral}(2bx+2a)}{2}}{b}$	31
default	$\frac{-\cos(bx+a)\,\mathrm{sinIntegral}(bx+a)+\frac{\mathrm{sinIntegral}(2bx+2a)}{2}}{b}$	31

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
[Out] 1/b*(-cos(b*x+a)*Si(b*x+a)+1/2*Si(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a),x, algorithm="maxima")
[Out] integrate(sin(b*x + a)*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.33, size = 31, normalized size = 0.91

$$-\frac{2\cos(bx+a)\operatorname{Si}(bx+a)-\operatorname{Si}(2bx+2a)}{2b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a),x, algorithm="fricas")
[Out] -1/2*(2*cos(b*x + a)*sin_integral(b*x + a) - sin_integral(2*b*x + 2*a))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\sin(a+bx)\operatorname{Si}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)*sin(b*x+a),x)
[Out] Integral(sin(a + b*x)*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.43, size = 57, normalized size = 1.68

$$-\frac{\cos(bx+a)\operatorname{Si}(bx+a)}{b}+\frac{\Im(\operatorname{Ci}(2bx+2a))-\Im(\operatorname{Ci}(-2bx-2a))+2\operatorname{Si}(2bx+2a)}{4b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a),x, algorithm="giac")
[Out] -cos(b*x + a)*sin_integral(b*x + a)/b + 1/4*(imag_part(cos_integral(2*b*x +
 2*a)) - imag_part(cos_integral(-2*b*x - 2*a)) + 2*sin_integral(2*b*x + 2*a
))/b
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int\operatorname{sinint}(a+b\,x)\,\sin(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)*sin(a + b*x),x)
[Out] int(sinint(a + b*x)*sin(a + b*x), x)
```

3.58 $\int \frac{\sin(a+bx)\mathbf{Si}(a+bx)}{x}\,dx$

Optimal. Leaf size=19

$$\mathrm{Int}\left(\frac{\sin(a+bx)\mathrm{Si}(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Si(b*x+a)*sin(b*x+a)/x,x)
```

Rubi [A]
time = 0.09, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Sin[a + b*x]*SinIntegral[a + b*x])/x,x]
```

```
[Out] Defer[Int][(Sin[a + b*x]*SinIntegral[a + b*x])/x, x]
```

Rubi steps

$$\int \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{x}\,dx = \int \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{x}\,dx$$

Mathematica [A]
time = 3.28, size = 0, normalized size = 0.00

$$\int \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Sin[a + b*x]*SinIntegral[a + b*x])/x,x]
```

```
[Out] Integrate[(Sin[a + b*x]*SinIntegral[a + b*x])/x, x]
```

Maple [A]
time = 0.12, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{sinIntegral}\left(bx+a\right)\sin\left(bx+a\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(b*x+a)*sin(b*x+a)/x,x)
[Out] int(Si(b*x+a)*sin(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a)/x,x, algorithm="maxima")
[Out] integrate(sin(b*x + a)*sin_integral(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a)/x,x, algorithm="fricas")
[Out] integral(sin(b*x + a)*sin_integral(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin (a + bx) \operatorname{Si}(a + bx)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(b*x+a)*sin(b*x+a)/x,x)
[Out] Integral(sin(a + b*x)*Si(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(b*x+a)*sin(b*x+a)/x,x, algorithm="giac")
[Out] integrate(sin(b*x + a)*sin_integral(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\mathrm{sinint}(a + b\,x)\ \sin (a + b\,x)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(a + b*x)*sin(a + b*x))/x,x)
[Out] int((sinint(a + b*x)*sin(a + b*x))/x, x)
```

3.59 $\int x^2 \cos(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=218

$$\frac{ax}{2b^2}-\frac{x^2}{4b}+\frac{\cos(2a+2bx)}{2b^3}-\frac{\text{CosIntegral}(2a+2bx)}{b^3}+\frac{a^2\text{CosIntegral}(2a+2bx)}{2b^3}+\frac{\log(a+bx)}{b^3}-\frac{a^2\log(a+bx)}{2b^3}-$$

```
[Out] 1/2*a*x/b^2-1/4*x^2/b-Ci(2*b*x+2*a)/b^3+1/2*a^2*Ci(2*b*x+2*a)/b^3+1/2*cos(2
*b*x+2*a)/b^3+ln(b*x+a)/b^3-1/2*a^2*ln(b*x+a)/b^3+2*x*cos(b*x+a)*Si(b*x+a)/
b^2+a*Si(2*b*x+2*a)/b^3-1/2*a*cos(b*x+a)*sin(b*x+a)/b^3+1/2*x*cos(b*x+a)*si
n(b*x+a)/b^2-2*Si(b*x+a)*sin(b*x+a)/b^3+x^2*Si(b*x+a)*sin(b*x+a)/b-1/4*sin(
b*x+a)^2/b^3
```

Rubi [A]
time = 0.48, antiderivative size = 218, normalized size of antiderivative = 1.00, number of steps used = 21, number of rules used = 14, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {6654, 6874, 2715, 8, 3391, 30, 3393, 3383, 6648, 4669, 6873, 2718, 3380, 6652}

$$\frac{a^2\text{CosIntegral}(2a+2bx)}{2b^3}-\frac{a^2\log(a+bx)}{2b^3}-\frac{\text{CosIntegral}(2a+2bx)}{b^3}+\frac{a\text{Si}(2a+2bx)}{b^3}-\frac{2\text{Si}(a+bx)\sin(a+bx)}{b^3}+\frac{\log(a+bx)}{b^3}-\frac{\sin^2(a+bx)}{4b^3}+\frac{\cos(2a+2bx)}{2b^3}-\frac{a\sin(a+bx)\cos(a+bx)}{2b^3}+\frac{2x\text{Si}(a+bx)\cos(a+bx)}{b^2}+\frac{ax}{2b^2}+\frac{x\sin(a+bx)\cos(a+bx)}{2b^2}+\frac{x^2\text{Si}(a+bx)\sin(a+bx)}{b}-\frac{x^2}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Cos[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] (a*x)/(2*b^2) - x^2/(4*b) + Cos[2*a + 2*b*x]/(2*b^3) - CosIntegral[2*a + 2*
b*x]/b^3 + (a^2*CosIntegral[2*a + 2*b*x])/(2*b^3) + Log[a + b*x]/b^3 - (a^2
*Log[a + b*x])/(2*b^3) - (a*Cos[a + b*x]*Sin[a + b*x])/(2*b^3) + (x*Cos[a +
 b*x]*Sin[a + b*x])/(2*b^2) - Sin[a + b*x]^2/(4*b^3) + (2*x*Cos[a + b*x]*Si
nIntegral[a + b*x])/b^2 - (2*Sin[a + b*x]*SinIntegral[a + b*x])/b^3 + (x^2*
Sin[a + b*x]*SinIntegral[a + b*x])/b + (a*SinIntegral[2*a + 2*b*x])/b^3
```

Rule 8

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

Rule 30

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x^2\cos(a+bx)\mathrm{Si}(a+bx)\,dx &= \frac{x^2\sin(a+bx)\mathrm{Si}(a+bx)}{b} - \frac{2\int x\sin(a+bx)\mathrm{Si}(a+bx)\,dx}{b} - \int \frac{x^2\sin^2(a+}{a+bx} \\
&= \frac{2x\cos(a+bx)\mathrm{Si}(a+bx)}{b^2} + \frac{x^2\sin(a+bx)\mathrm{Si}(a+bx)}{b} - \frac{2\int\cos(a+bx)\mathrm{Si}(a}{b^2} \\
&= \frac{2x\cos(a+bx)\mathrm{Si}(a+bx)}{b^2} - \frac{2\sin(a+bx)\mathrm{Si}(a+bx)}{b^3} + \frac{x^2\sin(a+bx)\mathrm{Si}(a+}{b} \\
&= -\frac{a\cos(a+bx)\sin(a+bx)}{2b^3} + \frac{x\cos(a+bx)\sin(a+bx)}{2b^2} - \frac{\sin^2(a+bx)}{4b^3} + \frac{2}{} \\
&= \frac{ax}{2b^2} - \frac{x^2}{4b} + \frac{\log(a+bx)}{b^3} - \frac{a^2\log(a+bx)}{2b^3} - \frac{a\cos(a+bx)\sin(a+bx)}{2b^3} + \frac{x\,\mathrm{c}}{} \\
&= \frac{ax}{2b^2} - \frac{x^2}{4b} - \frac{\mathrm{Ci}(2a+2bx)}{b^3} + \frac{a^2\mathrm{Ci}(2a+2bx)}{2b^3} + \frac{\log(a+bx)}{b^3} - \frac{a^2\log(a+bx}{2b^3} \\
&= \frac{ax}{2b^2} - \frac{x^2}{4b} + \frac{\cos(2a+2bx)}{2b^3} - \frac{\mathrm{Ci}(2a+2bx)}{b^3} + \frac{a^2\mathrm{Ci}(2a+2bx)}{2b^3} + \frac{\log(a+bx}{b^3}
\end{aligned}$$

Mathematica [A]
time = 0.24, size = 134, normalized size = 0.61

$$\frac{4abx - 2b^2x^2 + 5\cos(2(a+bx)) + 4(-2+a^2)\,\mathrm{CosIntegral}(2(a+bx)) + 8\log(a+bx) - 4a^2\log(a+bx) - 2a\sin(2(a+bx)) + 2bx\sin(2(a+bx)) + 8(2bx\cos(a+bx) + (-2+b^2x^2)\sin(a+bx))\,\mathrm{Si}(a+bx) + 8a\mathrm{Si}(2(a+bx))}{8b^3}$$

Antiderivative was successfully verified.

[In] Integrate[x^2*Cos[a + b*x]*SinIntegral[a + b*x],x]

[Out] (4*a*b*x - 2*b^2*x^2 + 5*Cos[2*(a + b*x)] + 4*(-2 + a^2)*CosIntegral[2*(a + b*x)] + 8*Log[a + b*x] - 4*a^2*Log[a + b*x] - 2*a*Sin[2*(a + b*x)] + 2*b*x *Sin[2*(a + b*x)] + 8*(2*b*x*Cos[a + b*x] + (-2 + b^2*x^2)*Sin[a + b*x])*SinIntegral[a + b*x] + 8*a*SinIntegral[2*(a + b*x)])/(8*b^3)

Maple [A]
time = 0.66, size = 212, normalized size = 0.97

method	result
derivativedivides	$\frac{\mathrm{sinIntegral}(bx+a)\left(a^2\sin(bx+a)-2a(\cos(bx+a)+(bx+a)\sin(bx+a))+(bx+a)^2\sin(bx+a)-2\sin(bx+a)+2(bx+a)\cos(b}{}$
default	$\frac{\mathrm{sinIntegral}(bx+a)\left(a^2\sin(bx+a)-2a(\cos(bx+a)+(bx+a)\sin(bx+a))+(bx+a)^2\sin(bx+a)-2\sin(bx+a)+2(bx+a)\cos(b}{}$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^2*cos(b*x+a)*Si(b*x+a),x,method=_RETURNVERBOSE)

[Out] 1/b^3*(Si(b*x+a)*(a^2*sin(b*x+a)-2*a*(cos(b*x+a)+(b*x+a)*sin(b*x+a))+(b*x+a)^2*sin(b*x+a)-2*sin(b*x+a)+2*(b*x+a)*cos(b*x+a))-1/2*a^2*ln(b*x+a)+1/2*a^2*Ci(2*b*x+2*a)-sin(b*x+a)*cos(b*x+a)*a+a*(b*x+a)-(b*x+a)*(-1/2*sin(b*x+a)*cos(b*x+a)+1/2*b*x+1/2*a)+1/4*(b*x+a)^2-1/4*sin(b*x+a)^2+a*Si(2*b*x+2*a)+cos(b*x+a)^2+ln(b*x+a)-Ci(2*b*x+2*a))

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="maxima")

[Out] integrate(x^2*cos(b*x + a)*sin_integral(b*x + a), x)

Fricas [A]
time = 0.37, size = 141, normalized size = 0.65

$$-\frac{b^2x^2 - 8\,bx\cos\left(bx+a\right)\mathrm{Si}\left(bx+a\right) - 2\,abx - 5\,\cos\left(bx+a\right)^2 - (a^2-2)\,\mathrm{Ci}\left(2\,bx+2\,a\right) - (a^2-2)\,\mathrm{Ci}\left(-2\,bx-2\,a\right) + 2\,(a^2-2)\log\left(bx+a\right) - 2\,((bx-a)\cos\left(bx+a\right) + 2\,(b^2x^2-2)\,\mathrm{Si}\left(bx+a\right))\sin\left(bx+a\right) - 4\,a\,\mathrm{Si}\left(2\,bx+2\,a\right)}{4\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(x^2*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="fricas")

[Out] -1/4*(b^2*x^2 - 8*b*x*cos(b*x + a)*sin_integral(b*x + a) - 2*a*b*x - 5*cos(b*x + a)^2 - (a^2 - 2)*cos_integral(2*b*x + 2*a) - (a^2 - 2)*cos_integral(-2*b*x - 2*a) + 2*(a^2 - 2)*log(b*x + a) - 2*((b*x - a)*cos(b*x + a) + 2*(b^

```
2*x^2 - 2)*sin_integral(b*x + a))*sin(b*x + a) - 4*a*sin_integral(2*b*x + 2
*a))/b^3
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2 \cos(a+bx)\,\mathrm{Si}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*cos(b*x+a)*Si(b*x+a),x)
```

```
[Out] Integral(x**2*cos(a + b*x)*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.43, size = 431, normalized size = 1.98

$$\left(\frac{2\,x\cos(bx+a)}{b^2}+\frac{(b^2x^2-2)\sin(bx+a)}{b^3}\right)\mathrm{Si}(bx+a)-\frac{2\,b^2x^2\tan(bx+a)^2-4\,abx\tan(bx+a)^2+4\,a^2\log(|bx+a|)\tan(bx+a)^2-2\,a^2\Re(\mathrm{Ci}(2\,bx+2\,a))\tan(bx+a)^2-2\,a^2\Re(\mathrm{Ci}(-2\,bx-2\,a))\tan(bx+a)^2+2\,b^2x^2-4\,a\Im(\mathrm{Ci}(2\,bx+2\,a))\tan(bx+a)^2+4\,a\Im(\mathrm{Ci}(-2\,bx-2\,a))\tan(bx+a)^2-8\,a\,\mathrm{Si}(2\,bx+2\,a)\tan(bx+a)^2-4\,abx+4\,a^2\log(|bx+a|)-2\,a^2\Re(\mathrm{Ci}(2\,bx+2\,a))-2\,a^2\Re(\mathrm{Ci}(-2\,bx-2\,a))-4\,bx\tan(bx+a)-8\log(|bx+a|)\tan(bx+a)^2+4\,\Re(\mathrm{Ci}(2\,bx+2\,a))\tan(bx+a)^2+4\,\Re(\mathrm{Ci}(-2\,bx-2\,a))\tan(bx+a)^2-4\,a\Im(\mathrm{Ci}(2\,bx+2\,a))+4\,a\Im(\mathrm{Ci}(-2\,bx-2\,a))-8\,a\,\mathrm{Si}(2\,bx+2\,a)+4\,a\tan(bx+a)+5\tan(bx+a)^2-8\log(|bx+a|)+4\,\Re(\mathrm{Ci}(2\,bx+2\,a))+4\,\Re(\mathrm{Ci}(-2\,bx-2\,a))-5}{8\,(b^3\tan(bx+a)^2+b^3)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="giac")
```

```
[Out] (2*x*cos(b*x + a)/b^2 + (b^2*x^2 - 2)*sin(b*x + a)/b^3)*sin_integral(b*x +
a) - 1/8*(2*b^2*x^2*tan(b*x + a)^2 - 4*a*b*x*tan(b*x + a)^2 + 4*a^2*log(abs
(b*x + a))*tan(b*x + a)^2 - 2*a^2*real_part(cos_integral(2*b*x + 2*a))*tan(
b*x + a)^2 - 2*a^2*real_part(cos_integral(-2*b*x - 2*a))*tan(b*x + a)^2 + 2
*b^2*x^2 - 4*a*imag_part(cos_integral(2*b*x + 2*a))*tan(b*x + a)^2 + 4*a*im
ag_part(cos_integral(-2*b*x - 2*a))*tan(b*x + a)^2 - 8*a*sin_integral(2*b*x
 + 2*a)*tan(b*x + a)^2 - 4*a*b*x + 4*a^2*log(abs(b*x + a)) - 2*a^2*real_par
t(cos_integral(2*b*x + 2*a)) - 2*a^2*real_part(cos_integral(-2*b*x - 2*a))
- 4*b*x*tan(b*x + a) - 8*log(abs(b*x + a))*tan(b*x + a)^2 + 4*real_part(cos
_integral(2*b*x + 2*a))*tan(b*x + a)^2 + 4*real_part(cos_integral(-2*b*x -
2*a))*tan(b*x + a)^2 - 4*a*imag_part(cos_integral(2*b*x + 2*a)) + 4*a*imag_
part(cos_integral(-2*b*x - 2*a)) - 8*a*sin_integral(2*b*x + 2*a) + 4*a*tan(
b*x + a) + 5*tan(b*x + a)^2 - 8*log(abs(b*x + a)) + 4*real_part(cos_integra
l(2*b*x + 2*a)) + 4*real_part(cos_integral(-2*b*x - 2*a)) - 5)/(b^3*tan(b*x
 + a)^2 + b^3)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.00

$$\int x^2\,\mathrm{sinint}(a+b\,x)\,\cos(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*sinint(a + b*x)*cos(a + b*x),x)
```

```
[Out] int(x^2*sinint(a + b*x)*cos(a + b*x), x)
```

3.60 $\int x\cos(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=108

$$-\frac{x}{2b}-\frac{a\text{CosIntegral}(2a+2bx)}{2b^2}+\frac{a\log(a+bx)}{2b^2}+\frac{\cos(a+bx)\sin(a+bx)}{2b^2}+\frac{\cos(a+bx)\text{Si}(a+bx)}{b^2}+\frac{x\sin(a+$$

```
[Out] -1/2*x/b-1/2*a*Ci(2*b*x+2*a)/b^2+1/2*a*ln(b*x+a)/b^2+cos(b*x+a)*Si(b*x+a)/b
^2-1/2*Si(2*b*x+2*a)/b^2+1/2*cos(b*x+a)*sin(b*x+a)/b^2+x*Si(b*x+a)*sin(b*x+
a)/b
```

Rubi [A]
time = 0.16, antiderivative size = 108, normalized size of antiderivative = 1.00, number of steps used = 12, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {6654, 6874, 2715, 8, 3393, 3383, 6646, 4491, 12, 3380}

$$-\frac{a\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{\text{Si}(2a+2bx)}{2b^2}+\frac{\text{Si}(a+bx)\cos(a+bx)}{b^2}+\frac{a\log(a+bx)}{2b^2}+\frac{\sin(a+bx)\cos(a+bx)}{2b^2}+\frac{x\text{Si}(a+bx)\sin(a+bx)}{b}-\frac{x}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*Cos[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] -1/2*x/b - (a*CosIntegral[2*a + 2*b*x])/(2*b^2) + (a*Log[a + b*x])/(2*b^2)
+ (Cos[a + b*x]*Sin[a + b*x])/(2*b^2) + (Cos[a + b*x]*SinIntegral[a + b*x])
/b^2 + (x*Sin[a + b*x]*SinIntegral[a + b*x])/b - SinIntegral[2*a + 2*b*x]/(
2*b^2)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\cos(a+bx)\text{Si}(a+bx)\,dx = \frac{x\sin(a+bx)\text{Si}(a+bx)}{b} - \frac{\int \sin(a+bx)\text{Si}(a+bx)\,dx}{b} - \int \frac{x\sin^2(a+bx)}{a+bx}$$

$$= \frac{\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(a+bx)}{b} - \frac{\int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx}{b} -$$

$$= \frac{\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(a+bx)}{b} - \frac{\int \sin^2(a+bx)\,dx}{b} - \int$$

$$= \frac{\cos(a+bx)\sin(a+bx)}{2b^2} + \frac{\cos(a+bx)\text{Si}(a+bx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(a+bx)}{b}$$

$$= -\frac{x}{2b} + \frac{a\log(a+bx)}{2b^2} + \frac{\cos(a+bx)\sin(a+bx)}{2b^2} + \frac{\cos(a+bx)\text{Si}(a+bx)}{b^2} +$$

$$= -\frac{x}{2b} - \frac{a\text{Ci}(2a+2bx)}{2b^2} + \frac{a\log(a+bx)}{2b^2} + \frac{\cos(a+bx)\sin(a+bx)}{2b^2} + \frac{\cos(a}{}$$

Mathematica [A]
time = 0.13, size = 74, normalized size = 0.69

$$\frac{-2bx - 2a\text{CosIntegral}(2(a+bx)) + 2a\log(a+bx) + \sin(2(a+bx)) + 4(\cos(a+bx) + bx\sin(a+bx))\text{Si}(a+bx) - 2\text{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] (-2*b*x - 2*a*CosIntegral[2*(a + b*x)] + 2*a*Log[a + b*x] + Sin[2*(a + b*x)
] + 4*(Cos[a + b*x] + b*x*Sin[a + b*x])*SinIntegral[a + b*x] - 2*SinIntegra
l[2*(a + b*x)])/(4*b^2)
```

Maple [A]
time = 0.57, size = 94, normalized size = 0.87

method	result
derivativedivides	$\frac{\text{sinIntegral}(bx+a)(-a\sin(bx+a)+\cos(bx+a)+(bx+a)\sin(bx+a))+\frac{a\ln(bx+a)}{2}-\frac{a\,\text{cosineIntegral}(2bx+2a)}{2}-\frac{\text{sinIntegral}(2bx+}{2}}{b^2}$
default	$\frac{\text{sinIntegral}(bx+a)(-a\sin(bx+a)+\cos(bx+a)+(bx+a)\sin(bx+a))+\frac{a\ln(bx+a)}{2}-\frac{a\,\text{cosineIntegral}(2bx+2a)}{2}-\frac{\text{sinIntegral}(2bx+}{2}}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cos(b*x+a)*Si(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Si(b*x+a)*(-a*sin(b*x+a)+cos(b*x+a)+(b*x+a)*sin(b*x+a))+1/2*a*ln(b*x
+a)-1/2*a*Ci(2*b*x+2*a)-1/2*Si(2*b*x+2*a)+1/2*sin(b*x+a)*cos(b*x+a)-1/2*b*x
-1/2*a)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x + a)*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.35, size = 91, normalized size = 0.84

$$-\frac{2\,bx + a\,\mathrm{Ci}\left(2\,bx + 2\,a\right) + a\,\mathrm{Ci}\left(-2\,bx - 2\,a\right) - 2\,a\log\left(bx + a\right) - 2\left(2\,bx\,\mathrm{Si}\left(bx + a\right) + \cos\left(bx + a\right)\right)\sin\left(bx + a\right) - 4\,\cos\left(bx + a\right)\mathrm{Si}\left(bx + a\right) + 2\,\mathrm{Si}\left(2\,bx + 2\,a\right)}{4\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/4*(2*b*x + a*cos_integral(2*b*x + 2*a) + a*cos_integral(-2*b*x - 2*a) -
2*a*log(b*x + a) - 2*(2*b*x*sin_integral(b*x + a) + cos(b*x + a))*sin(b*x +
 a) - 4*cos(b*x + a)*sin_integral(b*x + a) + 2*sin_integral(2*b*x + 2*a))/b
^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos\left(a + bx\right)\mathrm{Si}\left(a + bx\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*Si(b*x+a),x)
```

```
[Out] Integral(x*cos(a + b*x)*Si(a + b*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.42, size = 528, normalized size = 4.89

$$\left(\frac{x\sin\left(bx + a\right)}{b} + \frac{\cos\left(bx + a\right)}{b^2}\right)\mathrm{Si}\left(bx + a\right) - \frac{2\,bx\tan\left(bx\right)^2\tan\left(a\right)^2 - 2\,a\log\left(|bx + a|\right)\tan\left(bx\right)^2\tan\left(a\right)^2 + a\Re\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(bx\right)^2\tan\left(a\right)^2 + a\Re\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(bx\right)^2\tan\left(a\right)^2 + \Im\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(bx\right)^2\tan\left(a\right)^2 - \Im\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(bx\right)^2\tan\left(a\right)^2 + 2\,\mathrm{Si}\left(2\,bx + 2\,a\right)\tan\left(bx\right)^2\tan\left(a\right)^2 + 2\,bx\tan\left(bx\right)^2 - 2\,a\log\left(|bx + a|\right)\tan\left(bx\right)^2 + a\Re\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(bx\right)^2 + a\Re\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(bx\right)^2 + 2\,bx\tan\left(a\right)^2 - 2\,a\log\left(|bx + a|\right)\tan\left(a\right)^2 + a\Re\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(a\right)^2 + a\Re\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(a\right)^2 + \Im\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(bx\right)^2 - \Im\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(bx\right)^2 + 2\,\mathrm{Si}\left(2\,bx + 2\,a\right)\tan\left(bx\right)^2 + 2\,\tan\left(bx\right)^2\tan\left(a\right) + \Im\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right)\tan\left(a\right)^2 - \Im\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right)\tan\left(a\right)^2 + 2\,\mathrm{Si}\left(2\,bx + 2\,a\right)\tan\left(a\right)^2 + 2\,\tan\left(bx\right)\tan\left(a\right)^2 + 2\,bx - 2\,a\log\left(|bx + a|\right) + a\Re\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right) + a\Re\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right) + \Im\left(\mathrm{Ci}\left(2\,bx + 2\,a\right)\right) - \Im\left(\mathrm{Ci}\left(-2\,bx - 2\,a\right)\right) + 2\,\mathrm{Si}\left(2\,bx + 2\,a\right) - 2\,\tan\left(bx\right) - 2\,\tan\left(a\right)}{4\left(b^2\tan\left(bx\right)^2\tan\left(a\right)^2 + b^2\tan\left(bx\right)^2 + b^2\tan\left(a\right)^2 + b^2\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(b*x+a),x, algorithm="giac")
```

```
[Out] (x*sin(b*x + a)/b + cos(b*x + a)/b^2)*sin_integral(b*x + a) - 1/4*(2*b*x*ta
n(b*x)^2*tan(a)^2 - 2*a*log(abs(b*x + a))*tan(b*x)^2*tan(a)^2 + a*real_part
(cos_integral(2*b*x + 2*a))*tan(b*x)^2*tan(a)^2 + a*real_part(cos_integral(
-2*b*x - 2*a))*tan(b*x)^2*tan(a)^2 + imag_part(cos_integral(2*b*x + 2*a))*t
```

```
an(b*x)^2*tan(a)^2 - imag_part(cos_integral(-2*b*x - 2*a))*tan(b*x)^2*tan(a
)^2 + 2*sin_integral(2*b*x + 2*a)*tan(b*x)^2*tan(a)^2 + 2*b*x*tan(b*x)^2 -
2*a*log(abs(b*x + a))*tan(b*x)^2 + a*real_part(cos_integral(2*b*x + 2*a))*t
an(b*x)^2 + a*real_part(cos_integral(-2*b*x - 2*a))*tan(b*x)^2 + 2*b*x*tan(
a)^2 - 2*a*log(abs(b*x + a))*tan(a)^2 + a*real_part(cos_integral(2*b*x + 2*
a))*tan(a)^2 + a*real_part(cos_integral(-2*b*x - 2*a))*tan(a)^2 + imag_part
(cos_integral(2*b*x + 2*a))*tan(b*x)^2 - imag_part(cos_integral(-2*b*x - 2*
a))*tan(b*x)^2 + 2*sin_integral(2*b*x + 2*a)*tan(b*x)^2 + 2*tan(b*x)^2*tan(
a) + imag_part(cos_integral(2*b*x + 2*a))*tan(a)^2 - imag_part(cos_integral
(-2*b*x - 2*a))*tan(a)^2 + 2*sin_integral(2*b*x + 2*a)*tan(a)^2 + 2*tan(b*x
)*tan(a)^2 + 2*b*x - 2*a*log(abs(b*x + a)) + a*real_part(cos_integral(2*b*x
 + 2*a)) + a*real_part(cos_integral(-2*b*x - 2*a)) + imag_part(cos_integral
(2*b*x + 2*a)) - imag_part(cos_integral(-2*b*x - 2*a)) + 2*sin_integral(2*b
*x + 2*a) - 2*tan(b*x) - 2*tan(a))/(b^2*tan(b*x)^2*tan(a)^2 + b^2*tan(b*x)^
2 + b^2*tan(a)^2 + b^2)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{sinint}(a+b\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(a + b*x)*cos(a + b*x),x)
[Out] int(x*sinint(a + b*x)*cos(a + b*x), x)
```

3.61 $\int \cos(a+bx)\mathbf{Si}(a+bx)\,dx$

Optimal. Leaf size=46

$$\frac{\text{CosIntegral}(2a+2bx)}{2b}-\frac{\log(a+bx)}{2b}+\frac{\sin(a+bx)\text{Si}(a+bx)}{b}$$

```
[Out] 1/2*Ci(2*b*x+2*a)/b-1/2*ln(b*x+a)/b+Si(b*x+a)*sin(b*x+a)/b
```

Rubi [A]
time = 0.05, antiderivative size = 46, normalized size of antiderivative = 1.00, 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 = {6652, 3393, 3383}

$$\frac{\text{CosIntegral}(2a+2bx)}{2b}+\frac{\text{Si}(a+bx)\sin(a+bx)}{b}-\frac{\log(a+bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[a + b*x]*SinIntegral[a + b*x],x]
```

```
[Out] CosIntegral[2*a + 2*b*x]/(2*b) - Log[a + b*x]/(2*b) + (Sin[a + b*x]*SinInte
gral[a + b*x])/b
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \cos(a+bx)\mathrm{Si}(a+bx)\,dx &= \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b} - \int \frac{\sin^2(a+bx)}{a+bx}\,dx \\ &= \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b} - \int \left(\frac{1}{2(a+bx)} - \frac{\cos(2a+2bx)}{2(a+bx)}\right)dx \\ &= -\frac{\log(a+bx)}{2b} + \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b} + \frac{1}{2}\int \frac{\cos(2a+2bx)}{a+bx}\,dx \\ &= \frac{\mathrm{Ci}(2a+2bx)}{2b} - \frac{\log(a+bx)}{2b} + \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b}\end{aligned}$$

Mathematica [A]
time = 0.02, size = 45, normalized size = 0.98

$$\frac{\mathrm{CosIntegral}(2(a+bx))}{2b} - \frac{\log(a+bx)}{2b} + \frac{\sin(a+bx)\mathrm{Si}(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[a + b*x]*SinIntegral[a + b*x],x]
[Out] CosIntegral[2*(a + b*x)]/(2*b) - Log[a + b*x]/(2*b) + (Sin[a + b*x]*SinInte
gral[a + b*x])/b
```

Maple [A]
time = 0.39, size = 38, normalized size = 0.83

method	result	size
derivativedivides	$\frac{\mathrm{sinIntegral}(bx+a)\sin(bx+a)-\frac{\ln(bx+a)}{2}+\frac{\mathrm{cosineIntegral}(2bx+2a)}{2}}{b}$	38
default	$\frac{\mathrm{sinIntegral}(bx+a)\sin(bx+a)-\frac{\ln(bx+a)}{2}+\frac{\mathrm{cosineIntegral}(2bx+2a)}{2}}{b}$	38

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x+a)*Si(b*x+a),x,method=_RETURNVERBOSE)
[Out] 1/b*(Si(b*x+a)*sin(b*x+a)-1/2*ln(b*x+a)+1/2*Ci(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x + a)*sin_integral(b*x + a), x)
```

Fricas [A]
time = 0.36, size = 46, normalized size = 1.00

$$\frac{4 \sin(bx+a)\,\mathrm{Si}(bx+a) + \mathrm{Ci}(2\,bx+2\,a) + \mathrm{Ci}(-2\,bx-2\,a) - 2\,\log(bx+a)}{4\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/4*(4*sin(b*x + a)*sin_integral(b*x + a) + cos_integral(2*b*x + 2*a) + cos
_integral(-2*b*x - 2*a) - 2*log(b*x + a))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \cos(a+bx)\,\mathrm{Si}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*Si(b*x+a),x)
```

```
[Out] Integral(cos(a + b*x)*Si(a + b*x), x)
```

Giac [B] Leaf count of result is larger than twice the leaf count of optimal. 95 vs. 2(42) = 84.
time = 0.41, size = 95, normalized size = 2.07

$$\frac{\sin(bx+a)\,\mathrm{Si}(bx+a)}{b} + \frac{\cos(2\,a)^2\,\mathrm{Ci}(2\,bx+2\,a) + \cos(2\,a)^2\,\mathrm{Ci}(-2\,bx-2\,a) + \mathrm{Ci}(2\,bx+2\,a)\sin(2\,a)^2 + \mathrm{Ci}(-2\,bx-2\,a)\sin(2\,a)^2 - 2\,\log(bx+a)}{4\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a),x, algorithm="giac")
```

```
[Out] sin(b*x + a)*sin_integral(b*x + a)/b + 1/4*(cos(2*a)^2*cos_integral(2*b*x +
 2*a) + cos(2*a)^2*cos_integral(-2*b*x - 2*a) + cos_integral(2*b*x + 2*a)*s
in(2*a)^2 + cos_integral(-2*b*x - 2*a)*sin(2*a)^2 - 2*log(b*x + a))/b
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{\mathrm{cosint}(2\,a+2\,b\,x) - \ln(a+b\,x) + 2\,\mathrm{sinint}(a+b\,x)\,\sin(a+b\,x)}{2\,b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(a + b*x)*cos(a + b*x),x)
```

```
[Out] (cosint(2*a + 2*b*x) - log(a + b*x) + 2*sinint(a + b*x)*sin(a + b*x))/(2*b)
```

3.62 $\int \frac{\cos(a+bx)\mathbf{Si}(a+bx)}{x} \, dx$

Optimal. Leaf size=19

$$\operatorname{Int}\left(\frac{\cos(a+bx)\operatorname{Si}(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(cos(b*x+a)*Si(b*x+a)/x,x)
```

Rubi [A]
time = 0.09, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(a+bx)\operatorname{Si}(a+bx)}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[a + b*x]*SinIntegral[a + b*x])/x,x]
[Out] Defer[Int][(Cos[a + b*x]*SinIntegral[a + b*x])/x, x]
```

Rubi steps

$$\int \frac{\cos(a+bx)\operatorname{Si}(a+bx)}{x} \, dx = \int \frac{\cos(a+bx)\operatorname{Si}(a+bx)}{x} \, dx$$

Mathematica [A]
time = 1.80, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\operatorname{Si}(a+bx)}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[a + b*x]*SinIntegral[a + b*x])/x,x]
[Out] Integrate[(Cos[a + b*x]*SinIntegral[a + b*x])/x, x]
```

Maple [A]
time = 0.20, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx+a)\operatorname{sinIntegral}(bx+a)}{x} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x+a)*Si(b*x+a)/x,x)
```

```
[Out] int(cos(b*x+a)*Si(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a)/x,x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x + a)*sin_integral(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a)/x,x, algorithm="fricas")
```

```
[Out] integral(cos(b*x + a)*sin_integral(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos\left(a + bx\right)\operatorname{Si}\left(a + bx\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*Si(b*x+a)/x,x)
```

```
[Out] Integral(cos(a + b*x)*Si(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(b*x+a)/x,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x + a)*sin_integral(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\mathrm{sinint}(a+b\,x)\,\cos\left(a+b\,x\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(a + b*x)*cos(a + b*x))/x,x)
[Out] int((sinint(a + b*x)*cos(a + b*x))/x, x)
```

3.63 $\int x \sin(a+bx)\mathbf{Si}(c+dx)\,dx$

Optimal. Leaf size=371

$$\frac{\cos(a-c+(b-d)x)}{2b(b-d)}-\frac{\cos(a+c+(b+d)x)}{2b(b+d)}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b^2}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{Co}}{}$$

```
[Out] -1/2*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b^2+1/2*Ci(c*(b+d)/d+(b+d)*x)*cos(a
-b*c/d)/b^2+1/2*cos(a-c+(b-d)*x)/b/(b-d)-1/2*cos(a+c+(b+d)*x)/b/(b+d)+1/2*c
*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d)*x)/b/d-x*cos(b*x+a)*Si(d*x+c)/b-1/2*c*cos(
a-b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b/d+1/2*c*Ci(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)
/b/d-1/2*c*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b/d+1/2*Si(c*(b-d)/d+(b-d)*x)
*sin(a-b*c/d)/b^2-1/2*Si(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b^2+Si(d*x+c)*sin(
b*x+a)/b^2
```

Rubi [A]
time = 0.64, antiderivative size = 371, normalized size of antiderivative = 1.00, number of steps used = 24, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {6648, 6874, 4670, 2718, 4515, 3384, 3380, 3383, 6652, 4513}

$$-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b^2}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b^2}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b^2}+\frac{\sin(a+bx)\text{Si}(c+dx)}{b^2}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b^2}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2bd}-\frac{c\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2bd}+\frac{c\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2bd}-\frac{x\cos(a+bx)\text{Si}(c+dx)}{b}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2bd}+\frac{\cos(a+x(b-d)-c)}{2b(b-d)}-\frac{\cos(a+x(b+d)+c)}{2b(b+d)}$$

Antiderivative was successfully verified.

```
[In] Int[x*Sin[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] Cos[a - c + (b - d)*x]/(2*b*(b - d)) - Cos[a + c + (b + d)*x]/(2*b*(b + d))
 - (Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/(2*b^2) + (Cos
[a - (b*c)/d]*CosIntegral[(c*(b + d))/d + (b + d)*x])/(2*b^2) + (c*CosInteg
ral[(c*(b - d))/d + (b - d)*x]*Sin[a - (b*c)/d])/(2*b*d) - (c*CosIntegral[(
c*(b + d))/d + (b + d)*x]*Sin[a - (b*c)/d])/(2*b*d) + (c*Cos[a - (b*c)/d]*S
inIntegral[(c*(b - d))/d + (b - d)*x])/(2*b*d) + (Sin[a - (b*c)/d]*SinInteg
ral[(c*(b - d))/d + (b - d)*x])/(2*b^2) - (x*Cos[a + b*x]*SinIntegral[c + d
*x])/b + (Sin[a + b*x]*SinIntegral[c + d*x])/b^2 - (c*Cos[a - (b*c)/d]*SinI
ntegral[(c*(b + d))/d + (b + d)*x])/(2*b*d) - (Sin[a - (b*c)/d]*SinIntegral
[(c*(b + d))/d + (b + d)*x])/(2*b^2)
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4513

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]^(p_.)*Sin[(c_.) + (d
_.)*(x_)]^(q_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Sin[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 4670

```
Int[Cos[w_]^(q_.)*Sin[v_]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[Sin[v]^p
*Cos[w]^q, x], x] /; IGtQ[p, 0] && IGtQ[q, 0] && ((PolynomialQ[v, x] && Pol
ynomialQ[w, x]) || (BinomialQ[{v, w}, x] && IndependentQ[Cancel[v/w], x]))
```

Rule 6648

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(SinIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Sin[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*SinIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x \sin(a+bx)\mathrm{Si}(c+dx)\,dx &= -\frac{x\cos(a+bx)\mathrm{Si}(c+dx)}{b}+\frac{\int \cos(a+bx)\mathrm{Si}(c+dx)\,dx}{b}+\frac{d\int \frac{x\cos(a+bx)\sin(c+}{c+dx}}{b} \\
&= -\frac{x\cos(a+bx)\mathrm{Si}(c+dx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b^2}-\frac{d\int \frac{\sin(a+bx)\sin(c+dx)}{c+dx}\,dx}{b^2} \\
&= -\frac{x\cos(a+bx)\mathrm{Si}(c+dx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b^2}+\frac{\int \cos(a+bx)\sin(c+d}{b} \\
&= -\frac{x\cos(a+bx)\mathrm{Si}(c+dx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b^2}+\frac{\int \left(-\frac{1}{2}\sin(a-c+(b-\right.}{} \\
&= -\frac{x\cos(a+bx)\mathrm{Si}(c+dx)}{b}+\frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b^2}-\frac{\int \sin(a-c+(b-d)x)}{2b} \\
&= \frac{\cos(a-c+(b-d)x)}{2b(b-d)}-\frac{\cos(a+c+(b+d)x)}{2b(b+d)}-\frac{\cos\left(a-\frac{bc}{d}\right)\mathrm{Ci}\left(\frac{c(b-d)}{d}+(b\right.}{2b^2} \\
&= \frac{\cos(a-c+(b-d)x)}{2b(b-d)}-\frac{\cos(a+c+(b+d)x)}{2b(b+d)}-\frac{\cos\left(a-\frac{bc}{d}\right)\mathrm{Ci}\left(\frac{c(b-d)}{d}+(b\right.}{2b^2}
\end{aligned}$$

Mathematica [C] Result contains complex when optimal does not.
time = 3.28, size = 345, normalized size = 0.93

$$\frac{e^{-i(a+c)}\left(bd\left(-\frac{e^{-i(b+d)x}}{b+d}+\frac{e^{i(2a+bx-dx)}}{b-d}\right)-i(bc-id)e^{\frac{i(-bc+(2a+c)d)}{d}}\mathrm{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+(-ibc+d)e^{\frac{ic(b+d)}{d}}\mathrm{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)\right)}{4b^2d}+\frac{e^{-i(a-c)}\left(bd\left(\frac{e^{-i(b-d)x}}{b-d}-\frac{e^{i(2a+(b+d)x)}}{b+d}\right)+i(bc+id)e^{\frac{ic(b-d)}{d}}\mathrm{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)+(ibc+d)e^{-\frac{i(bc-2ad+cd)}{d}}\mathrm{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)}{4b^2d}-\frac{(bx\cos(a+bx)-\sin(a+bx))\mathrm{Si}(c+dx)}{b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Sin[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] (b*d*(-(1/((b + d)*E^(I*(b + d)*x))) + E^(I*(2*a + b*x - d*x))/(b - d)) - I
*(b*c - I*d)*E^((I*(-(b*c) + (2*a + c)*d))/d)*ExpIntegralEi[(I*(b - d)*(c +
 d*x))/d] + ((-I)*b*c + d)*E^((I*c*(b + d))/d)*ExpIntegralEi[((-I)*(b + d)*
(c + d*x))/d]])/(4*b^2*d*E^(I*(a + c))) + (b*d*(1/((b - d)*E^(I*(b - d)*x))
- E^(I*(2*a + (b + d)*x))/(b + d)) + I*(b*c + I*d)*E^((I*c*(b - d))/d)*ExpI
ntegralEi[((-I)*(b - d)*(c + d*x))/d] + ((I*b*c + d)*ExpIntegralEi[(I*(b +
d)*(c + d*x))/d])/E^((I*(b*c - 2*a*d + c*d))/d))/(4*b^2*d*E^(I*(a - c))) -
((b*x*Cos[a + b*x] - Sin[a + b*x])*SinIntegral[c + d*x])/b^2
```

Maple [B] Leaf count of result is larger than twice the leaf count of optimal. 1245 vs. $2(351) = 702$.
time = 2.03, size = 1246, normalized size = 3.36

method	result	size
default	Expression too large to display	1246

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Si(d*x+c)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (-Si(d*x+c)/b*(-d/b*a*cos(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(sin(1/d*b*(d*x+
c)+(a*d-b*c)/d)-(1/d*b*(d*x+c)+(a*d-b*c)/d)*cos(1/d*b*(d*x+c)+(a*d-b*c)/d))
)+1/b*(1/2/(b-d)*d^2*a*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos(
(-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)
/d)/d)-1/2*d^2*c/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos(
(-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)
/d)/d)-1/2*(a*d-b*c)/(b-d)*d*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d
)*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*
d+b*c)/d)/d)+1/2/(b-d)*d*cos((b-d)/d*(d*x+c)+(a*d-b*c)/d)-1/2*d^2*a/(b+d)*(
-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)
/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)-1/2*d^2*c/(b+d)*(
-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)
/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)+1/2*(a*d-b*c)*d/(
b+d)*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci
((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)-1/2/(b+d)*d
*cos((b+d)/d*(d*x+c)+(a*d-b*c)/d)-1/2/b*d^2*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)
/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b
*c)/d)*cos((-a*d+b*c)/d)/d)+1/2/b*d^2*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a
*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)
*cos((-a*d+b*c)/d)/d))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(d*x+c)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*sin(b*x + a)*sin_integral(d*x + c), x)
```

Fricas [A]
time = 0.39, size = 580, normalized size = 1.56

$$\frac{4\,bd^{2}\cos\left(bx+a\right)\cos\left(dx+c\right)+4\,b^{2}d\sin\left(bx+a\right)\sin\left(dx+c\right)-4\left(b^{3}d-bd^{3}\right)x\cos\left(bx+a\right)\operatorname{Si}\left(dx+c\right)+4\left(b^{2}d-d^{3}\right)\sin\left(bx+a\right)\operatorname{Si}\left(dx+c\right)+\left(\left(b^{2}d-d^{3}\right)\operatorname{Ci}\left(\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)+\left(b^{2}d-d^{3}\right)\operatorname{Ci}\left(-\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)-\left(b^{2}d-d^{3}\right)\operatorname{Ci}\left(\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)-\left(b^{2}d-d^{3}\right)\operatorname{Ci}\left(-\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)-2\left(b^{3}c-bcd^{2}\right)\operatorname{Si}\left(\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)-2\left(b^{3}c-bcd^{2}\right)\operatorname{Si}\left(-\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)\right)\cos\left(-\frac{bc-ad}{d}\right)-\left(\left(b^{3}c-bcd^{2}\right)\operatorname{Ci}\left(\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)+\left(b^{3}c-bcd^{2}\right)\operatorname{Ci}\left(-\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)-\left(b^{3}c-bcd^{2}\right)\operatorname{Ci}\left(\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)-\left(b^{3}c-bcd^{2}\right)\operatorname{Ci}\left(-\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)+2\left(b^{2}d-d^{3}\right)\operatorname{Si}\left(\frac{bc+cd+\left(bd+d^{2}\right)x}{d}\right)+2\left(b^{2}d-d^{3}\right)\operatorname{Si}\left(-\frac{bc-cd+\left(bd-d^{2}\right)x}{d}\right)\right)\sin\left(-\frac{bc-ad}{d}\right)}{4\left(b^{4}d-b^{2}d^{3}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(d*x+c)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/4*(4*b*d^2*cos(b*x + a)*cos(d*x + c) + 4*b^2*d*sin(b*x + a)*sin(d*x + c)
- 4*(b^3*d - b*d^3)*x*cos(b*x + a)*sin_integral(d*x + c) + 4*(b^2*d - d^3)*
sin(b*x + a)*sin_integral(d*x + c) + ((b^2*d - d^3)*cos_integral((b*c + c*d
 + (b*d + d^2)*x)/d) + (b^2*d - d^3)*cos_integral(-(b*c + c*d + (b*d + d^2)
*x)/d) - (b^2*d - d^3)*cos_integral((b*c - c*d + (b*d - d^2)*x)/d) - (b^2*d
 - d^3)*cos_integral(-(b*c - c*d + (b*d - d^2)*x)/d) - 2*(b^3*c - b*c*d^2)*
sin_integral((b*c + c*d + (b*d + d^2)*x)/d) - 2*(b^3*c - b*c*d^2)*sin_integ
ral(-(b*c - c*d + (b*d - d^2)*x)/d))*cos(-(b*c - a*d)/d) - ((b^3*c - b*c*d^
2)*cos_integral((b*c + c*d + (b*d + d^2)*x)/d) + (b^3*c - b*c*d^2)*cos_inte
gral(-(b*c + c*d + (b*d + d^2)*x)/d) - (b^3*c - b*c*d^2)*cos_integral((b*c
- c*d + (b*d - d^2)*x)/d) - (b^3*c - b*c*d^2)*cos_integral(-(b*c - c*d + (b
*d - d^2)*x)/d) + 2*(b^2*d - d^3)*sin_integral((b*c + c*d + (b*d + d^2)*x)/
d) + 2*(b^2*d - d^3)*sin_integral(-(b*c - c*d + (b*d - d^2)*x)/d))*sin(-(b*
c - a*d)/d))/(b^4*d - b^2*d^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\sin\left(a+bx\right)\operatorname{Si}\left(c+dx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Si(d*x+c)*sin(b*x+a),x)
```

```
[Out] Integral(x*sin(a + b*x)*Si(c + d*x), x)
```

Giac [**C**] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 3.72, size = 200182, normalized size = 539.57

Too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*sin_integral(d*x+c)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] -(x*cos(b*x + a)/b - sin(b*x + a)/b^2)*sin_integral(d*x + c) - 1/4*(b^3*c*i
mag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(
1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c
 + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - b*c*d^2*imag_part(cos_integral(b*x
+ d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1
/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c
- c*d)/d)^2 - b^3*c*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*
b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a -
1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + b*c*d^2*imag_p
```

art(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b
*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*
d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + b^3*c*imag_part(cos_integral(-b*x + d*x
+ c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a +
 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)
/d)^2 - b*c*d^2*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x
 + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2
*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - b^3*c*imag_part(c
os_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x -
 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d
)^2*tan(1/2*(b*c - c*d)/d)^2 + b*c*d^2*imag_part(cos_integral(-b*x - d*x -
c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1
/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d
)^2 + 2*b^3*c*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*b*x + 1/2
*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*
tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*sin_integral(
(b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d
*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*ta
n(1/2*(b*c - c*d)/d)^2 - 2*b^3*c*sin_integral((b*d*x - d^2*x + b*c - c*d)/d
)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*ta
n(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*b*
c*d^2*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*
tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*
(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*b^3*c*real_part(cos_integral(
b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*t
an(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(
b*c - c*d)/d) + 2*b*c*d^2*real_part(cos_integral(b*x - d*x - c + b*c/d))*ta
n(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/
2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*b^3*c*re
al_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(
1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c
 + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) + 2*b*c*d^2*real_part(cos_integral(-b*x
 + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(
1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c
 - c*d)/d) + 2*b^3*c*real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2
*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a -
 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*real_
part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*
b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c
*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*b^3*c*real_part(cos_integral(-b*x - d*x
 - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a
+ 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/
d)^2 - 2*b*c*d^2*real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*
x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/
2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*b^3*c*real_part(

```
cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x -
 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^
2*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*real_part(cos_integral(b*x - d*x - c
 + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/
2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2
 + 2*b^3*c*real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/
2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*t
an(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*real_part(cos_
integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/
2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*t
an(1/2*(b*c - c*d)/d)^2 - 2*b^3*c*real_part(cos_integral(b*x + d*x + c + b*
c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)*
tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*t...
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.00

$$\int x\,\mathrm{sinint}(c+d\,x)\,\sin\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(c + d*x)*sin(a + b*x),x)
```

```
[Out] int(x*sinint(c + d*x)*sin(a + b*x), x)
```

3.64 $\int \sin(a+bx)\mathbf{Si}(c+dx)\,dx$

Optimal. Leaf size=154

$$-\frac{\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}+\frac{\text{CosIntegral}\left(\frac{c(b+d)}{d}+(b+d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{S}}{}$$

```
[Out] -1/2*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d)*x)/b-cos(b*x+a)*Si(d*x+c)/b+1/2*cos(a-
b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b-1/2*Ci(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)/b+1/2
*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b
```

Rubi [A]
time = 0.16, antiderivative size = 154, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6646, 4515, 3384, 3380, 3383}

$$-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b}-\frac{\cos(a+bx)\text{Si}(c+dx)}{b}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Sin[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] -1/2*(CosIntegral[(c*(b - d))/d + (b - d)*x]*Sin[a - (b*c)/d])/b + (CosInte
gral[(c*(b + d))/d + (b + d)*x]*Sin[a - (b*c)/d])/(2*b) - (Cos[a - (b*c)/d]
*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b) - (Cos[a + b*x]*SinIntegral[
c + d*x])/b + (Cos[a - (b*c)/d]*SinIntegral[(c*(b + d))/d + (b + d)*x])/(2*
b)
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int \sin(a+bx)\operatorname{Si}(c+dx)\,dx &= -\frac{\cos(a+bx)\operatorname{Si}(c+dx)}{b}+\frac{d\int \frac{\cos(a+bx)\sin(c+dx)}{c+dx}\,dx}{b}\\
&= -\frac{\cos(a+bx)\operatorname{Si}(c+dx)}{b}+\frac{d\int \left(-\frac{\sin(a-c+(b-d)x)}{2(c+dx)}+\frac{\sin(a+c+(b+d)x)}{2(c+dx)}\right)dx}{b}\\
&= -\frac{\cos(a+bx)\operatorname{Si}(c+dx)}{b}-\frac{d\int \frac{\sin(a-c+(b-d)x)}{c+dx}\,dx}{2b}+\frac{d\int \frac{\sin(a+c+(b+d)x)}{c+dx}\,dx}{2b}\\
&= -\frac{\cos(a+bx)\operatorname{Si}(c+dx)}{b}-\frac{\left(d\cos\left(a-\frac{bc}{d}\right)\right)\int \frac{\sin\left(\frac{c(b-d)}{d}+(b-d)x\right)}{c+dx}\,dx}{2b}+\frac{\left(d\cos\left(a-\right.\right.}{}\\
&= -\frac{\operatorname{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}+\frac{\operatorname{Ci}\left(\frac{c(b+d)}{d}+(b+d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}-\frac{\mathrm{co}}{}
\end{aligned}$$

Mathematica [C] Result contains complex when optimal does not.
time = 1.23, size = 168, normalized size = 1.09

$$\frac{ie^{-\frac{i(bc+ad)}{d}}\left(-e^{\frac{2ibc}{d}}\operatorname{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)+e^{2ia}\operatorname{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+e^{\frac{2ibc}{d}}\operatorname{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)-e^{2ia}\operatorname{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)+4ie^{\frac{i(bc+ad)}{d}}\cos(a+bx)\operatorname{Si}(c+dx)\right)}{4b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Sin[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] ((I/4)*(-(E^(((2*I)*b*c)/d)*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d]) + E^
((2*I)*a)*ExpIntegralEi[(I*(b - d)*(c + d*x))/d] + E^(((2*I)*b*c)/d)*ExpInt
egralEi[((-I)*(b + d)*(c + d*x))/d] - E^((2*I)*a)*ExpIntegralEi[(I*(b + d)*
(c + d*x))/d] + (4*I)*E^((I*(b*c + a*d))/d)*Cos[a + b*x]*SinIntegral[c + d*
x]))/(b*E^((I*(b*c + a*d))/d))
```

Maple [A]
time = 1.08, size = 290, normalized size = 1.88

method	result
default	$\frac{-\frac{\text{sinIntegral}(dx+c)d\cos\left(\frac{b(dx+c)}{d}+\frac{ad-cb}{d}\right)}{b}+\frac{d\left(-\frac{d\left(-\frac{\text{sinIntegral}\left(-\frac{(b-d)(dx+c)}{d}-\frac{ad-cb}{d}-\frac{-ad+cb}{d}\right)\cos\left(\frac{-ad+cb}{d}\right)}{d}-\frac{\text{cosineIntegral}\left(\frac{(b-d)(d}{d}\right.}{}\right.}{2}\right.}{}}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*x+c)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (-Si(d*x+c)/b*d*cos(1/d*b*(d*x+c)+(a*d-b*c)/d)+1/b*d*(-1/2*d*(-Si(-(b-d)/d*
(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a
*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)+1/2*d*(-Si(-(b+d)/d*(d*x+c)-(a
*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+
(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(d*x+c)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(sin(b*x + a)*sin_integral(d*x + c), x)
```

Fricas [A]
time = 0.36, size = 195, normalized size = 1.27

$$\frac{2\left(\mathrm{Si}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\mathrm{Si}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\cos\left(-\frac{bc-ad}{d}\right)+\left(\mathrm{Ci}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\mathrm{Ci}\left(-\frac{bc+cd+(bd+d^2)x}{d}\right)-\mathrm{Ci}\left(\frac{bc-cd+(bd-d^2)x}{d}\right)-\mathrm{Ci}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\sin\left(-\frac{bc-ad}{d}\right)-4\cos(bx+a)\,\mathrm{Si}(dx+c)}{4b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(d*x+c)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/4*(2*(sin_integral((b*c + c*d + (b*d + d^2)*x)/d) + sin_integral(-(b*c -
c*d + (b*d - d^2)*x)/d))*cos(-(b*c - a*d)/d) + (cos_integral((b*c + c*d + (
b*d + d^2)*x)/d) + cos_integral(-(b*c + c*d + (b*d + d^2)*x)/d) - cos_integ
ral((b*c - c*d + (b*d - d^2)*x)/d) - cos_integral(-(b*c - c*d + (b*d - d^2)
*x)/d))*sin(-(b*c - a*d)/d) - 4*cos(b*x + a)*sin_integral(d*x + c))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \sin(a+bx)\,\mathrm{Si}(c+dx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Si(d*x+c)*sin(b*x+a),x)
```

```
[Out] Integral(sin(a + b*x)*Si(c + d*x), x)
```

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.63, size = 9541, normalized size = 61.95

Too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(sin_integral(d*x+c)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] 1/4*(imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*ta
n(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - imag
_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a -
 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + imag_part(cos
_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^
2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - imag_part(cos_integra
l(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/
2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*sin_integral((b*d*x + d^2*x
 + b*c + c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c
*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*sin_integral((b*d*x - d^2*x + b*c - c
*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*t
an(1/2*(b*c - c*d)/d)^2 - 2*real_part(cos_integral(b*x - d*x - c + b*c/d))*
tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*
(b*c - c*d)/d) - 2*real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*
a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c
*d)/d) + 2*real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c
)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 +
2*real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(
1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*real_p
art(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1
/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*real_part(cos_i
ntegral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*ta
n(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*real_part(cos_integral(
b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*
c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*real_part(cos_integral(-b*x - d*
x - c - b*c/d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)
/d)^2*tan(1/2*(b*c - c*d)/d)^2 + imag_part(cos_integral(b*x + d*x + c + b*c
/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 + i
mag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*
a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 - imag_part(cos_integral(-b*x + d*x +
 c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/
d)^2 - imag_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2
```

```
*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 + 2*sin_integral((b*d*x + d^
2*x + b*c + c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c
+ c*d)/d)^2 + 2*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*a + 1/2
*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 - 4*imag_part(cos_integ
ral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2
*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) + 4*imag_part(cos_integral(-b*x +
d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*
d)/d)^2*tan(1/2*(b*c - c*d)/d) - 8*sin_integral((b*d*x - d^2*x + b*c - c*d)
/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/
2*(b*c - c*d)/d) - imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a
 + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 - imag_part(cos_i
ntegral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*t
an(1/2*(b*c - c*d)/d)^2 + imag_part(cos_integral(-b*x + d*x + c - b*c/d))*t
an(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 + imag_pa
rt(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1
/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*sin_integral((b*d*x + d^2*x + b*c + c*
d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 -
2*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*
a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 + 4*imag_part(cos_integral(b*x + d*x
+ c + b*c/d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d
)*tan(1/2*(b*c - c*d)/d)^2 - 4*imag_part(cos_integral(-b*x - d*x - c - b*c/
d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*
(b*c - c*d)/d)^2 + 8*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*a
+ 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)
^2 + imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*ta
n(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + imag_part(cos_integral(b*
x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2
*(b*c - c*d)/d)^2 - imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2
*a + 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - imag_part
(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c +
c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*sin_integral((b*d*x + d^2*x + b*c +
c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d
)^2 + 2*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*a + 1/2*c)^2*ta
n(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - imag_part(cos_integral(b*
x + d*x + c + b*c/d))*tan(1/2*a - 1/2*c)^2*tan(...
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{sinint}(c+d\,x)\,\sin\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(c + d*x)*sin(a + b*x),x)
[Out] int(sinint(c + d*x)*sin(a + b*x), x)
```

3.65 $\int \frac{\sin(a+bx)\mathbf{Si}(c+dx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\sin(a+bx)\text{Si}(c+dx)}{x},x\right)$$

```
[Out] CannotIntegrate(Si(d*x+c)*sin(b*x+a)/x,x)
```

Rubi [A]
time = 0.10, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\sin(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Sin[a + b*x]*SinIntegral[c + d*x])/x,x]
[Out] Defer[Int][(Sin[a + b*x]*SinIntegral[c + d*x])/x, x]
```

Rubi steps

$$\int \frac{\sin(a+bx)\text{Si}(c+dx)}{x}\,dx = \int \frac{\sin(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Mathematica [A]
time = 19.98, size = 0, normalized size = 0.00

$$\int \frac{\sin(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Sin[a + b*x]*SinIntegral[c + d*x])/x,x]
[Out] Integrate[(Sin[a + b*x]*SinIntegral[c + d*x])/x, x]
```

Maple [A]
time = 0.17, size = 0, normalized size = 0.00

$$\int \frac{\text{sinIntegral}\,(dx+c)\sin\,(bx+a)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Si(d*x+c)*sin(b*x+a)/x,x)
```

```
[Out] int(Si(d*x+c)*sin(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin(b*x + a)*sin_integral(d*x + c)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(sin(b*x + a)*sin_integral(d*x + c)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin{\left(a + b x \right)} \operatorname{Si}{\left(c + d x \right)}}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(sin(b*x + a)*sin_integral(d*x + c)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\mathrm{sinint}\left(c+d\,x\right)\,\sin\left(a+b\,x\right)}{x} \,d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(c + d*x)*sin(a + b*x))/x,x)
[Out] int((sinint(c + d*x)*sin(a + b*x))/x, x)
```

3.66 $\int x\cos(a+bx)\mathbf{Si}(c+dx)\,dx$

Optimal. Leaf size=370

$$\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2bd}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+(b+d)x\right)}{2bd}+\frac{\text{CosIntegral}}{}$$

```
[Out] 1/2*c*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b/d-1/2*c*Ci(c*(b+d)/d+(b+d)*x)*co
s(a-b*c/d)/b/d+1/2*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d)*x)/b^2+cos(b*x+a)*Si(d*x
+c)/b^2-1/2*cos(a-b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b^2+1/2*Ci(c*(b-d)/d+(b-d)*x
)*sin(a-b*c/d)/b^2-1/2*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b^2-1/2*c*Si(c*(b
-d)/d+(b-d)*x)*sin(a-b*c/d)/b/d+1/2*c*Si(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b/
d+x*Si(d*x+c)*sin(b*x+a)/b-1/2*sin(a-c+(b-d)*x)/b/(b-d)+1/2*sin(a+c+(b+d)*x
)/b/(b+d)
```

Rubi [A]
time = 0.86, antiderivative size = 370, normalized size of antiderivative = 1.00, number of steps used = 24, number of rules used = 9, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.643$, Rules used = {6654, 4704, 6874, 2717, 3384, 3380, 3383, 6646, 4515}

$$\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b^2}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b^2}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b^2}+\frac{\cos(a+bx)\text{Si}(c+dx)}{b^2}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b^2}+\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2bd}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2bd}-\frac{c\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2bd}+\frac{x\sin(a+bx)\text{Si}(c+dx)}{b}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2bd}-\frac{\sin(a+x(b-d)-c)}{2b(b-d)}+\frac{\sin(a+x(b+d)+c)}{2b(b+d)}$$

Antiderivative was successfully verified.

```
[In] Int[x*Cos[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] (c*Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/(2*b*d) - (c*Co
s[a - (b*c)/d]*CosIntegral[(c*(b + d))/d + (b + d)*x])/(2*b*d) + (CosIntegr
al[(c*(b - d))/d + (b - d)*x]*Sin[a - (b*c)/d])/(2*b^2) - (CosIntegral[(c*(
b + d))/d + (b + d)*x]*Sin[a - (b*c)/d])/(2*b^2) - Sin[a - c + (b - d)*x]/(
2*b*(b - d)) + Sin[a + c + (b + d)*x]/(2*b*(b + d)) + (Cos[a - (b*c)/d]*Sin
Integral[(c*(b - d))/d + (b - d)*x])/(2*b^2) - (c*Sin[a - (b*c)/d]*SinInteg
ral[(c*(b - d))/d + (b - d)*x])/(2*b*d) + (Cos[a + b*x]*SinIntegral[c + d*x
])/b^2 + (x*Sin[a + b*x]*SinIntegral[c + d*x])/b - (Cos[a - (b*c)/d]*SinInt
egral[(c*(b + d))/d + (b + d)*x])/(2*b^2) + (c*Sin[a - (b*c)/d]*SinIntegral
[(c*(b + d))/d + (b + d)*x])/(2*b*d)
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 4704

```
Int[(u_.)*Sin[(a_.) + (b_.)*(x_)]^(m_.)*Sin[(c_.) + (d_.)*(x_)]^(n_.), x_Sy
mbol] :> Int[ExpandTrigReduce[u, Sin[a + b*x]^m*Sin[c + d*x]^n, x], x] /; F
reeQ[{a, b, c, d}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

Rule 6646

```
Int[Sin[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(SinIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6654

```
Int[Cos[(a_.) + (b_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*SinIntegral[(c_.) +
(d_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(SinIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Sin[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*SinIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\cos(a+bx)\text{Si}(c+dx)\,dx = \frac{x\sin(a+bx)\text{Si}(c+dx)}{b} - \frac{\int \sin(a+bx)\text{Si}(c+dx)\,dx}{b} - \frac{d\int \frac{x\sin(a+bx)\sin(c+c}{c+dx}}{b}$$

$$= \frac{\cos(a+bx)\text{Si}(c+dx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(c+dx)}{b} - \frac{d\int \frac{\cos(a+bx)\sin(c+dx)}{c+dx}\,dx}{b^2}$$

$$= \frac{\cos(a+bx)\text{Si}(c+dx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(c+dx)}{b} - \frac{d\int \left(-\frac{\sin(a-c+(b-d)x)}{2(c+dx)} + \right.}{b^2}$$

$$= \frac{\cos(a+bx)\text{Si}(c+dx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(c+dx)}{b} + \frac{d\int \frac{\sin(a-c+(b-d)x)}{c+dx}\,dx}{2b^2} -$$

$$= \frac{\cos(a+bx)\text{Si}(c+dx)}{b^2} + \frac{x\sin(a+bx)\text{Si}(c+dx)}{b} - \frac{\int \cos(a-c+(b-d)x)}{2b}$$

$$= \frac{\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b^2} - \frac{\text{Ci}\left(\frac{c(b+d)}{d}+(b+d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b^2} -$$

$$= \frac{c\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2bd} - \frac{c\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b+d)}{d}+(b+d)x\right)}{2bd}$$

Mathematica [C] Result contains complex when optimal does not.
time = 3.15, size = 427, normalized size = 1.15

$$\frac{e^{-\frac{i(b(c+dx)+d(a+c+dx))}{d}}\left((bc-id)(b^2-d^2)e^{i(2a+c+(b+d)x)}\text{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+e^{\frac{ibc}{d}}\left(ibd\left(d\left(-1+e^{2i(a+bx)}\right)+b\left(1+e^{2i(a+bx)}\right)\right)-(bc+id)(b^2-d^2)e^{\frac{i(b+d)(c+dx)}{d}}\text{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)\right)\right)+e^{-\frac{i(d(a-dx)+b(c+dx))}{d}}\left(-ibde^{\frac{ic(b+d)}{d}}\left(b+d+be^{2i(a+bx)}-de^{2i(a+bx)}\right)+(bc+id)(b^2-d^2)e^{-idx+ib\left(\frac{2c}{d}+x\right)}\text{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)-(bc-id)(b^2-d^2)e^{i(2a+(b-d)x)}\text{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)+4(b-d)d(b+d)(\cos(a+bx)+bx\sin(a+bx))\text{Si}(c+dx)}{4b^2(b-d)d(b+d)}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] (((b*c - I*d)*(b^2 - d^2)*E^(I*(2*a + c + (b + d)*x))*ExpIntegralEi[(I*(b -
 d)*(c + d*x))/d] + E^((I*b*c)/d)*(I*b*d*(d*(-1 + E^((2*I)*(a + b*x))) + b*
(1 + E^((2*I)*(a + b*x)))) - (b*c + I*d)*(b^2 - d^2)*E^((I*(b + d)*(c + d*x
))/d)*ExpIntegralEi[((-I)*(b + d)*(c + d*x))/d]))/E^((I*(b*(c + d*x) + d*(a
 + c + d*x)))/d) + ((-I)*b*d*E^((I*c*(b + d))/d)*(b + d + b*E^((2*I)*(a + b
*x)) - d*E^((2*I)*(a + b*x))) + (b*c + I*d)*(b^2 - d^2)*E^((-I)*d*x + I*b*(
(2*c)/d + x))*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d] - (b*c - I*d)*(b^2
- d^2)*E^(I*(2*a + (b - d)*x))*ExpIntegralEi[(I*(b + d)*(c + d*x))/d])/E^((
I*(d*(a - d*x) + b*(c + d*x)))/d) + 4*(b - d)*d*(b + d)*(Cos[a + b*x] + b*x
*Sin[a + b*x])*SinIntegral[c + d*x])/(4*b^2*(b - d)*d*(b + d))
```

Maple [B] Leaf count of result is larger than twice the leaf count of optimal. 1239 vs. $2(350) = 700$.
time = 2.14, size = 1240, normalized size = 3.35

method	result	size
default	Expression too large to display	1240

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cos(b*x+a)*Si(d*x+c),x,method=_RETURNVERBOSE)
```

```
[Out] (-Si(d*x+c)/b*(d/b*a*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(cos(1/d*b*(d*x+c
)+(a*d-b*c)/d)+(1/d*b*(d*x+c)+(a*d-b*c)/d)*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)))
+1/b*(1/2*d^2*a/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((
-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/
d)/d)-1/2*d^2*c/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((
-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/
d)/d)-1/2*(a*d-b*c)*d/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)
*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d
+b*c)/d)/d)-1/2/(b-d)*d*sin((b-d)/d*(d*x+c)+(a*d-b*c)/d)-1/2*d^2*a/(b+d)*(-
Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/
d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)-1/2*d^2*c/(b+d)*(-
Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/
d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)+1/2*(a*d-b*c)*d/(b
+d)*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci(
(b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)+1/2/(b+d)*d*
sin((b+d)/d*(d*x+c)+(a*d-b*c)/d)-1/2/b*d^2*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/
d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*
c)/d)*sin((-a*d+b*c)/d)/d)+1/2/b*d^2*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*
d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*
sin((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(d*x+c),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x + a)*sin_integral(d*x + c), x)
```

Fricas [A]
time = 0.41, size = 577, normalized size = 1.56

$$\frac{4\,b^2d\cos\left(bx+a\right)\sin\left(dx+c\right)+4\left(b^2d-d^3\right)\cos\left(bx+a\right)\operatorname{Si}\left(dx+c\right)-\left(\left(b^3c-bcd^2\right)\operatorname{Ci}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\left(b^3c-bcd^2\right)\operatorname{Ci}\left(-\frac{bc+cd+(bd+d^2)x}{d}\right)-\left(b^3c-bcd^2\right)\operatorname{Ci}\left(\frac{bc-cd+(bd-d^2)x}{d}\right)-\left(b^3c-bcd^2\right)\operatorname{Ci}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)+2\left(b^2d-d^3\right)\operatorname{Si}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+2\left(b^2d-d^3\right)\operatorname{Si}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\cos\left(-\frac{bc-ad}{d}\right)-4\left(bd^2\cos\left(dx+c\right)-\left(b^3d-bd^3\right)x\operatorname{Si}\left(dx+c\right)\right)\sin\left(bx+a\right)-\left(\left(b^2d-d^3\right)\operatorname{Ci}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\left(b^2d-d^3\right)\operatorname{Ci}\left(-\frac{bc+cd+(bd+d^2)x}{d}\right)-\left(b^2d-d^3\right)\operatorname{Ci}\left(\frac{bc-cd+(bd-d^2)x}{d}\right)-\left(b^2d-d^3\right)\operatorname{Ci}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)-2\left(b^3c-bcd^2\right)\operatorname{Si}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)-2\left(b^3c-bcd^2\right)\operatorname{Si}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\sin\left(-\frac{bc-ad}{d}\right)}{4\left(b^4d-b^2d^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(d*x+c),x, algorithm="fricas")
```

```
[Out] 1/4*(4*b^2*d*cos(b*x + a)*sin(d*x + c) + 4*(b^2*d - d^3)*cos(b*x + a)*sin_i
ntegral(d*x + c) - ((b^3*c - b*c*d^2)*cos_integral((b*c + c*d + (b*d + d^2)
*x)/d) + (b^3*c - b*c*d^2)*cos_integral(-(b*c + c*d + (b*d + d^2)*x)/d) - (
b^3*c - b*c*d^2)*cos_integral((b*c - c*d + (b*d - d^2)*x)/d) - (b^3*c - b*c
*d^2)*cos_integral(-(b*c - c*d + (b*d - d^2)*x)/d) + 2*(b^2*d - d^3)*sin_in
tegral((b*c + c*d + (b*d + d^2)*x)/d) + 2*(b^2*d - d^3)*sin_integral(-(b*c
- c*d + (b*d - d^2)*x)/d))*cos(-(b*c - a*d)/d) - 4*(b*d^2*cos(d*x + c) - (b
^3*d - b*d^3)*x*sin_integral(d*x + c))*sin(b*x + a) - ((b^2*d - d^3)*cos_in
tegral((b*c + c*d + (b*d + d^2)*x)/d) + (b^2*d - d^3)*cos_integral(-(b*c +
c*d + (b*d + d^2)*x)/d) - (b^2*d - d^3)*cos_integral((b*c - c*d + (b*d - d^
2)*x)/d) - (b^2*d - d^3)*cos_integral(-(b*c - c*d + (b*d - d^2)*x)/d) - 2*(
b^3*c - b*c*d^2)*sin_integral((b*c + c*d + (b*d + d^2)*x)/d) - 2*(b^3*c - b
*c*d^2)*sin_integral(-(b*c - c*d + (b*d - d^2)*x)/d))*sin(-(b*c - a*d)/d))/
(b^4*d - b^2*d^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos(a+bx)\operatorname{Si}(c+dx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*Si(d*x+c),x)
```

```
[Out] Integral(x*cos(a + b*x)*Si(c + d*x), x)
```

Giac [**C**] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 3.77, size = 206132, normalized size = 557.11

Too large to display

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*cos(b*x+a)*sin_integral(d*x+c),x, algorithm="giac")
```

```
[Out] (x*sin(b*x + a)/b + cos(b*x + a)/b^2)*sin_integral(d*x + c) - 1/4*(b^3*c*re
al_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1
/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c
+ c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - b*c*d^2*real_part(cos_integral(b*x +
 d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/
2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c -
 c*d)/d)^2 - b^3*c*real_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b
*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1
/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + b*c*d^2*real_pa
rt(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*
x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d
)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - b^3*c*real_part(cos_integral(-b*x + d*x +
```

c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + b*c*d^2*real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + b^3*c*real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - b*c*d^2*real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*b^3*c*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*b*c*d^2*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*b^3*c*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) + 2*b*c*d^2*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) + 4*b^3*c*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 4*b*c*d^2*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*b^3*c*imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*b*c*d^2*imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*b^3*c*imag_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*imag_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 4*b^3*c*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 4*b*c*d^2*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 2*b^3*c*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*b*c*d^2*imag_part(cos_integral(b*x - d*x - c + b*c/d)

```
)*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*ta
n(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*b^3*
c*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*
tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b
*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*b*c*d^2*imag_part(cos_integral(
-b*x + d*x + c - b*c/d))*tan(1/2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*
tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b
*c - c*d)/d)^2 - 4*b^3*c*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/
2*b*x + 1/2*d*x)^2*tan(1/2*b*x - 1/2*d*x)^2*tan(1/2*a + 1/2*c)^2*tan(1/2*a
- 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c ...
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.00

$$\int x\,\mathrm{sinint}(c+d\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*sinint(c + d*x)*cos(a + b*x),x)
```

```
[Out] int(x*sinint(c + d*x)*cos(a + b*x), x)
```

3.67 $\int \cos(a+bx)\mathbf{Si}(c+dx)\,dx$

Optimal. Leaf size=153

$$-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+(b+d)x\right)}{2b}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}(}{}$$

```
[Out] -1/2*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b+1/2*Ci(c*(b+d)/d+(b+d)*x)*cos(a-b
*c/d)/b+1/2*Si(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)/b-1/2*Si(c*(b+d)/d+(b+d)*x)*
sin(a-b*c/d)/b+Si(d*x+c)*sin(b*x+a)/b
```

Rubi [A]
time = 0.16, antiderivative size = 153, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6652, 4513, 3384, 3380, 3383}

$$-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b}+\frac{\sin(a+bx)\text{Si}(c+dx)}{b}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] -1/2*(Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/b + (Cos[a -
 (b*c)/d]*CosIntegral[(c*(b + d))/d + (b + d)*x])/(2*b) + (Sin[a - (b*c)/d]
*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b) + (Sin[a + b*x]*SinIntegral[
c + d*x])/b - (Sin[a - (b*c)/d]*SinIntegral[(c*(b + d))/d + (b + d)*x])/(2*
b)
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4513

```
Int[((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b_.)*(x_)]^(p_.)*Sin[(c_.) + (d
_.)*(x_)]^(q_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Sin[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 6652

```
Int[Cos[(a_.) + (b_.)*(x_)]*SinIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(SinIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Sin[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int \cos(a+bx)\mathrm{Si}(c+dx)\,dx &= \frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b} - \frac{d\int \frac{\sin(a+bx)\sin(c+dx)}{c+dx}\,dx}{b} \\
&= \frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b} - \frac{d\int \left(\frac{\cos(a-c+(b-d)x)}{2(c+dx)} - \frac{\cos(a+c+(b+d)x)}{2(c+dx)}\right)dx}{b} \\
&= \frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b} - \frac{d\int \frac{\cos(a-c+(b-d)x)}{c+dx}\,dx}{2b} + \frac{d\int \frac{\cos(a+c+(b+d)x)}{c+dx}\,dx}{2b} \\
&= \frac{\sin(a+bx)\mathrm{Si}(c+dx)}{b} - \frac{\left(d\cos\left(a-\frac{bc}{d}\right)\right)\int \frac{\cos\left(\frac{c(b-d)}{d}+(b-d)x\right)}{c+dx}\,dx}{2b} + \frac{\left(d\cos\left(a-\right.\right.}{} \\
&= -\frac{\cos\left(a-\frac{bc}{d}\right)\mathrm{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b} + \frac{\cos\left(a-\frac{bc}{d}\right)\mathrm{Ci}\left(\frac{c(b+d)}{d}+(b+d)x\right)}{2b} +
\end{aligned}$$

Mathematica [C] Result contains complex when optimal does not.
time = 1.07, size = 164, normalized size = 1.07

$$\frac{e^{-\frac{i(bc+ad)}{d}}\left(-e^{\frac{2ibc}{d}}\mathrm{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)-e^{2ia}\mathrm{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+e^{\frac{2ibc}{d}}\mathrm{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)+e^{2ia}\mathrm{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)+4e^{\frac{i(bc+ad)}{d}}\sin(a+bx)\mathrm{Si}(c+dx)\right)}{4b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[a + b*x]*SinIntegral[c + d*x],x]
```

```
[Out] (-(E^(((2*I)*b*c)/d)*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d]) - E^((2*I)*
a)*ExpIntegralEi[(I*(b - d)*(c + d*x))/d] + E^(((2*I)*b*c)/d)*ExpIntegralEi
[((-I)*(b + d)*(c + d*x))/d] + E^((2*I)*a)*ExpIntegralEi[(I*(b + d)*(c + d*
x))/d] + 4*E^((I*(b*c + a*d))/d)*Sin[a + b*x]*SinIntegral[c + d*x])/(4*b*E^
((I*(b*c + a*d))/d))
```

Maple [A]
time = 1.41, size = 288, normalized size = 1.88

method	result
default	$\frac{\frac{\operatorname{sinIntegral}(dx+c)d\sin\left(\frac{b(dx+c)}{d}+\frac{ad-cb}{d}\right)}{b}-\frac{d\left(\frac{d\left(-\frac{\operatorname{sinIntegral}\left(-\frac{(b-d)(dx+c)}{d}-\frac{ad-cb}{d}-\frac{-ad+cb}{d}\right)\sin\left(\frac{-ad+cb}{d}\right)}{d}+\frac{\operatorname{cosineIntegral}\left(\frac{(b-d)(dx+c)}{d}\right.}{}\right.}{2}\right.}{}}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x+a)*Si(d*x+c),x,method=_RETURNVERBOSE)
```

```
[Out] (Si(d*x+c)/b*d*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(1/2*d*(-Si(-(b-d)/d*(d
*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d
-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)-1/2*d*(-Si(-(b+d)/d*(d*x+c)-(a*d
-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-
a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(d*x+c),x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x + a)*sin_integral(d*x + c), x)
```

Fricas [A]
time = 0.37, size = 195, normalized size = 1.27

$$\frac{\left(\operatorname{Ci}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\operatorname{Ci}\left(-\frac{bc+cd+(bd+d^2)x}{d}\right)-\operatorname{Ci}\left(\frac{bc-cd+(bd-d^2)x}{d}\right)-\operatorname{Ci}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\cos\left(-\frac{bc-ad}{d}\right)-2\left(\operatorname{Si}\left(\frac{bc+cd+(bd+d^2)x}{d}\right)+\operatorname{Si}\left(-\frac{bc-cd+(bd-d^2)x}{d}\right)\right)\sin\left(-\frac{bc-ad}{d}\right)+4\sin(bx+a)\operatorname{Si}(dx+c)}{4b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(cos(b*x+a)*sin_integral(d*x+c),x, algorithm="fricas")
```

```
[Out] 1/4*((cos_integral((b*c + c*d + (b*d + d^2)*x)/d) + cos_integral(-(b*c + c*
d + (b*d + d^2)*x)/d) - cos_integral((b*c - c*d + (b*d - d^2)*x)/d) - cos_i
ntegral(-(b*c - c*d + (b*d - d^2)*x)/d))*cos(-(b*c - a*d)/d) - 2*(sin_integ
ral((b*c + c*d + (b*d + d^2)*x)/d) + sin_integral(-(b*c - c*d + (b*d - d^2)
*x)/d))*sin(-(b*c - a*d)/d) + 4*sin(b*x + a)*sin_integral(d*x + c))/b
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \cos(a+bx)\operatorname{Si}(c+dx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(cos(b*x+a)*Si(d*x+c),x)

[Out] Integral(cos(a + b*x)*Si(c + d*x), x)

Giac [C] Result contains higher order function than in optimal. Order 9 vs. order 4.
time = 0.67, size = 9214, normalized size = 60.22

Too large to display

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(cos(b*x+a)*sin_integral(d*x+c),x, algorithm="giac")

[Out] 1/4*(real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) + 4*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) - 2*imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + 2*imag_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 4*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 - 2*imag_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*imag_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 4*sin_integral((b*d*x - d^2*x + b*c - c*d)/d)*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 2*imag_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*imag_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + 4*sin_integral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*a + 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 + real_part(cos_integral(b*x -

```
d*x - c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c +
c*d)/d)^2 + real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2
*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2 + real_part(cos_integra
l(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/
2*(b*c + c*d)/d)^2 - 4*real_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1
/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c -
c*d)/d) - 4*real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2
*c)^2*tan(1/2*a - 1/2*c)*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d) -
real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2
*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(b*x - d*x -
 c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/
d)^2 - real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c)^2
*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(-b*
x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*
c - c*d)/d)^2 + 4*real_part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a
+ 1/2*c)*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)
^2 + 4*real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)*t
an(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)*tan(1/2*(b*c - c*d)/d)^2 + real_
part(cos_integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c
 + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + real_part(cos_integral(b*x - d*x -
c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*
d)/d)^2 + real_part(cos_integral(-b*x + d*x + c - b*c/d))*tan(1/2*a + 1/2*c
)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 + real_part(cos_integ
ral(-b*x - d*x - c - b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*
tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(b*x + d*x + c + b*c/d))*t
an(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - rea
l_part(cos_integral(b*x - d*x - c + b*c/d))*tan(1/2*a - 1/2*c)^2*tan(1/2*(b
*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - real_part(cos_integral(-b*x + d*x
 + c - b*c/d))*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c -
 c*d)/d)^2 - real_part(cos_integral(-b*x - d*x - c - b*c/d))*tan(1/2*a - 1/
2*c)^2*tan(1/2*(b*c + c*d)/d)^2*tan(1/2*(b*c - c*d)/d)^2 - 2*imag_part(cos_
integral(b*x + d*x + c + b*c/d))*tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*
tan(1/2*(b*c + c*d)/d) + 2*imag_part(cos_integral(-b*x - d*x - c - b*c/d))*
tan(1/2*a + 1/2*c)^2*tan(1/2*a - 1/2*c)^2*tan(1/2*(b*c + c*d)/d) - 4*sin_in
tegral((b*d*x + d^2*x + b*c + c*d)/d)*tan(1/2*a...
```

Mupad [F]

time = 0.00, size = -1, normalized size = -0.01

$$\int \text{sinint}(c+d\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(sinint(c + d*x)*cos(a + b*x),x)
```

```
[Out] int(sinint(c + d*x)*cos(a + b*x), x)
```

3.68 $\int \frac{\cos(a+bx)\mathbf{Si}(c+dx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\cos(a+bx)\text{Si}(c+dx)}{x},x\right)$$

```
[Out] CannotIntegrate(cos(b*x+a)*Si(d*x+c)/x,x)
```

Rubi [A]
time = 0.08, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[a + b*x]*SinIntegral[c + d*x])/x,x]
[Out] Defer[Int][(Cos[a + b*x]*SinIntegral[c + d*x])/x, x]
```

Rubi steps

$$\int \frac{\cos(a+bx)\text{Si}(c+dx)}{x}\,dx = \int \frac{\cos(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Mathematica [A]
time = 9.06, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\text{Si}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[a + b*x]*SinIntegral[c + d*x])/x,x]
[Out] Integrate[(Cos[a + b*x]*SinIntegral[c + d*x])/x, x]
```

Maple [A]
time = 0.37, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx+a)\,\text{sinIntegral}(dx+c)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cos(b*x+a)*Si(d*x+c)/x,x)
```

```
[Out] int(cos(b*x+a)*Si(d*x+c)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(cos(b*x + a)*sin_integral(d*x + c)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(cos(b*x + a)*sin_integral(d*x + c)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\operatorname{Si}(c+dx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(cos(b*x + a)*sin_integral(d*x + c)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\mathrm{sinint}(c+d\,x)\,\cos(a+b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((sinint(c + d*x)*cos(a + b*x))/x,x)
```

```
[Out] int((sinint(c + d*x)*cos(a + b*x))/x, x)
```

3.69 $\int x^m \textbf{CosIntegral}(bx)\,dx$

Optimal. Leaf size=90

$$\frac{x^{1+m}\text{CosIntegral}(bx)}{1+m}+\frac{ix^m(-ibx)^{-m}\Gamma(1+m,-ibx)}{2b(1+m)}-\frac{ix^m(ibx)^{-m}\Gamma(1+m,ibx)}{2b(1+m)}$$

```
[Out] x^(1+m)*Ci(b*x)/(1+m)+1/2*I*x^m*GAMMA(1+m,-I*b*x)/b/(1+m)/((-I*b*x)^m)-1/2*
I*x^m*GAMMA(1+m,I*b*x)/b/(1+m)/((I*b*x)^m)
```

Rubi [A]
time = 0.06, antiderivative size = 90, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.500, Rules used = {6639, 12, 3388, 2212}

$$\frac{ix^m(-ibx)^{-m}\text{Gamma}(m+1,-ibx)}{2b(m+1)}-\frac{ix^m(ibx)^{-m}\text{Gamma}(m+1,ibx)}{2b(m+1)}+\frac{x^{m+1}\text{CosIntegral}(bx)}{m+1}$$

Antiderivative was successfully verified.

```
[In] Int[x^m*CosIntegral[b*x],x]
```

```
[Out] (x^(1 + m)*CosIntegral[b*x])/(1 + m) + ((I/2)*x^m*Gamma[1 + m, (-I)*b*x])/(
b*(1 + m)*((-I)*b*x)^m) - ((I/2)*x^m*Gamma[1 + m, I*b*x])/(b*(1 + m)*(I*b*x
)^m)
```

Rule 12

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

Rule 2212

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))*((c_.) + (d_.)*(x_))^(m_), x_Symbol]
:> Simp[(-F^(g*(e - c*(f/d))))*((c + d*x)^FracPart[m]/(d*((-f)*g*(Log[F]/d)
)^(IntPart[m] + 1)*((-f)*g*Log[F]*((c + d*x)/d))^FracPart[m]))*Gamma[m + 1,
 ((-f)*g*(Log[F]/d))*(c + d*x)], x] /; FreeQ[{F, c, d, e, f, g, m}, x] &&
!IntegerQ[m]
```

Rule 3388

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol
] :> Dist[I/2, Int[(c + d*x)^m/(E^(I*k*Pi)*E^(I*(e + f*x))), x], x] - Dist[
I/2, Int[(c + d*x)^m*E^(I*k*Pi)*E^(I*(e + f*x)), x], x] /; FreeQ[{c, d, e,
f, m}, x] && IntegerQ[2*k]
```

Rule 6639

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

Rubi steps

$$\begin{aligned}\int x^m \text{Ci}(bx)\,dx &= \frac{x^{1+m}\text{Ci}(bx)}{1+m} - \frac{b\int \frac{x^m\cos(bx)}{b}\,dx}{1+m}\\ &= \frac{x^{1+m}\text{Ci}(bx)}{1+m} - \frac{\int x^m\cos(bx)\,dx}{1+m}\\ &= \frac{x^{1+m}\text{Ci}(bx)}{1+m} - \frac{\int e^{-ibx}x^m\,dx}{2(1+m)} - \frac{\int e^{ibx}x^m\,dx}{2(1+m)}\\ &= \frac{x^{1+m}\text{Ci}(bx)}{1+m} + \frac{ix^m(-ibx)^{-m}\Gamma(1+m,-ibx)}{2b(1+m)} - \frac{ix^m(ibx)^{-m}\Gamma(1+m,ibx)}{2b(1+m)}\end{aligned}$$

Mathematica [A]
time = 0.06, size = 78, normalized size = 0.87

$$\frac{x^m\left(2x\text{CosIntegral}(bx) + \frac{i(b^2x^2)^{-m}((ibx)^m\Gamma(1+m,-ibx)-(-ibx)^m\Gamma(1+m,ibx))}{b}\right)}{2(1+m)}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^m*CosIntegral[b*x],x]
```

```
[Out] (x^m*(2*x*CosIntegral[b*x] + (I*((I*b*x)^m*Gamma[1 + m, (-I)*b*x] - ((-I)*b
*x)^m*Gamma[1 + m, I*b*x]))/(b*(b^2*x^2)^m)))/(2*(1 + m))
```

Maple [C] Result contains higher order function than in optimal. Order 5 vs. order 4.
time = 0.55, size = 124, normalized size = 1.38

method	result
meijerg	$2^{-1+m}b^{-1-m}\sqrt{\pi}\left(-\frac{2^{-1-m}x^{3+m}b^{3+m}\,\text{hypergeom}\left([1,1,\frac{3}{2}+\frac{m}{2}],[\frac{3}{2},2,2,\frac{5}{2}+\frac{m}{2}],-\frac{b^2x^2}{4}\right)}{\sqrt{\pi}\,(3+m)} + \frac{2(\Psi(\frac{1}{2}+\frac{m}{2})+2\gamma-\Psi(\frac{3}{2}+\frac{m}{2})+2}{\sqrt{\pi}}\right.$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Ci(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 2^(-1+m)*b^(-1-m)*Pi^(1/2)*(-2^(-1-m)/Pi^(1/2)/(3+m)*x^(3+m)*b^(3+m)*hyperg
eom([1,1,3/2+1/2*m],[3/2,2,2,5/2+1/2*m],-1/4*b^2*x^2)+2*(Psi(1/2+1/2*m)+2*g
```

```
amma-Psi(3/2+1/2*m)+2*ln(x)+2*ln(b))/Pi^(1/2)*x^(1+m)*2^(-1-m)*b^(1+m)/(1+m
))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^m*fresnel_cos(b*x), x)
```

Fricas [A]
time = 0.11, size = 109, normalized size = 1.21

$$\frac{2\,\pi bxx^{m}\,\mathrm{C}\left(bx\right)-i\left(\cosh\left(\frac{1}{2}\,m\log\left(\frac{1}{2}i\,\pi b^{2}\right)\right)-\sinh\left(\frac{1}{2}\,m\log\left(\frac{1}{2}i\,\pi b^{2}\right)\right)\right)\Gamma\left(\frac{1}{2}\,m+1,\frac{1}{2}i\,\pi b^{2}x^{2}\right)+i\left(\cosh\left(\frac{1}{2}\,m\log\left(-\frac{1}{2}i\,\pi b^{2}\right)\right)-\sinh\left(\frac{1}{2}\,m\log\left(-\frac{1}{2}i\,\pi b^{2}\right)\right)\right)\Gamma\left(\frac{1}{2}\,m+1,-\frac{1}{2}i\,\pi b^{2}x^{2}\right)}{2\,\pi(bm+b)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x),x, algorithm="fricas")
```

```
[Out] 1/2*(2*pi*b*x*x^m*fresnel_cos(b*x) - I*(cosh(1/2*m*log(1/2*I*pi*b^2)) - sin
h(1/2*m*log(1/2*I*pi*b^2)))*gamma(1/2*m + 1, 1/2*I*pi*b^2*x^2) + I*(cosh(1/
2*m*log(-1/2*I*pi*b^2)) - sinh(1/2*m*log(-1/2*I*pi*b^2)))*gamma(1/2*m + 1,
-1/2*I*pi*b^2*x^2))/(pi*(b*m + b))
```

Sympy [B] Leaf count of result is larger than twice the leaf count of optimal. 654 vs. $2(70) = 140$.
time = 0.98, size = 654, normalized size = 7.27

$$\frac{4\cdot 2^{m}b^{-m}mx\sqrt{e^{-2m\log\left(2\right)}e^{m\log\left(b^{2}x^{2}\right)}}\log\left(b^{2}x^{2}\right)\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}+\frac{8\cdot 2^{m}\gamma b^{-m}mx\sqrt{e^{-2m\log\left(2\right)}e^{m\log\left(b^{2}x^{2}\right)}}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}+\frac{4\cdot 2^{m}b^{-m}x\sqrt{e^{-2m\log\left(2\right)}e^{m\log\left(b^{2}x^{2}\right)}}\log\left(b^{2}x^{2}\right)\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}-\frac{8\cdot 2^{m}b^{-m}x\sqrt{e^{-2m\log\left(2\right)}e^{m\log\left(b^{2}x^{2}\right)}}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}+\frac{8\cdot 2^{m}\gamma b^{-m}x\sqrt{e^{-2m\log\left(2\right)}e^{m\log\left(b^{2}x^{2}\right)}}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}-\frac{b^{2}m^{2}x^{3}x^{m}\Gamma\left(\frac{m}{2}+\frac{3}{2}\right){}_{3}F_{4}\left(\begin{matrix}1,1,\frac{m}{2}+\frac{3}{2}\\ \frac{3}{2},2,2,\frac{m}{2}+\frac{5}{2}\end{matrix}\middle|-\frac{b^{2}x^{2}}{4}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}-\frac{2b^{2}mx^{3}x^{m}\Gamma\left(\frac{m}{2}+\frac{3}{2}\right){}_{3}F_{4}\left(\begin{matrix}1,1,\frac{m}{2}+\frac{3}{2}\\ \frac{3}{2},2,2,\frac{m}{2}+\frac{5}{2}\end{matrix}\middle|-\frac{b^{2}x^{2}}{4}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}-\frac{b^{2}x^{3}x^{m}\Gamma\left(\frac{m}{2}+\frac{3}{2}\right){}_{3}F_{4}\left(\begin{matrix}1,1,\frac{m}{2}+\frac{3}{2}\\ \frac{3}{2},2,2,\frac{m}{2}+\frac{5}{2}\end{matrix}\middle|-\frac{b^{2}x^{2}}{4}\right)}{8m^{2}\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+16m\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)+8\Gamma\left(\frac{m}{2}+\frac{5}{2}\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Ci(b*x),x)
```

```
[Out] 4*2**m*m*x*sqrt(exp(-2*m*log(2))*exp(m*log(b**2*x**2)))*log(b**2*x**2)*gamm
a(m/2 + 5/2)/(b**m*(8*m**2*gamma(m/2 + 5/2) + 16*m*gamma(m/2 + 5/2) + 8*gam
ma(m/2 + 5/2))) + 8*2**m*EulerGamma*m*x*sqrt(exp(-2*m*log(2))*exp(m*log(b**
2*x**2)))*gamma(m/2 + 5/2)/(b**m*(8*m**2*gamma(m/2 + 5/2) + 16*m*gamma(m/2
+ 5/2) + 8*gamma(m/2 + 5/2))) + 4*2**m*x*sqrt(exp(-2*m*log(2))*exp(m*log(b*
*2*x**2)))*log(b**2*x**2)*gamma(m/2 + 5/2)/(b**m*(8*m**2*gamma(m/2 + 5/2) +
 16*m*gamma(m/2 + 5/2) + 8*gamma(m/2 + 5/2))) - 8*2**m*x*sqrt(exp(-2*m*log(
2))*exp(m*log(b**2*x**2)))*gamma(m/2 + 5/2)/(b**m*(8*m**2*gamma(m/2 + 5/2)
+ 16*m*gamma(m/2 + 5/2) + 8*gamma(m/2 + 5/2))) + 8*2**m*EulerGamma*x*sqrt(e
xp(-2*m*log(2))*exp(m*log(b**2*x**2)))*gamma(m/2 + 5/2)/(b**m*(8*m**2*gamma
(m/2 + 5/2) + 16*m*gamma(m/2 + 5/2) + 8*gamma(m/2 + 5/2))) - b**2*m**2*x**3
```

```
*x**m*gamma(m/2 + 3/2)*hyper((1, 1, m/2 + 3/2), (3/2, 2, 2, m/2 + 5/2), -b*
*2*x**2/4)/(8*m**2*gamma(m/2 + 5/2) + 16*m*gamma(m/2 + 5/2) + 8*gamma(m/2 +
 5/2)) - 2*b**2*m*x**3*x**m*gamma(m/2 + 3/2)*hyper((1, 1, m/2 + 3/2), (3/2,
 2, 2, m/2 + 5/2), -b**2*x**2/4)/(8*m**2*gamma(m/2 + 5/2) + 16*m*gamma(m/2
+ 5/2) + 8*gamma(m/2 + 5/2)) - b**2*x**3*x**m*gamma(m/2 + 3/2)*hyper((1, 1,
 m/2 + 3/2), (3/2, 2, 2, m/2 + 5/2), -b**2*x**2/4)/(8*m**2*gamma(m/2 + 5/2)
 + 16*m*gamma(m/2 + 5/2) + 8*gamma(m/2 + 5/2))
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x),x, algorithm="giac")
[Out] integrate(x^m*fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^m\,\mathrm{cosint}(b\,x)\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*cosint(b*x),x)
[Out] int(x^m*cosint(b*x), x)
```

3.70 $\int x^3\text{CosIntegral}(bx)\,dx$

Optimal. Leaf size=63

$$\frac{3\cos(bx)}{2b^4}-\frac{3x^2\cos(bx)}{4b^2}+\frac{1}{4}x^4\text{CosIntegral}(bx)+\frac{3x\sin(bx)}{2b^3}-\frac{x^3\sin(bx)}{4b}$$

```
[Out] 1/4*x^4*Ci(b*x)+3/2*cos(b*x)/b^4-3/4*x^2*cos(b*x)/b^2+3/2*x*sin(b*x)/b^3-1/
4*x^3*sin(b*x)/b
```

Rubi [A]
time = 0.05, antiderivative size = 63, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}=0.500$, Rules used = {6639, 12, 3377, 2718}

$$\frac{3\cos(bx)}{2b^4}+\frac{3x\sin(bx)}{2b^3}-\frac{3x^2\cos(bx)}{4b^2}+\frac{1}{4}x^4\text{CosIntegral}(bx)-\frac{x^3\sin(bx)}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*CosIntegral[b*x],x]
```

```
[Out] (3*Cos[b*x])/(2*b^4) - (3*x^2*Cos[b*x])/(4*b^2) + (x^4*CosIntegral[b*x])/4
+ (3*x*Sin[b*x])/(2*b^3) - (x^3*Sin[b*x])/(4*b)
```

Rule 12

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

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6639

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

Rubi steps

$$
\begin{aligned}
\int x^3\text{Ci}(bx)\,dx &= \frac{1}{4}x^4\text{Ci}(bx) - \frac{1}{4}b\int \frac{x^3\cos(bx)}{b}\,dx \\
&= \frac{1}{4}x^4\text{Ci}(bx) - \frac{1}{4}\int x^3\cos(bx)\,dx \\
&= \frac{1}{4}x^4\text{Ci}(bx) - \frac{x^3\sin(bx)}{4b} + \frac{3\int x^2\sin(bx)\,dx}{4b} \\
&= -\frac{3x^2\cos(bx)}{4b^2} + \frac{1}{4}x^4\text{Ci}(bx) - \frac{x^3\sin(bx)}{4b} + \frac{3\int x\cos(bx)\,dx}{2b^2} \\
&= -\frac{3x^2\cos(bx)}{4b^2} + \frac{1}{4}x^4\text{Ci}(bx) + \frac{3x\sin(bx)}{2b^3} - \frac{x^3\sin(bx)}{4b} - \frac{3\int \sin(bx)\,dx}{2b^3} \\
&= \frac{3\cos(bx)}{2b^4} - \frac{3x^2\cos(bx)}{4b^2} + \frac{1}{4}x^4\text{Ci}(bx) + \frac{3x\sin(bx)}{2b^3} - \frac{x^3\sin(bx)}{4b}
\end{aligned}
$$

Mathematica [A]
time = 0.03, size = 53, normalized size = 0.84

$$-\frac{3(-2+b^2x^2)\cos(bx)}{4b^4} + \frac{1}{4}x^4\text{CosIntegral}(bx) - \frac{x(-6+b^2x^2)\sin(bx)}{4b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*CosIntegral[b*x],x]
```

```
[Out] (-3*(-2 + b^2*x^2)*Cos[b*x])/(4*b^4) + (x^4*CosIntegral[b*x])/4 - (x*(-6 +
b^2*x^2)*Sin[b*x])/(4*b^3)
```

Maple [A]
time = 0.27, size = 56, normalized size = 0.89

method	result	size
derivativedivides	$\frac{\frac{b^4x^4\,\text{cosineIntegral}(bx)}{4}-\frac{b^3x^3\sin(bx)}{4}-\frac{3b^2x^2\cos(bx)}{4}+\frac{3\cos(bx)}{2}+\frac{3bx\sin(bx)}{2}}{b^4}$	56
default	$\frac{\frac{b^4x^4\,\text{cosineIntegral}(bx)}{4}-\frac{b^3x^3\sin(bx)}{4}-\frac{3b^2x^2\cos(bx)}{4}+\frac{3\cos(bx)}{2}+\frac{3bx\sin(bx)}{2}}{b^4}$	56
meijerg	$\frac{4\sqrt{\pi}\left(-\frac{b^6x^6\,\text{hypergeom}\left([1,1,3],\left[\frac{3}{2},2,2,4\right],-\frac{b^2x^2}{4}\right)}{96\sqrt{\pi}}+\frac{\left(-\frac{1}{2}+2\gamma+2\ln(x)+2\ln(b)\right)x^4b^4}{32\sqrt{\pi}}\right)}{b^4}$	63

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Ci(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*b^4*x^4*Ci(b*x)-1/4*b^3*x^3*sin(b*x)-3/4*b^2*x^2*cos(b*x)+3/2*co
s(b*x)+3/2*b*x*sin(b*x))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.48, size = 94, normalized size = 1.49

$$\frac{1}{4}\,x^4\,\mathrm{C}\left(bx\right)-\frac{\sqrt{\frac{1}{2}}\left(4\sqrt{\frac{1}{2}}\,\pi^2b^3x^3\sin\left(\frac{1}{2}\,\pi b^2x^2\right)+12\sqrt{\frac{1}{2}}\,\pi bx\cos\left(\frac{1}{2}\,\pi b^2x^2\right)+(3i-3)\left(\frac{1}{4}\right)^{\frac{1}{4}}\pi\,\mathrm{erf}\left(\sqrt{\frac{1}{2}i\pi}\,bx\right)-(3i+3)\left(\frac{1}{4}\right)^{\frac{1}{4}}\pi\,\mathrm{erf}\left(\sqrt{-\frac{1}{2}i\pi}\,bx\right)\right)}{8\,\pi^3b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x),x, algorithm="maxima")
```

```
[Out] 1/4*x^4*fresnel_cos(b*x) - 1/8*sqrt(1/2)*(4*sqrt(1/2)*pi^2*b^3*x^3*sin(1/2*
pi*b^2*x^2) + 12*sqrt(1/2)*pi*b*x*cos(1/2*pi*b^2*x^2) + (3*I - 3)*(1/4)^(1/
4)*pi*erf(sqrt(1/2*I*pi)*b*x) - (3*I + 3)*(1/4)^(1/4)*pi*erf(sqrt(-1/2*I*pi
)*b*x))/(pi^3*b^4)
```

Fricas [A]
time = 0.35, size = 59, normalized size = 0.94

$$-\frac{\pi b^3x^3\sin\left(\frac{1}{2}\,\pi b^2x^2\right)+3\,bx\cos\left(\frac{1}{2}\,\pi b^2x^2\right)-\left(\pi^2b^4x^4+3\right)\mathrm{C}\left(bx\right)}{4\,\pi^2b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x),x, algorithm="fricas")
```

```
[Out] -1/4*(pi*b^3*x^3*sin(1/2*pi*b^2*x^2) + 3*b*x*cos(1/2*pi*b^2*x^2) - (pi^2*b^
4*x^4 + 3)*fresnel_cos(b*x))/(pi^2*b^4)
```

Sympy [A]
time = 1.45, size = 85, normalized size = 1.35

$$-\frac{x^4\log\left(bx\right)}{4}+\frac{x^4\log\left(b^2x^2\right)}{8}+\frac{x^4\,\mathrm{Ci}\left(bx\right)}{4}-\frac{x^3\sin\left(bx\right)}{4b}-\frac{3x^2\cos\left(bx\right)}{4b^2}+\frac{3x\sin\left(bx\right)}{2b^3}+\frac{3\cos\left(bx\right)}{2b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Ci(b*x),x)
```

```
[Out] -x**4*log(b*x)/4 + x**4*log(b**2*x**2)/8 + x**4*Ci(b*x)/4 - x**3*sin(b*x)/(
4*b) - 3*x**2*cos(b*x)/(4*b**2) + 3*x*sin(b*x)/(2*b**3) + 3*cos(b*x)/(2*b**
4)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x),x, algorithm="giac")
```

```
[Out] integrate(x^3*fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{6\,\cos\left(b\,x\right)-3\,b^2\,x^2\,\cos\left(b\,x\right)-b^3\,x^3\,\sin\left(b\,x\right)+6\,b\,x\,\sin\left(b\,x\right)}{4\,b^4}+\frac{x^4\,\mathrm{cosint}(b\,x)}{4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cosint(b*x),x)
```

```
[Out] (6*cos(b*x) - 3*b^2*x^2*cos(b*x) - b^3*x^3*sin(b*x) + 6*b*x*sin(b*x))/(4*b^
4) + (x^4*cosint(b*x))/4
```

3.71 $\int x^2\text{CosIntegral}(bx)\,dx$

Optimal. Leaf size=49

$$-\frac{2x\cos(bx)}{3b^2}+\frac{1}{3}x^3\text{CosIntegral}(bx)+\frac{2\sin(bx)}{3b^3}-\frac{x^2\sin(bx)}{3b}$$

```
[Out] 1/3*x^3*Ci(b*x)-2/3*x*cos(b*x)/b^2+2/3*sin(b*x)/b^3-1/3*x^2*sin(b*x)/b
```

Rubi [A]
time = 0.03, antiderivative size = 49, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}=0.500$, Rules used = {6639, 12, 3377, 2717}

$$\frac{2\sin(bx)}{3b^3}-\frac{2x\cos(bx)}{3b^2}+\frac{1}{3}x^3\text{CosIntegral}(bx)-\frac{x^2\sin(bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[b*x],x]
```

```
[Out] (-2*x*Cos[b*x])/(3*b^2) + (x^3*CosIntegral[b*x])/3 + (2*Sin[b*x])/(3*b^3) -
 (x^2*Sin[b*x])/(3*b)
```

Rule 12

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

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6639

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

Rubi steps

$$\begin{aligned}\int x^2\text{Ci}(bx)\,dx &= \frac{1}{3}x^3\text{Ci}(bx) - \frac{1}{3}b\int \frac{x^2\cos(bx)}{b}\,dx\\ &= \frac{1}{3}x^3\text{Ci}(bx) - \frac{1}{3}\int x^2\cos(bx)\,dx\\ &= \frac{1}{3}x^3\text{Ci}(bx) - \frac{x^2\sin(bx)}{3b} + \frac{2\int x\sin(bx)\,dx}{3b}\\ &= -\frac{2x\cos(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx) - \frac{x^2\sin(bx)}{3b} + \frac{2\int\cos(bx)\,dx}{3b^2}\\ &= -\frac{2x\cos(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx) + \frac{2\sin(bx)}{3b^3} - \frac{x^2\sin(bx)}{3b}\end{aligned}$$

Mathematica [A]
time = 0.02, size = 44, normalized size = 0.90

$$-\frac{2x\cos(bx)}{3b^2} + \frac{1}{3}x^3\text{CosIntegral}(bx) - \frac{(-2+b^2x^2)\sin(bx)}{3b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[b*x],x]
```

```
[Out] (-2*x*Cos[b*x])/(3*b^2) + (x^3*CosIntegral[b*x])/3 - ((-2 + b^2*x^2)*Sin[b*
x])/(3*b^3)
```

Maple [A]
time = 0.25, size = 44, normalized size = 0.90

method	result	size
derivativedivides	$\frac{\frac{b^3x^3\,\text{cosineIntegral}(bx)}{3}-\frac{b^2x^2\sin(bx)}{3}+\frac{2\sin(bx)}{3}-\frac{2bx\cos(bx)}{3}}{b^3}$	44
default	$\frac{\frac{b^3x^3\,\text{cosineIntegral}(bx)}{3}-\frac{b^2x^2\sin(bx)}{3}+\frac{2\sin(bx)}{3}-\frac{2bx\cos(bx)}{3}}{b^3}$	44
meijerg	$\frac{2\sqrt{\pi}\left(-\frac{x^5b^5\,\text{hypergeom}\left(\left[1,1,\frac{5}{2}\right],\left[\frac{3}{2},2,2,\frac{7}{2}\right],-\frac{b^2x^2}{4}\right)}{40\sqrt{\pi}}+\frac{\left(-\frac{2}{3}+2\gamma+2\ln(x)+2\ln(b)\right)x^3b^3}{12\sqrt{\pi}}\right)}{b^3}$	63

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*b^3*x^3*Ci(b*x)-1/3*b^2*x^2*sin(b*x)+2/3*sin(b*x)-2/3*b*x*cos(b*
x))
```

Maxima [A]
time = 0.27, size = 49, normalized size = 1.00

$$\frac{1}{3}\,x^3\,\mathrm{C}\left(bx\right)-\frac{\pi b^2 x^2\sin\left(\frac{1}{2}\,\pi b^2 x^2\right)+2\,\cos\left(\frac{1}{2}\,\pi b^2 x^2\right)}{3\,\pi^2 b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x),x, algorithm="maxima")
```

```
[Out] 1/3*x^3*fresnel_cos(b*x) - 1/3*(pi*b^2*x^2*sin(1/2*pi*b^2*x^2) + 2*cos(1/2*
pi*b^2*x^2))/(pi^2*b^3)
```

Fricas [A]
time = 0.35, size = 54, normalized size = 1.10

$$\frac{\pi^2 b^3 x^3\,\mathrm{C}\left(bx\right)-\pi b^2 x^2\sin\left(\frac{1}{2}\,\pi b^2 x^2\right)-2\,\cos\left(\frac{1}{2}\,\pi b^2 x^2\right)}{3\,\pi^2 b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x),x, algorithm="fricas")
```

```
[Out] 1/3*(pi^2*b^3*x^3*fresnel_cos(b*x) - pi*b^2*x^2*sin(1/2*pi*b^2*x^2) - 2*cos
(1/2*pi*b^2*x^2))/(pi^2*b^3)
```

Sympy [A]
time = 1.17, size = 70, normalized size = 1.43

$$-\frac{x^3\log\left(bx\right)}{3}+\frac{x^3\log\left(b^2x^2\right)}{6}+\frac{x^3\,\mathrm{Ci}\left(bx\right)}{3}-\frac{x^2\sin\left(bx\right)}{3b}-\frac{2x\cos\left(bx\right)}{3b^2}+\frac{2\sin\left(bx\right)}{3b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x),x)
```

```
[Out] -x**3*log(b*x)/3 + x**3*log(b**2*x**2)/6 + x**3*Ci(b*x)/3 - x**2*sin(b*x)/(
3*b) - 2*x*cos(b*x)/(3*b**2) + 2*sin(b*x)/(3*b**3)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x),x, algorithm="giac")
```

```
[Out] integrate(x^2*fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{x^3 \operatorname{cosint}(b\,x)}{3}-\frac{b^2\,x^2\,\sin\left(b\,x\right)-2\,\sin\left(b\,x\right)+2\,b\,x\,\cos\left(b\,x\right)}{3\,b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(b*x),x)
```

```
[Out] (x^3*cosint(b*x))/3 - (b^2*x^2*sin(b*x) - 2*sin(b*x) + 2*b*x*cos(b*x))/(3*b
^3)
```

3.72 $\int x\text{CosIntegral}(bx)\,dx$

Optimal. Leaf size=35

$$-\frac{\cos(bx)}{2b^2}+\frac{1}{2}x^2\text{CosIntegral}(bx)-\frac{x\sin(bx)}{2b}$$

```
[Out] 1/2*x^2*Ci(b*x)-1/2*cos(b*x)/b^2-1/2*x*sin(b*x)/b
```

Rubi [A]
time = 0.02, antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}=0.667$, Rules used = {6639, 12, 3377, 2718}

$$-\frac{\cos(bx)}{2b^2}+\frac{1}{2}x^2\text{CosIntegral}(bx)-\frac{x\sin(bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[b*x],x]
```

```
[Out] -1/2*Cos[b*x]/b^2 + (x^2*CosIntegral[b*x])/2 - (x*Sin[b*x])/(2*b)
```

Rule 12

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

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 6639

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

Rubi steps

$$
\begin{aligned}
\int x\mathrm{Ci}(bx)\,dx &= \frac{1}{2}x^2\mathrm{Ci}(bx) - \frac{1}{2}b\int \frac{x\cos(bx)}{b}\,dx \\
&= \frac{1}{2}x^2\mathrm{Ci}(bx) - \frac{1}{2}\int x\cos(bx)\,dx \\
&= \frac{1}{2}x^2\mathrm{Ci}(bx) - \frac{x\sin(bx)}{2b} + \frac{\int \sin(bx)\,dx}{2b} \\
&= -\frac{\cos(bx)}{2b^2} + \frac{1}{2}x^2\mathrm{Ci}(bx) - \frac{x\sin(bx)}{2b}
\end{aligned}
$$

Mathematica [A]
time = 0.01, size = 35, normalized size = 1.00

$$
-\frac{\cos(bx)}{2b^2} + \frac{1}{2}x^2\mathrm{CosIntegral}(bx) - \frac{x\sin(bx)}{2b}
$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[b*x],x]
```

```
[Out] -1/2*Cos[b*x]/b^2 + (x^2*CosIntegral[b*x])/2 - (x*Sin[b*x])/(2*b)
```

Maple [A]
time = 0.28, size = 32, normalized size = 0.91

method	result
derivativedivides	$\frac{\frac{b^2x^2\,\mathrm{cosineIntegral}(bx)}{2} - \frac{\cos(bx)}{2} - \frac{bx\sin(bx)}{2}}{b^2}$
default	$\frac{\frac{b^2x^2\,\mathrm{cosineIntegral}(bx)}{2} - \frac{\cos(bx)}{2} - \frac{bx\sin(bx)}{2}}{b^2}$
meijerg	$\frac{\sqrt{\pi}\left(\frac{\frac{b^2x^2}{2}+1}{2\sqrt{\pi}} - \frac{b^2x^2\gamma}{2\sqrt{\pi}} - \frac{b^2x^2\ln(2)}{2\sqrt{\pi}} - \frac{b^2x^2\ln\left(\frac{bx}{2}\right)}{2\sqrt{\pi}} - \frac{\cos(bx)}{2\sqrt{\pi}} - \frac{bx\sin(bx)}{2\sqrt{\pi}} + \frac{b^2x^2\,\mathrm{cosineIntegral}(bx)}{2\sqrt{\pi}} + \frac{(2\gamma-1+2\ln(x)+2\ln(b))x}{4\sqrt{\pi}}\right.}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(1/2*b^2*x^2*Ci(b*x)-1/2*cos(b*x)-1/2*b*x*sin(b*x))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.48, size = 70, normalized size = 2.00

$$
\frac{1}{2}x^2\,\mathrm{C}\,(bx) - \frac{\sqrt{\frac{1}{2}}\left(4\sqrt{\frac{1}{2}}\,\pi bx\sin\left(\frac{1}{2}\pi b^2x^2\right) - (i+1)\left(\frac{1}{4}\right)^{\frac{1}{4}}\pi\,\mathrm{erf}\left(\sqrt{\frac{1}{2}i\pi}\,bx\right) + (i-1)\left(\frac{1}{4}\right)^{\frac{1}{4}}\pi\,\mathrm{erf}\left(\sqrt{-\frac{1}{2}i\pi}\,bx\right)\right)}{4\pi^2b^2}
$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x),x, algorithm="maxima")
```

```
[Out] 1/2*x^2*fresnel_cos(b*x) - 1/4*sqrt(1/2)*(4*sqrt(1/2)*pi*b*x*sin(1/2*pi*b^2
*x^2) - (I + 1)*(1/4)^(1/4)*pi*erf(sqrt(1/2*I*pi)*b*x) + (I - 1)*(1/4)^(1/4
)*pi*erf(sqrt(-1/2*I*pi)*b*x))/(pi^2*b^2)
```

Fricas [A]
time = 0.40, size = 51, normalized size = 1.46

$$\frac{\pi b^3 x^2 \operatorname{C}(bx) - b^2 x \sin\left(\frac{1}{2}\pi b^2 x^2\right) + \sqrt{b^2}\operatorname{S}\left(\sqrt{b^2}\,x\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x),x, algorithm="fricas")
```

```
[Out] 1/2*(pi*b^3*x^2*fresnel_cos(b*x) - b^2*x*sin(1/2*pi*b^2*x^2) + sqrt(b^2)*fr
esnel_sin(sqrt(b^2)*x))/(pi*b^3)
```

Sympy [A]
time = 0.91, size = 53, normalized size = 1.51

$$-\frac{x^2\log(bx)}{2} + \frac{x^2\log(b^2x^2)}{4} + \frac{x^2\operatorname{Ci}(bx)}{2} - \frac{x\sin(bx)}{2b} - \frac{\cos(bx)}{2b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x),x)
```

```
[Out] -x**2*log(b*x)/2 + x**2*log(b**2*x**2)/4 + x**2*Ci(b*x)/2 - x*sin(b*x)/(2*b
) - cos(b*x)/(2*b**2)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x),x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\frac{x^2\,\mathrm{cosint}(b\,x)}{2} - \frac{\cos(b\,x) + b\,x\,\sin(b\,x)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(b*x),x)
```

```
[Out] (x^2*cosint(b*x))/2 - (cos(b*x) + b*x*sin(b*x))/(2*b^2)
```

3.73 $\int \text{CosIntegral}(bx)\,dx$

Optimal. Leaf size=16

$$x\text{CosIntegral}(bx) - \frac{\sin(bx)}{b}$$

```
[Out] x*Ci(b*x)-sin(b*x)/b
```

Rubi [A]
time = 0.00, antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {6635}

$$x\text{CosIntegral}(bx) - \frac{\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x],x]
```

```
[Out] x*CosIntegral[b*x] - Sin[b*x]/b
```

Rule 6635

```
Int[CosIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(CosIntegr
al[a + b*x]/b), x] - Simp[Sin[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\int \text{Ci}(bx)\,dx = x\text{Ci}(bx) - \frac{\sin(bx)}{b}$$

Mathematica [A]
time = 0.00, size = 16, normalized size = 1.00

$$x\text{CosIntegral}(bx) - \frac{\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x],x]
```

```
[Out] x*CosIntegral[b*x] - Sin[b*x]/b
```

Maple [A]
time = 0.17, size = 19, normalized size = 1.19

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx)bx-\sin(bx)}{b}$	19
default	$\frac{\text{cosineIntegral}(bx)bx-\sin(bx)}{b}$	19
meijerg	$\frac{\sqrt{\pi}\left(\frac{2bx}{\sqrt{\pi}}-\frac{2bx\gamma}{\sqrt{\pi}}-\frac{2bx\ln(2)}{\sqrt{\pi}}-\frac{2bx\ln\left(\frac{bx}{2}\right)}{\sqrt{\pi}}-\frac{2\sin(bx)}{\sqrt{\pi}}+\frac{2bx\,\text{cosineIntegral}(bx)}{\sqrt{\pi}}+\frac{(2\gamma-2+2\ln(x)+2\ln(b))xb}{\sqrt{\pi}}\right)}{2b}$	85

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b*(Ci(b*x)*b*x-sin(b*x))
```

Maxima [A]
time = 0.26, size = 27, normalized size = 1.69

$$\frac{bx\,\mathrm{C}\,(bx)-\frac{\sin\left(\frac{1}{2}\pi b^2x^2\right)}{\pi}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x),x, algorithm="maxima")
[Out] (b*x*fresnel_cos(b*x) - sin(1/2*pi*b^2*x^2)/pi)/b
```

Fricas [A]
time = 0.36, size = 28, normalized size = 1.75

$$\frac{\pi bx\,\mathrm{C}\,(bx)-\sin\left(\frac{1}{2}\pi b^2x^2\right)}{\pi b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x),x, algorithm="fricas")
[Out] (pi*b*x*fresnel_cos(b*x) - sin(1/2*pi*b^2*x^2))/(pi*b)
```

Sympy [B] Leaf count of result is larger than twice the leaf count of optimal. 31 vs. 2(12) = 24.
time = 0.75, size = 31, normalized size = 1.94

$$-x\log(bx)+\frac{x\log(b^2x^2)}{2}+x\,\mathrm{Ci}\,(bx)-\frac{\sin(bx)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x),x)
```

```
[Out] -x*log(b*x) + x*log(b**2*x**2)/2 + x*Ci(b*x) - sin(b*x)/b
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x),x, algorithm="giac")
[Out] integrate(fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.06

$$x\,\mathrm{cosint}(b\,x)-\frac{\sin\left(b\,x\right)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x),x)
[Out] x*cosint(b*x) - sin(b*x)/b
```

3.74 $\int \frac{\text{CosIntegral}(bx)}{x} dx$

Optimal. Leaf size=61

$$-\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;ibx)+\gamma\log(x)+\frac{1}{2}\log^2(bx)$$

```
[Out] -1/2*I*b*x*hypergeom([1, 1, 1],[2, 2, 2],-I*b*x)+1/2*I*b*x*hypergeom([1, 1,
 1],[2, 2, 2],I*b*x)+EulerGamma*ln(x)+1/2*ln(b*x)^2
```

Rubi [A]

time = 0.02, antiderivative size = 61, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {6637}

$$-\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;ibx)+\frac{1}{2}\log^2(bx)+\gamma\log(x)$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x]/x,x]
```

```
[Out] (-1/2*I)*b*x*HypergeometricPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x] + (I/2)*b*x*
HypergeometricPFQ[{1, 1, 1}, {2, 2, 2}, I*b*x] + EulerGamma*Log[x] + Log[b*
x]^2/2
```

Rule 6637

```
Int[CosIntegral[(b_.)*(x_)]/(x_), x_Symbol] :> Simp[(-2^(-1))*I*b*x*Hyperge
ometricPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x], x] + (Simp[(1/2)*I*b*x*Hypergeo
metricPFQ[{1, 1, 1}, {2, 2, 2}, I*b*x], x] + Simp[EulerGamma*Log[x], x] + S
imp[(1/2)*Log[b*x]^2, x]) /; FreeQ[b, x]
```

Rubi steps

$$\int \frac{\text{Ci}(bx)}{x}\,dx=-\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;-ibx)+\frac{1}{2}ibx\,{}_3F_3(1,1,1;2,2,2;ibx)+\gamma\log(x)+\frac{1}{2}\log^2(bx)$$

Mathematica [A]

time = 0.03, size = 94, normalized size = 1.54

$$\frac{1}{2}(-ibx\,{}_3F_3(1,1,1;2,2,2;-ibx)+ibx\,{}_3F_3(1,1,1;2,2,2;ibx)+\log(x)(2\gamma+2\text{CosIntegral}(bx)+\Gamma(0,-ibx)+\Gamma(0,ibx)-\log(x)+\log(-ibx)+\log(ibx)))$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x]/x,x]
```

```
[Out] ((-I)*b*x*HypergeometricPFQ[{1, 1, 1}, {2, 2, 2}, (-I)*b*x] + I*b*x*Hyperge
ometricPFQ[{1, 1, 1}, {2, 2, 2}, I*b*x] + Log[x]*(2*EulerGamma + 2*CosInteg
ral[b*x] + Gamma[0, (-I)*b*x] + Gamma[0, I*b*x] - Log[x] + Log[(-I)*b*x] +
Log[I*b*x]))/2
```

Maple [B] Leaf count of result is larger than twice the leaf count of optimal. 157 vs. $2(51) = 102$.
time = 0.30, size = 158, normalized size = 2.59

method	result
meijerg	$\frac{\sqrt{\pi}\left(-\frac{b^{2} x^{2} \text{hypergeom}\left([1,1,1],\left[\frac{3}{2},2,2,2\right],-\frac{b^{2} x^{2}}{4}\right)}{2 \sqrt{\pi}}+\frac{-2 \gamma(-\gamma-2 \ln (2))-4 \ln (x)(-\gamma-2 \ln (2))+4 \ln (2)(-\gamma-2 \ln (2))-4 \ln (b)(-\gamma-2 \ln (2))-\frac{\pi^{2}}{3}+(\cdots}{}\right.}{4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)/x,x,method=_RETURNVERBOSE)
```

```
[Out] 1/4*Pi^(1/2)*(-1/2/Pi^(1/2)*b^2*x^2*hypergeom([1,1,1],[3/2,2,2,2],-1/4*b^2*
x^2)+1/2*(-2*gamma*(-gamma-2*ln(2))-4*ln(x)*(-gamma-2*ln(2))+4*ln(2)*(-gamm
a-2*ln(2))-4*ln(b)*(-gamma-2*ln(2))-1/3*Pi^2+(-gamma-2*ln(2))^2+4*ln(b)^2+4
*ln(2)^2+4*ln(x)^2-8*ln(x)*ln(2)+8*ln(x)*ln(b)-8*ln(2)*ln(b)+gamma^2+4*ln(b
)*gamma+4*ln(x)*gamma-4*ln(2)*gamma)/Pi^(1/2))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)/x, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x)/x, x)
```

Sympy [A]
time = 0.55, size = 44, normalized size = 0.72

$$-\frac{b^2x^2{}_3F_4\left(\begin{matrix}1,1,1\\ \frac{3}{2},2,2,2\end{matrix}\middle|-\frac{b^2x^2}{4}\right)}{8}+\frac{\log\left(b^2x^2\right)^2}{8}+\frac{\gamma\log\left(b^2x^2\right)}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)/x,x)
```

```
[Out] -b**2*x**2*hyper((1, 1, 1), (3/2, 2, 2, 2), -b**2*x**2/4)/8 + log(b**2*x**2
)**2/8 + EulerGamma*log(b**2*x**2)/2
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)/x, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{cosint}(b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)/x,x)
```

```
[Out] int(cosint(b*x)/x, x)
```

3.75 $\int \frac{\textbf{CosIntegral}(bx)}{x^2} dx$

Optimal. Leaf size=26

$$-\frac{\cos(bx)}{x} - \frac{\text{CosIntegral}(bx)}{x} - b\text{Si}(bx)$$

```
[Out] -Ci(b*x)/x-cos(b*x)/x-b*Si(b*x)
```

Rubi [A]
time = 0.03, antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6639, 12, 3378, 3380}

$$-\frac{\text{CosIntegral}(bx)}{x} - b\text{Si}(bx) - \frac{\cos(bx)}{x}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x]/x^2,x]
```

```
[Out] -(Cos[b*x]/x) - CosIntegral[b*x]/x - b*SinIntegral[b*x]
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 6639

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

Rubi steps

$$\begin{aligned}\int \frac{\text{Ci}(bx)}{x^2}\,dx &= -\frac{\text{Ci}(bx)}{x} + b\int \frac{\cos(bx)}{bx^2}\,dx\\ &= -\frac{\text{Ci}(bx)}{x} + \int \frac{\cos(bx)}{x^2}\,dx\\ &= -\frac{\cos(bx)}{x} - \frac{\text{Ci}(bx)}{x} - b\int \frac{\sin(bx)}{x}\,dx\\ &= -\frac{\cos(bx)}{x} - \frac{\text{Ci}(bx)}{x} - b\text{Si}(bx)\end{aligned}$$

Mathematica [A]
time = 0.01, size = 26, normalized size = 1.00

$$-\frac{\cos(bx)}{x} - \frac{\text{CosIntegral}(bx)}{x} - b\text{Si}(bx)$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x]/x^2,x]
[Out] -(Cos[b*x]/x) - CosIntegral[b*x]/x - b*SinIntegral[b*x]
```

Maple [A]
time = 0.26, size = 34, normalized size = 1.31

method	result	size
derivativedivides	$b\left(-\frac{\text{cosineIntegral}(bx)}{bx} - \frac{\cos(bx)}{bx} - \text{sinIntegral}(bx)\right)$	34
default	$b\left(-\frac{\text{cosineIntegral}(bx)}{bx} - \frac{\cos(bx)}{bx} - \text{sinIntegral}(bx)\right)$	34
meijerg	$\frac{b\sqrt{\pi}\left(-\frac{2bx\,\text{hypergeom}\left(\left[\frac{1}{2},1,1\right],\left[\frac{3}{2},\frac{3}{2},2,2\right],-\frac{b^2x^2}{4}\right)}{\sqrt{\pi}} - \frac{4(2+2\gamma+2\ln(x)+2\ln(b))}{\sqrt{\pi}\,xb}\right)}{8}$	57

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)/x^2,x,method=_RETURNVERBOSE)
[Out] b*(-Ci(b*x)/b/x-cos(b*x)/b/x-Si(b*x))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.31, size = 34, normalized size = 1.31

$$\frac{1}{4}\,b\left(\text{Ei}\left(\frac{1}{2}i\,\pi b^2x^2\right) + \text{Ei}\left(-\frac{1}{2}i\,\pi b^2x^2\right)\right) - \frac{\text{C}\,(bx)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x^2,x, algorithm="maxima")
```

```
[Out] 1/4*b*(Ei(1/2*I*pi*b^2*x^2) + Ei(-1/2*I*pi*b^2*x^2)) - fresnel_cos(b*x)/x
```

Fricas [A]
time = 0.35, size = 38, normalized size = 1.46

$$\frac{bx\,\mathrm{Ci}\left(\frac{1}{2}\,\pi b^2x^2\right)+bx\,\mathrm{Ci}\left(-\frac{1}{2}\,\pi b^2x^2\right)-4\,\mathrm{C}\left(bx\right)}{4\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x^2,x, algorithm="fricas")
```

```
[Out] 1/4*(b*x*cos_integral(1/2*pi*b^2*x^2) + b*x*cos_integral(-1/2*pi*b^2*x^2) -
 4*fresnel_cos(b*x))/x
```

Sympy [B] Leaf count of result is larger than twice the leaf count of optimal. 42 vs. 2(20) = 40.
time = 0.53, size = 42, normalized size = 1.62

$$-\frac{b^2x{}_3F_4\left(\begin{matrix}\frac{1}{2},1,1\\ \frac{3}{2},\frac{3}{2},2,2\end{matrix}\middle|-\frac{b^2x^2}{4}\right)}{4}-\frac{\log\left(b^2x^2\right)}{2x}-\frac{1}{x}-\frac{\gamma}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)/x**2,x)
```

```
[Out] -b**2*x*hyper((1/2, 1, 1), (3/2, 3/2, 2, 2), -b**2*x**2/4)/4 - log(b**2*x**
2)/(2*x) - 1/x - EulerGamma/x
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x^2,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)/x^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.04

$$-b\,\mathrm{sinint}(b\,x)-\frac{\mathrm{cosint}(b\,x)}{x}-\frac{\cos\left(b\,x\right)}{x}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)/x^2,x)
```

```
[Out] - b*sinint(b*x) - cosint(b*x)/x - cos(b*x)/x
```

3.76 $\int \frac{\text{CosIntegral}(bx)}{x^3} \, dx$

Optimal. Leaf size=46

$$-\frac{\cos(bx)}{4x^2}-\frac{1}{4}b^2\text{CosIntegral}(bx)-\frac{\text{CosIntegral}(bx)}{2x^2}+\frac{b\sin(bx)}{4x}$$

```
[Out] -1/4*b^2*Ci(b*x)-1/2*Ci(b*x)/x^2-1/4*cos(b*x)/x^2+1/4*b*sin(b*x)/x
```

Rubi [A]
time = 0.05, antiderivative size = 46, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6639, 12, 3378, 3383}

$$-\frac{1}{4}b^2\text{CosIntegral}(bx)-\frac{\text{CosIntegral}(bx)}{2x^2}-\frac{\cos(bx)}{4x^2}+\frac{b\sin(bx)}{4x}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x]/x^3,x]
```

```
[Out] -1/4*Cos[b*x]/x^2 - (b^2*CosIntegral[b*x])/4 - CosIntegral[b*x]/(2*x^2) + (
b*Sin[b*x])/(4*x)
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 6639

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :
> Simp[(c + d*x)^(m + 1)*(CosIntegral[a + b*x]/(d*(m + 1))), x] - Dist[b/(d
*(m + 1)), Int[(c + d*x)^(m + 1)*(Cos[a + b*x]/(a + b*x)), x], x] /; FreeQ[
```

```
{a, b, c, d, m}, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\mathrm{Ci}(bx)}{x^3}\,dx &= -\frac{\mathrm{Ci}(bx)}{2x^2} + \frac{1}{2}b\int \frac{\cos(bx)}{bx^3}\,dx\\ &= -\frac{\mathrm{Ci}(bx)}{2x^2} + \frac{1}{2}\int \frac{\cos(bx)}{x^3}\,dx\\ &= -\frac{\cos(bx)}{4x^2} - \frac{\mathrm{Ci}(bx)}{2x^2} - \frac{1}{4}b\int \frac{\sin(bx)}{x^2}\,dx\\ &= -\frac{\cos(bx)}{4x^2} - \frac{\mathrm{Ci}(bx)}{2x^2} + \frac{b\sin(bx)}{4x} - \frac{1}{4}b^2\int \frac{\cos(bx)}{x}\,dx\\ &= -\frac{\cos(bx)}{4x^2} - \frac{1}{4}b^2\mathrm{Ci}(bx) - \frac{\mathrm{Ci}(bx)}{2x^2} + \frac{b\sin(bx)}{4x}\end{aligned}$$

Mathematica [A]
time = 0.01, size = 46, normalized size = 1.00

$$-\frac{\cos(bx)}{4x^2} - \frac{1}{4}b^2\mathrm{CosIntegral}(bx) - \frac{\mathrm{CosIntegral}(bx)}{2x^2} + \frac{b\sin(bx)}{4x}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x]/x^3,x]
[Out] -1/4*Cos[b*x]/x^2 - (b^2*CosIntegral[b*x])/4 - CosIntegral[b*x]/(2*x^2) + (
b*Sin[b*x])/(4*x)
```

Maple [A]
time = 0.22, size = 48, normalized size = 1.04

method	result
derivativedivides	$b^2\left(-\frac{\mathrm{cosineIntegral}(bx)}{2b^2x^2} - \frac{\cos(bx)}{4b^2x^2} + \frac{\sin(bx)}{4bx} - \frac{\mathrm{cosineIntegral}(bx)}{4}\right)$
default	$b^2\left(-\frac{\mathrm{cosineIntegral}(bx)}{2b^2x^2} - \frac{\cos(bx)}{4b^2x^2} + \frac{\sin(bx)}{4bx} - \frac{\mathrm{cosineIntegral}(bx)}{4}\right)$
meijerg	$\frac{\sqrt{\pi}\, b^2\left(\frac{-8b^2x^2+4}{\sqrt{\pi}\, b^2x^2} + \frac{4(3b^2x^2+6)\gamma}{3\sqrt{\pi}\, b^2x^2} + \frac{4(3b^2x^2+6)\ln(2)}{3\sqrt{\pi}\, b^2x^2} + \frac{4(3b^2x^2+6)\ln\left(\frac{bx}{2}\right)}{3\sqrt{\pi}\, b^2x^2} - \frac{4\cos(bx)}{\sqrt{\pi}\, b^2x^2} + \frac{4\sin(bx)}{\sqrt{\pi}\, bx} - \frac{4(3b^2x^2+6)\,\mathrm{cosine}}{3\sqrt{\pi}\, b^2}\right.}{16}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)/x^3,x,method=_RETURNVERBOSE)
```

```
[Out] b^2*(-1/2*Ci(b*x)/b^2/x^2-1/4*cos(b*x)/b^2/x^2+1/4*sin(b*x)/b/x-1/4*Ci(b*x)
)
```

Maxima [C] Result contains complex when optimal does not.
time = 0.53, size = 61, normalized size = 1.33

$$-\frac{\sqrt{\frac{1}{2}}\sqrt{\pi x^2}\left((i+1)\sqrt{2}\,\Gamma\left(-\frac{1}{2},\frac{1}{2}i\pi b^2x^2\right)-(i-1)\sqrt{2}\,\Gamma\left(-\frac{1}{2},-\frac{1}{2}i\pi b^2x^2\right)\right)b^2}{16\,x}-\frac{\mathrm{C}\left(bx\right)}{2\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/16*sqrt(1/2)*sqrt(pi*x^2)*((I + 1)*sqrt(2)*gamma(-1/2, 1/2*I*pi*b^2*x^2)
 - (I - 1)*sqrt(2)*gamma(-1/2, -1/2*I*pi*b^2*x^2))*b^2/x - 1/2*fresnel_cos(
b*x)/x^2
```

Fricas [A]
time = 0.36, size = 42, normalized size = 0.91

$$-\frac{\pi\sqrt{b^2}\,bx^2\,\mathrm{S}\left(\sqrt{b^2}\,x\right)+bx\cos\left(\frac{1}{2}\pi b^2x^2\right)+\mathrm{C}\left(bx\right)}{2\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/2*(pi*sqrt(b^2)*b*x^2*fresnel_sin(sqrt(b^2)*x) + b*x*cos(1/2*pi*b^2*x^2)
 + fresnel_cos(b*x))/x^2
```

Sympy [B] Leaf count of result is larger than twice the leaf count of optimal. 87 vs. $2(39) = 78$.
time = 1.50, size = 87, normalized size = 1.89

$$\frac{b^2\log\left(bx\right)}{4}-\frac{b^2\log\left(b^2x^2\right)}{8}-\frac{b^2\operatorname{Ci}\left(bx\right)}{4}+\frac{b\sin\left(bx\right)}{4x}+\frac{\log\left(bx\right)}{2x^2}-\frac{\log\left(b^2x^2\right)}{4x^2}-\frac{\cos\left(bx\right)}{4x^2}-\frac{\operatorname{Ci}\left(bx\right)}{2x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)/x**3,x)
```

```
[Out] b**2*log(b*x)/4 - b**2*log(b**2*x**2)/8 - b**2*Ci(b*x)/4 + b*sin(b*x)/(4*x)
 + log(b*x)/(2*x**2) - log(b**2*x**2)/(4*x**2) - cos(b*x)/(4*x**2) - Ci(b*x
)/(2*x**2)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)/x^3,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)/x^3, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$-\frac{\frac{\cos(b\,x)}{2}-\frac{b\,x\,\sin(b\,x)}{2}}{2\,x^2}-\frac{b^2\,\mathrm{cosint}(b\,x)}{4}-\frac{\mathrm{cosint}(b\,x)}{2\,x^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)/x^3,x)
```

```
[Out] - (cos(b*x)/2 - (b*x*sin(b*x))/2)/(2*x^2) - (b^2*cosint(b*x))/4 - cosint(b*
x)/(2*x^2)
```

3.77 $\int x^m \mathbf{CosIntegral}(bx)^2\,dx$

Optimal. Leaf size=13

$$\operatorname{Int}\left(x^m \operatorname{CosIntegral}(bx)^2, x\right)$$

[Out] CannotIntegrate(x^m*Ci(b*x)^2,x)

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int x^m \operatorname{CosIntegral}(bx)^2\,dx$$

Verification is not applicable to the result.

[In] Int[x^m*CosIntegral[b*x]^2,x]

[Out] Defer[Int][x^m*CosIntegral[b*x]^2, x]

Rubi steps

$$\int x^m \operatorname{Ci}(bx)^2\,dx = \int x^m \operatorname{Ci}(bx)^2\,dx$$

Mathematica [A]
time = 1.97, size = 0, normalized size = 0.00

$$\int x^m \operatorname{CosIntegral}(bx)^2\,dx$$

Verification is not applicable to the result.

[In] Integrate[x^m*CosIntegral[b*x]^2,x]

[Out] Integrate[x^m*CosIntegral[b*x]^2, x]

Maple [A]
time = 0.12, size = 0, normalized size = 0.00

$$\int x^m \operatorname{cosineIntegral}\left(bx\right)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(x^m*Ci(b*x)^2,x)

```
[Out] int(x^m*Ci(b*x)^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x)^2,x, algorithm="maxima")
[Out] integrate(x^m*fresnel_cos(b*x)^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x)^2,x, algorithm="fricas")
[Out] integral(x^m*fresnel_cos(b*x)^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Ci}^2(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Ci(b*x)**2,x)
[Out] Integral(x**m*Ci(b*x)**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x)^2,x, algorithm="giac")
[Out] integrate(x^m*fresnel_cos(b*x)^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int x^m \operatorname{cosint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*cosint(b*x)^2,x)
[Out] int(x^m*cosint(b*x)^2, x)
```

3.78 $\int x^3 \textbf{CosIntegral}(bx)^2 \, dx$

Optimal. Leaf size=163

$$\frac{x^2}{4b^2}+\frac{3\cos^2(bx)}{8b^4}+\frac{3\cos(bx)\text{CosIntegral}(bx)}{b^4}-\frac{3x^2\cos(bx)\text{CosIntegral}(bx)}{2b^2}+\frac{1}{4}x^4\text{CosIntegral}(bx)^2-\frac{3\text{CosIntegra}}{2b^4}$$

```
[Out] 1/4*x^2/b^2+1/4*x^4*Ci(b*x)^2-3/2*Ci(2*b*x)/b^4+3*Ci(b*x)*cos(b*x)/b^4-3/2*
x^2*Ci(b*x)*cos(b*x)/b^2+3/8*cos(b*x)^2/b^4-3/2*ln(x)/b^4+3*x*Ci(b*x)*sin(b
*x)/b^3-1/2*x^3*Ci(b*x)*sin(b*x)/b+x*cos(b*x)*sin(b*x)/b^3-13/8*sin(b*x)^2/
b^4+1/4*x^2*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.16, antiderivative size = 163, normalized size of antiderivative = 1.00, number of steps used = 19, number of rules used = 11, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.100$, Rules used = {6643, 6649, 12, 3524, 3391, 30, 6655, 2644, 6653, 3393, 3383}

$$-\frac{3\text{CosIntegral}(2bx)}{2b^4}+\frac{3\text{CosIntegral}(bx)\cos(bx)}{b^4}-\frac{3\log(x)}{2b^4}-\frac{13\sin^2(bx)}{8b^4}+\frac{3\cos^2(bx)}{8b^4}+\frac{3x\text{CosIntegral}(bx)\sin(bx)}{b^3}+\frac{x\sin(bx)\cos(bx)}{b^3}-\frac{3x^2\text{CosIntegral}(bx)\cos(bx)}{2b^2}+\frac{x^2}{4b^2}+\frac{x^2\sin^2(bx)}{4b^2}+\frac{1}{4}x^4\text{CosIntegral}(bx)^2-\frac{x^3\text{CosIntegral}(bx)\sin(bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*CosIntegral[b*x]^2,x]
```

```
[Out] x^2/(4*b^2) + (3*Cos[b*x]^2)/(8*b^4) + (3*Cos[b*x]*CosIntegral[b*x])/b^4 -
(3*x^2*Cos[b*x]*CosIntegral[b*x])/(2*b^2) + (x^4*CosIntegral[b*x]^2)/4 - (3
*CosIntegral[2*b*x])/(2*b^4) - (3*Log[x])/(2*b^4) + (x*Cos[b*x]*Sin[b*x])/b
^3 + (3*x*CosIntegral[b*x]*Sin[b*x])/b^3 - (x^3*CosIntegral[b*x]*Sin[b*x])/
(2*b) - (13*Sin[b*x]^2)/(8*b^4) + (x^2*Sin[b*x]^2)/(4*b^2)
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 6643

```
Int[CosIntegral[(b_.)*(x_)]^2*(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)*(CosI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Cos[b*x]*CosIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^3\text{Ci}(bx)^2\,dx = \frac{1}{4}x^4\text{Ci}(bx)^2 - \frac{1}{2}\int x^3\cos(bx)\text{Ci}(bx)\,dx$$
$$= \frac{1}{4}x^4\text{Ci}(bx)^2 - \frac{x^3\text{Ci}(bx)\sin(bx)}{2b} + \frac{1}{2}\int \frac{x^2\cos(bx)\sin(bx)}{b}\,dx + \frac{3\int x^2\text{Ci}(bx)\sin(bx)\,dx}{2b}$$
$$= -\frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 - \frac{x^3\text{Ci}(bx)\sin(bx)}{2b} + \frac{3\int x\cos(bx)\text{Ci}(bx)\,dx}{b^2} + \frac{\int x^2\cos}{}$$
$$= -\frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 + \frac{3x\text{Ci}(bx)\sin(bx)}{b^3} - \frac{x^3\text{Ci}(bx)\sin(bx)}{2b} + \frac{x^2\sin^2(bx)}{4b^2} -$$
$$= \frac{3\cos^2(bx)}{8b^4} + \frac{3\cos(bx)\text{Ci}(bx)}{b^4} - \frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 + \frac{x\cos(bx)\sin(bx)}{b^3} + \frac{3x}{}$$
$$= \frac{x^2}{4b^2} + \frac{3\cos^2(bx)}{8b^4} + \frac{3\cos(bx)\text{Ci}(bx)}{b^4} - \frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 + \frac{x\cos(bx)\sin(bx}{b^3}$$
$$= \frac{x^2}{4b^2} + \frac{3\cos^2(bx)}{8b^4} + \frac{3\cos(bx)\text{Ci}(bx)}{b^4} - \frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 + \frac{x\cos(bx)\sin(bx}{b^3}$$
$$= \frac{x^2}{4b^2} + \frac{3\cos^2(bx)}{8b^4} + \frac{3\cos(bx)\text{Ci}(bx)}{b^4} - \frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 - \frac{3\log(x)}{2b^4} + \frac{x\cos}{}$$
$$= \frac{x^2}{4b^2} + \frac{3\cos^2(bx)}{8b^4} + \frac{3\cos(bx)\text{Ci}(bx)}{b^4} - \frac{3x^2\cos(bx)\text{Ci}(bx)}{2b^2} + \frac{1}{4}x^4\text{Ci}(bx)^2 - \frac{3\text{Ci}(2bx)}{2b^4} - \frac{3\,\text{lo}}{2}$$

Mathematica [A]
time = 0.08, size = 108, normalized size = 0.66

$$\frac{3b^2x^2 + 8\cos(2bx) - b^2x^2\cos(2bx) + 2b^4x^4\text{CosIntegral}(bx)^2 - 12\text{CosIntegral}(2bx) - 12\log(x) - 4\text{CosIntegral}(bx)\left(3(-2+b^2x^2)\cos(bx) + bx(-6+b^2x^2)\sin(bx)\right) + 4bx\sin(2bx)}{8b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*CosIntegral[b*x]^2,x]
```

```
[Out] (3*b^2*x^2 + 8*Cos[2*b*x] - b^2*x^2*Cos[2*b*x] + 2*b^4*x^4*CosIntegral[b*x]
^2 - 12*CosIntegral[2*b*x] - 12*Log[x] - 4*CosIntegral[b*x]*(3*(-2 + b^2*x^
2)*Cos[b*x] + b*x*(-6 + b^2*x^2)*Sin[b*x]) + 4*b*x*Sin[2*b*x])/(8*b^4)
```

Maple [A]
time = 0.34, size = 135, normalized size = 0.83

method	result
derivativedivides	$\frac{\frac{b^4x^4\,\mathrm{cosineIntegral}(bx)^2}{4}-2\,\mathrm{cosineIntegral}(bx)\left(\frac{b^3x^3\sin(bx)}{4}+\frac{3b^2x^2\cos(bx)}{4}-\frac{3\cos(bx)}{2}-\frac{3bx\sin(bx)}{2}\right)-\frac{b^2x^2\left(\cos^2(bx)\right)}{4}+2bx(}{b^4}$
default	$\frac{\frac{b^4x^4\,\mathrm{cosineIntegral}(bx)^2}{4}-2\,\mathrm{cosineIntegral}(bx)\left(\frac{b^3x^3\sin(bx)}{4}+\frac{3b^2x^2\cos(bx)}{4}-\frac{3\cos(bx)}{2}-\frac{3bx\sin(bx)}{2}\right)-\frac{b^2x^2\left(\cos^2(bx)\right)}{4}+2bx(}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Ci(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*b^4*x^4*Ci(b*x)^2-2*Ci(b*x)*(1/4*b^3*x^3*sin(b*x)+3/4*b^2*x^2*co
s(b*x)-3/2*cos(b*x)-3/2*b*x*sin(b*x))-1/4*cos(b*x)^2*b^2*x^2+2*b*x*(1/2*sin
(b*x)*cos(b*x)+1/2*b*x)-1/2*b^2*x^2-1/2*sin(b*x)^2-3/2*ln(b*x)-3/2*Ci(2*b*x
)+3/2*cos(b*x)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x^3*fresnel_cos(b*x)^2, x)
```

Fricas [A]
time = 0.36, size = 118, normalized size = 0.72

$$-\frac{\pi b^2x^2\cos\left(\frac{1}{2}\,\pi b^2x^2\right)^2-2\,\pi b^2x^2+6\,\pi bx\cos\left(\frac{1}{2}\,\pi b^2x^2\right)\mathrm{C}\left(bx\right)-\left(3\,\pi+\pi^3b^4x^4\right)\mathrm{C}\left(bx\right)^2+2\left(\pi^2b^3x^3\,\mathrm{C}\left(bx\right)-2\,\cos\left(\frac{1}{2}\,\pi b^2x^2\right)\right)\sin\left(\frac{1}{2}\,\pi b^2x^2\right)}{4\,\pi^3b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)^2,x, algorithm="fricas")
```

```
[Out] -1/4*(pi*b^2*x^2*cos(1/2*pi*b^2*x^2)^2 - 2*pi*b^2*x^2 + 6*pi*b*x*cos(1/2*pi
*b^2*x^2)*fresnel_cos(b*x) - (3*pi + pi^3*b^4*x^4)*fresnel_cos(b*x)^2 + 2*(
pi^2*b^3*x^3*fresnel_cos(b*x) - 2*cos(1/2*pi*b^2*x^2))*sin(1/2*pi*b^2*x^2))
/(pi^3*b^4)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3\,\mathrm{Ci}^2\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Ci(b*x)**2,x)
```

```
[Out] Integral(x**3*Ci(b*x)**2, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)^2,x, algorithm="giac")
```

```
[Out] integrate(x^3*fresnel_cos(b*x)^2, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3\,\mathrm{cosint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cosint(b*x)^2,x)
```

```
[Out] int(x^3*cosint(b*x)^2, x)
```

3.79 $\int x^2\textbf{CosIntegral}(bx)^2\,dx$

Optimal. Leaf size=112

$$\frac{x}{2b^2}-\frac{4x\cos(bx)\text{CosIntegral}(bx)}{3b^2}+\frac{1}{3}x^3\text{CosIntegral}(bx)^2+\frac{5\cos(bx)\sin(bx)}{6b^3}+\frac{4\text{CosIntegral}(bx)\sin(bx)}{3b^3}-\frac{2x^2\text{C}}{}$$

```
[Out] 1/2*x/b^2+1/3*x^3*Ci(b*x)^2-4/3*x*Ci(b*x)*cos(b*x)/b^2-2/3*Si(2*b*x)/b^3+4/
3*Ci(b*x)*sin(b*x)/b^3-2/3*x^2*Ci(b*x)*sin(b*x)/b+5/6*cos(b*x)*sin(b*x)/b^3
+1/3*x*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.10, antiderivative size = 112, normalized size of antiderivative = 1.00, number of steps used = 15, number of rules used = 10, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {6643, 6649, 12, 3524, 2715, 8, 6655, 6647, 4491, 3380}

$$\frac{4\text{CosIntegral}(bx)\sin(bx)}{3b^3}-\frac{2\text{Si}(2bx)}{3b^3}+\frac{5\sin(bx)\cos(bx)}{6b^3}-\frac{4x\text{CosIntegral}(bx)\cos(bx)}{3b^2}+\frac{x}{2b^2}+\frac{x\sin^2(bx)}{3b^2}+\frac{1}{3}x^3\text{CosIntegral}(bx)^2-\frac{2x^2\text{CosIntegral}(bx)\sin(bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[b*x]^2,x]
```

```
[Out] x/(2*b^2) - (4*x*Cos[b*x]*CosIntegral[b*x])/(3*b^2) + (x^3*CosIntegral[b*x]
^2)/3 + (5*Cos[b*x]*Sin[b*x])/(6*b^3) + (4*CosIntegral[b*x]*Sin[b*x])/(3*b^
3) - (2*x^2*CosIntegral[b*x]*Sin[b*x])/(3*b) + (x*Sin[b*x]^2)/(3*b^2) - (2*
SinIntegral[2*b*x])/(3*b^3)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6643

```
Int[CosIntegral[(b_.)*(x_)]^2*(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)*(CosI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Cos[b*x]*CosIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\text{Ci}(bx)^2\,dx = \frac{1}{3}x^3\text{Ci}(bx)^2 - \frac{2}{3}\int x^2\cos(bx)\text{Ci}(bx)\,dx$$
$$= \frac{1}{3}x^3\text{Ci}(bx)^2 - \frac{2x^2\text{Ci}(bx)\sin(bx)}{3b} + \frac{2}{3}\int \frac{x\cos(bx)\sin(bx)}{b}\,dx + \frac{4\int x\text{Ci}(bx)\sin(bx)\,dx}{3b}$$
$$= -\frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 - \frac{2x^2\text{Ci}(bx)\sin(bx)}{3b} + \frac{4\int\cos(bx)\text{Ci}(bx)\,dx}{3b^2} + \frac{2\int x\,\text{co}}{}$$
$$= -\frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 + \frac{4\text{Ci}(bx)\sin(bx)}{3b^3} - \frac{2x^2\text{Ci}(bx)\sin(bx)}{3b} + \frac{x\sin^2(bx)}{3b^2} -$$
$$= -\frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 + \frac{5\cos(bx)\sin(bx)}{6b^3} + \frac{4\text{Ci}(bx)\sin(bx)}{3b^3} - \frac{2x^2\text{Ci}(bx)\sin}{3b}$$
$$= \frac{x}{2b^2} - \frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 + \frac{5\cos(bx)\sin(bx)}{6b^3} + \frac{4\text{Ci}(bx)\sin(bx)}{3b^3} - \frac{2x^2\text{Ci}(bx}{3}$$
$$= \frac{x}{2b^2} - \frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 + \frac{5\cos(bx)\sin(bx)}{6b^3} + \frac{4\text{Ci}(bx)\sin(bx)}{3b^3} - \frac{2x^2\text{Ci}(bx}{3}$$
$$= \frac{x}{2b^2} - \frac{4x\cos(bx)\text{Ci}(bx)}{3b^2} + \frac{1}{3}x^3\text{Ci}(bx)^2 + \frac{5\cos(bx)\sin(bx)}{6b^3} + \frac{4\text{Ci}(bx)\sin(bx)}{3b^3} - \frac{2x^2\text{Ci}(bx}{3}$$

Mathematica [A]
time = 0.06, size = 78, normalized size = 0.70

$$\frac{8bx - 2bx\cos(2bx) + 4b^3x^3\text{CosIntegral}(bx)^2 - 8\text{CosIntegral}(bx)\left(2bx\cos(bx) + (-2 + b^2x^2)\sin(bx)\right) + 5\sin(2bx) - 8\text{Si}(2bx)}{12b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[b*x]^2,x]
```

```
[Out] (8*b*x - 2*b*x*Cos[2*b*x] + 4*b^3*x^3*CosIntegral[b*x]^2 - 8*CosIntegral[b*
x]*(2*b*x*Cos[b*x] + (-2 + b^2*x^2)*Sin[b*x]) + 5*Sin[2*b*x] - 8*SinIntegra
l[2*b*x])/(12*b^3)
```

Maple [A]
time = 0.46, size = 84, normalized size = 0.75

method	result
derivativedivides	$\frac{\frac{b^3x^3\,\text{cosineIntegral}(bx)^2}{3} - 2\,\text{cosineIntegral}(bx)\left(\frac{b^2x^2\sin(bx)}{3} - \frac{2\sin(bx)}{3} + \frac{2bx\cos(bx)}{3}\right) - \frac{bx\left(\cos^2(bx)\right)}{3} + \frac{5\sin(bx)\cos(bx)}{6} + \frac{5bx}{6}}{b^3}$
default	$\frac{\frac{b^3x^3\,\text{cosineIntegral}(bx)^2}{3} - 2\,\text{cosineIntegral}(bx)\left(\frac{b^2x^2\sin(bx)}{3} - \frac{2\sin(bx)}{3} + \frac{2bx\cos(bx)}{3}\right) - \frac{bx\left(\cos^2(bx)\right)}{3} + \frac{5\sin(bx)\cos(bx)}{6} + \frac{5bx}{6}}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*b^3*x^3*Ci(b*x)^2-2*Ci(b*x)*(1/3*b^2*x^2*sin(b*x)-2/3*sin(b*x)+2
/3*b*x*cos(b*x))-1/3*cos(b*x)^2*b*x+5/6*sin(b*x)*cos(b*x)+5/6*b*x-2/3*Si(2*
b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x^2*fresnel_cos(b*x)^2, x)
```

Fricas [A]
time = 0.37, size = 111, normalized size = 0.99

$$\frac{4\,\pi^2 b^4 x^3\,\mathrm{C}\left(bx\right)^2 - 8\,\pi b^3 x^2\,\mathrm{C}\left(bx\right)\sin\left(\frac{1}{2}\,\pi b^2 x^2\right) - 4\,b^2 x\cos\left(\frac{1}{2}\,\pi b^2 x^2\right)^2 + 10\,b^2 x - 16\,b\cos\left(\frac{1}{2}\,\pi b^2 x^2\right)\mathrm{C}\left(bx\right) + 5\,\sqrt{2}\,\sqrt{b^2}\,\mathrm{C}\left(\sqrt{2}\,\sqrt{b^2}\,x\right)}{12\,\pi^2 b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)^2,x, algorithm="fricas")
```

```
[Out] 1/12*(4*pi^2*b^4*x^3*fresnel_cos(b*x)^2 - 8*pi*b^3*x^2*fresnel_cos(b*x)*sin
(1/2*pi*b^2*x^2) - 4*b^2*x*cos(1/2*pi*b^2*x^2)^2 + 10*b^2*x - 16*b*cos(1/2*
pi*b^2*x^2)*fresnel_cos(b*x) + 5*sqrt(2)*sqrt(b^2)*fresnel_cos(sqrt(2)*sqrt
(b^2)*x))/(pi^2*b^4)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\,\mathrm{Ci}^2\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x)**2,x)
```

```
[Out] Integral(x**2*Ci(b*x)**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)^2,x, algorithm="giac")
```

```
[Out] integrate(x^2*fresnel_cos(b*x)^2, x)
```

Mupad [**F**]

time = 0.00, size = -1, normalized size = -0.01

$$\int x^2\,\mathrm{cosint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(b*x)^2,x)
```

```
[Out] int(x^2*cosint(b*x)^2, x)
```

3.80 $\int x\mathbf{CosIntegral}(bx)^2\,dx$

Optimal. Leaf size=75

$$-\frac{\cos(bx)\text{CosIntegral}(bx)}{b^2}+\frac{1}{2}x^2\text{CosIntegral}(bx)^2+\frac{\text{CosIntegral}(2bx)}{2b^2}+\frac{\log(x)}{2b^2}-\frac{x\text{CosIntegral}(bx)\sin(bx)}{b}+\frac{\sin^2}{2}$$

```
[Out] 1/2*x^2*Ci(b*x)^2+1/2*Ci(2*b*x)/b^2-Ci(b*x)*cos(b*x)/b^2+1/2*ln(x)/b^2-x*Ci
(b*x)*sin(b*x)/b+1/2*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.06, antiderivative size = 75, normalized size of antiderivative = 1.00, number of steps used = 10, number of rules used = 8, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}$ = 1.000, Rules used = {6643, 6649, 12, 2644, 30, 6653, 3393, 3383}

$$\frac{\text{CosIntegral}(2bx)}{2b^2}-\frac{\text{CosIntegral}(bx)\cos(bx)}{b^2}+\frac{\log(x)}{2b^2}+\frac{\sin^2(bx)}{2b^2}+\frac{1}{2}x^2\text{CosIntegral}(bx)^2-\frac{x\text{CosIntegral}(bx)\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[b*x]^2,x]
```

```
[Out] -((Cos[b*x]*CosIntegral[b*x])/b^2) + (x^2*CosIntegral[b*x]^2)/2 + CosIntegr
al[2*b*x]/(2*b^2) + Log[x]/(2*b^2) - (x*CosIntegral[b*x]*Sin[b*x])/b + Sin[
b*x]^2/(2*b^2)
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6643

```
Int[CosIntegral[(b_.)*(x_)]^2*(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)*(CosI
ntegral[b*x]^2/(m + 1)), x] - Dist[2/(m + 1), Int[x^m*Cos[b*x]*CosIntegral[
b*x], x], x] /; FreeQ[b, x] && IGtQ[m, 0]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int x\text{Ci}(bx)^2\,dx &= \frac{1}{2}x^2\text{Ci}(bx)^2-\int x\cos(bx)\text{Ci}(bx)\,dx\\
&= \frac{1}{2}x^2\text{Ci}(bx)^2-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\int \text{Ci}(bx)\sin(bx)\,dx}{b}+\int \frac{\cos(bx)\sin(bx)}{b}\,dx\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{1}{2}x^2\text{Ci}(bx)^2-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\int \frac{\cos^2(bx)}{bx}\,dx}{b}+\frac{\int \cos(bx)\sin(bx)\,dx}{b}\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{1}{2}x^2\text{Ci}(bx)^2-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\int \frac{\cos^2(bx)}{x}\,dx}{b^2}+\frac{\text{Subst}(\int x\,dx,x,\sin(b}{b^2}\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{1}{2}x^2\text{Ci}(bx)^2-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\sin^2(bx)}{2b^2}+\frac{\int \left(\frac{1}{2x}+\frac{\cos(2bx)}{2x}\right)\,dx}{b^2}\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{1}{2}x^2\text{Ci}(bx)^2+\frac{\log(x)}{2b^2}-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\sin^2(bx)}{2b^2}+\frac{\int \frac{\cos(2bx)}{x}\,dx}{2b^2}\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{1}{2}x^2\text{Ci}(bx)^2+\frac{\text{Ci}(2bx)}{2b^2}+\frac{\log(x)}{2b^2}-\frac{x\text{Ci}(bx)\sin(bx)}{b}+\frac{\sin^2(bx)}{2b^2}
\end{aligned}
$$

Mathematica [A]
time = 0.04, size = 58, normalized size = 0.77

$$\frac{-\cos(2bx)+2b^2x^2\text{CosIntegral}(bx)^2+2\text{CosIntegral}(2bx)+2\log(x)-4\text{CosIntegral}(bx)(\cos(bx)+bx\sin(bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[b*x]^2,x]
```

```
[Out] (-Cos[2*b*x] + 2*b^2*x^2*CosIntegral[b*x]^2 + 2*CosIntegral[2*b*x] + 2*Log[
x] - 4*CosIntegral[b*x]*(Cos[b*x] + b*x*Sin[b*x]))/(4*b^2)
```

Maple [A]
time = 0.35, size = 62, normalized size = 0.83

method	result	size
derivativedivides	$\frac{\frac{b^2x^2\,\text{cosineIntegral}(bx)^2}{2}-2\,\text{cosineIntegral}(bx)\left(\frac{\cos(bx)}{2}+\frac{bx\sin(bx)}{2}\right)+\frac{\ln(bx)}{2}+\frac{\text{cosineIntegral}(2bx)}{2}-\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	62
default	$\frac{\frac{b^2x^2\,\text{cosineIntegral}(bx)^2}{2}-2\,\text{cosineIntegral}(bx)\left(\frac{\cos(bx)}{2}+\frac{bx\sin(bx)}{2}\right)+\frac{\ln(bx)}{2}+\frac{\text{cosineIntegral}(2bx)}{2}-\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	62

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(1/2*b^2*x^2*Ci(b*x)^2-2*Ci(b*x)*(1/2*cos(b*x)+1/2*b*x*sin(b*x))+1/2*
ln(b*x)+1/2*Ci(2*b*x)-1/2*cos(b*x)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(x*fresnel_cos(b*x)^2, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)^2,x, algorithm="fricas")
```

```
[Out] integral(x*fresnel_cos(b*x)^2, x)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Ci}^2\,(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x)**2,x)
```

```
[Out] Integral(x*Ci(b*x)**2, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)^2,x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(b*x)^2, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{cosint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(b*x)^2,x)
```

```
[Out] int(x*cosint(b*x)^2, x)
```

3.81 $\int \text{CosIntegral}(bx)^2\,dx$

Optimal. Leaf size=31

$$x\text{CosIntegral}(bx)^2-\frac{2\text{CosIntegral}(bx)\sin(bx)}{b}+\frac{\text{Si}(2bx)}{b}$$

```
[Out] x*Ci(b*x)^2+Si(2*b*x)/b-2*Ci(b*x)*sin(b*x)/b
```

Rubi [A]
time = 0.04, antiderivative size = 31, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 5, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}=0.833$, Rules used = {6641, 6647, 12, 4491, 3380}

$$x\text{CosIntegral}(bx)^2-\frac{2\text{CosIntegral}(bx)\sin(bx)}{b}+\frac{\text{Si}(2bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x]^2,x]
```

```
[Out] x*CosIntegral[b*x]^2 - (2*CosIntegral[b*x]*Sin[b*x])/b + SinIntegral[2*b*x]
/b
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6641

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(CosInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Cos[a + b*x]*CosIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int \mathrm{Ci}(bx)^2\,dx &= x\mathrm{Ci}(bx)^2 - 2\int \cos(bx)\mathrm{Ci}(bx)\,dx \\
&= x\mathrm{Ci}(bx)^2 - \frac{2\mathrm{Ci}(bx)\sin(bx)}{b} + 2\int \frac{\cos(bx)\sin(bx)}{bx}\,dx \\
&= x\mathrm{Ci}(bx)^2 - \frac{2\mathrm{Ci}(bx)\sin(bx)}{b} + \frac{2\int \frac{\cos(bx)\sin(bx)}{x}\,dx}{b} \\
&= x\mathrm{Ci}(bx)^2 - \frac{2\mathrm{Ci}(bx)\sin(bx)}{b} + \frac{2\int \frac{\sin(2bx)}{2x}\,dx}{b} \\
&= x\mathrm{Ci}(bx)^2 - \frac{2\mathrm{Ci}(bx)\sin(bx)}{b} + \frac{\int \frac{\sin(2bx)}{x}\,dx}{b} \\
&= x\mathrm{Ci}(bx)^2 - \frac{2\mathrm{Ci}(bx)\sin(bx)}{b} + \frac{\mathrm{Si}(2bx)}{b}
\end{aligned}$$

Mathematica [A]
time = 0.01, size = 31, normalized size = 1.00

$$x\mathrm{CosIntegral}(bx)^2 - \frac{2\mathrm{CosIntegral}(bx)\sin(bx)}{b} + \frac{\mathrm{Si}(2bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x]^2,x]
```

```
[Out] x*CosIntegral[b*x]^2 - (2*CosIntegral[b*x]*Sin[b*x])/b + SinIntegral[2*b*x]
/b
```

Maple [A]
time = 0.32, size = 30, normalized size = 0.97

method	result	size
derivativedivides	$\frac{\mathrm{cosineIntegral}(bx)^2 bx - 2\,\mathrm{cosineIntegral}(bx)\sin(bx) + \mathrm{sinIntegral}(2bx)}{b}$	30
default	$\frac{\mathrm{cosineIntegral}(bx)^2 bx - 2\,\mathrm{cosineIntegral}(bx)\sin(bx) + \mathrm{sinIntegral}(2bx)}{b}$	30

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b*(Ci(b*x)^2*b*x-2*Ci(b*x)*sin(b*x)+Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)^2, x)
```

Fricas [A]
time = 0.35, size = 59, normalized size = 1.90

$$\frac{2\,\pi b^2 x\,\mathrm{C}\left(bx\right)^2 - 4\,b\,\mathrm{C}\left(bx\right)\sin\left(\frac{1}{2}\,\pi b^2 x^2\right) + \sqrt{2}\,\sqrt{b^2}\,\mathrm{S}\left(\sqrt{2}\,\sqrt{b^2}\,x\right)}{2\,\pi b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2,x, algorithm="fricas")
```

```
[Out] 1/2*(2*pi*b^2*x*fresnel_cos(b*x)^2 - 4*b*fresnel_cos(b*x)*sin(1/2*pi*b^2*x^
2) + sqrt(2)*sqrt(b^2)*fresnel_sin(sqrt(2)*sqrt(b^2)*x))/(pi*b^2)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \mathrm{Ci}^2\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)**2,x)
```

```
[Out] Integral(Ci(b*x)**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int \operatorname{cosint}(b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)^2,x)
```

```
[Out] int(cosint(b*x)^2, x)
```

3.82 $\int \frac{\text{CosIntegral}(bx)^2}{x} \, dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{CosIntegral}(bx)^2}{x}, x\right)$$

```
[Out] CannotIntegrate(Ci(b*x)^2/x,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(bx)^2}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Int[CosIntegral[b*x]^2/x,x]
```

```
[Out] Defer[Int][CosIntegral[b*x]^2/x, x]
```

Rubi steps

$$\int \frac{\text{Ci}(bx)^2}{x} \, dx = \int \frac{\text{Ci}(bx)^2}{x} \, dx$$

Mathematica [A]
time = 0.30, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(bx)^2}{x} \, dx$$

Verification is not applicable to the result.

```
[In] Integrate[CosIntegral[b*x]^2/x,x]
```

```
[Out] Integrate[CosIntegral[b*x]^2/x, x]
```

Maple [A]
time = 0.07, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx)^2}{x} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)^2/x,x)
[Out] int(Ci(b*x)^2/x,x)
```

Maxima [**A**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x,x, algorithm="maxima")
[Out] integrate(fresnel_cos(b*x)^2/x, x)
```

Fricas [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x,x, algorithm="fricas")
[Out] integral(fresnel_cos(b*x)^2/x, x)
```

Sympy [**A**]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}^{2}(bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)**2/x,x)
[Out] Integral(Ci(b*x)**2/x, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x,x, algorithm="giac")
[Out] integrate(fresnel_cos(b*x)^2/x, x)
```

Mupad [**A**]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{\mathrm{cosint}(b\,x)^2}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)^2/x,x)
```

```
[Out] int(cosint(b*x)^2/x, x)
```

3.83 $\int \frac{\text{CosIntegral}(bx)^2}{x^2} dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{CosIntegral}(bx)^2}{x^2}, x\right)$$

[Out] CannotIntegrate(Ci(b*x)^2/x^2,x)

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {}

$$\int \frac{\text{CosIntegral}(bx)^2}{x^2} dx$$

Verification is not applicable to the result.

[In] Int[CosIntegral[b*x]^2/x^2,x]

[Out] Defer[Int][CosIntegral[b*x]^2/x^2, x]

Rubi steps

$$\int \frac{\text{Ci}(bx)^2}{x^2} dx = \int \frac{\text{Ci}(bx)^2}{x^2} dx$$

Mathematica [A]
time = 0.36, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(bx)^2}{x^2} dx$$

Verification is not applicable to the result.

[In] Integrate[CosIntegral[b*x]^2/x^2,x]

[Out] Integrate[CosIntegral[b*x]^2/x^2, x]

Maple [A]
time = 0.09, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx\right)^2}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)^2/x^2,x)
```

```
[Out] int(Ci(b*x)^2/x^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^2,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)^2/x^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^2,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x)^2/x^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}^{2}\left(bx\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)**2/x**2,x)
```

```
[Out] Integral(Ci(b*x)**2/x**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^2,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)^2/x^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{{\mathrm{cosint}\left(b\,x\right)}^2}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)^2/x^2,x)
```

```
[Out] int(cosint(b*x)^2/x^2, x)
```

3.84 $\int \frac{\text{CosIntegral}(bx)^2}{x^3} dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{CosIntegral}(bx)^2}{x^3}, x\right)$$

```
[Out] CannotIntegrate(Ci(b*x)^2/x^3,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(bx)^2}{x^3} dx$$

Verification is not applicable to the result.

```
[In] Int[CosIntegral[b*x]^2/x^3,x]
```

```
[Out] Defer[Int][CosIntegral[b*x]^2/x^3, x]
```

Rubi steps

$$\int \frac{\text{Ci}(bx)^2}{x^3} dx = \int \frac{\text{Ci}(bx)^2}{x^3} dx$$

Mathematica [A]
time = 0.37, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(bx)^2}{x^3} dx$$

Verification is not applicable to the result.

```
[In] Integrate[CosIntegral[b*x]^2/x^3,x]
```

```
[Out] Integrate[CosIntegral[b*x]^2/x^3, x]
```

Maple [A]
time = 0.11, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx\right)^2}{x^3} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)^2/x^3,x)
[Out] int(Ci(b*x)^2/x^3,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^3,x, algorithm="maxima")
[Out] integrate(fresnel_cos(b*x)^2/x^3, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^3,x, algorithm="fricas")
[Out] integral(fresnel_cos(b*x)^2/x^3, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}^2(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)**2/x**3,x)
[Out] Integral(Ci(b*x)**2/x**3, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)^2/x^3,x, algorithm="giac")
[Out] integrate(fresnel_cos(b*x)^2/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{\operatorname{cosint}(b\,x)^2}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)^2/x^3,x)
[Out] int(cosint(b*x)^2/x^3, x)
```

3.85 $\int x^m \textbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=48

$$\frac{x^{1+m}\text{CosIntegral}(a+bx)}{1+m}-\frac{b\text{Int}\left(\frac{x^{1+m}\cos(a+bx)}{a+bx},x\right)}{1+m}$$

```
[Out] -b*CannotIntegrate(x^(1+m)*cos(b*x+a)/(b*x+a),x)/(1+m)+x^(1+m)*Ci(b*x+a)/(1
+m)
```

Rubi [A]
time = 0.23, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}=0.000$, Rules used = {}

$$\int x^m\text{CosIntegral}(a+bx)\,dx$$

Verification is not applicable to the result.

```
[In] Int[x^m*CosIntegral[a + b*x],x]
```

```
[Out] (x^(1 + m)*CosIntegral[a + b*x])/(1 + m) - (b*Defer[Int][(x^(1 + m)*Cos[a +
 b*x])/(a + b*x), x])/(1 + m)
```

Rubi steps

$$\int x^m\text{Ci}(a+bx)\,dx=\frac{x^{1+m}\text{Ci}(a+bx)}{1+m}-\frac{b\int\frac{x^{1+m}\cos(a+bx)}{a+bx}\,dx}{1+m}$$

Mathematica [A]
time = 2.49, size = 0, normalized size = 0.00

$$\int x^m\text{CosIntegral}(a+bx)\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[x^m*CosIntegral[a + b*x],x]
```

```
[Out] Integrate[x^m*CosIntegral[a + b*x], x]
```

Maple [A]
time = 0.13, size = 0, normalized size = 0.00

$$\int x^m\,\text{cosineIntegral}\left(bx+a\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Ci(b*x+a),x)
```

```
[Out] int(x^m*Ci(b*x+a),x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^m*fresnel_cos(b*x + a), x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(x^m*fresnel_cos(b*x + a), x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Ci}(a + bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Ci(b*x+a),x)
```

```
[Out] Integral(x**m*Ci(a + b*x), x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^m*fresnel_cos(b*x + a), x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.02

$$\int x^m \operatorname{cosint}(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*cosint(a + b*x),x)
[Out] int(x^m*cosint(a + b*x), x)
```

3.86 $\int x^3\textbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=184

$$\frac{3\cos(a+bx)}{2b^4}-\frac{a^2\cos(a+bx)}{4b^4}+\frac{ax\cos(a+bx)}{2b^3}-\frac{3x^2\cos(a+bx)}{4b^2}-\frac{a^4\text{CosIntegral}(a+bx)}{4b^4}+\frac{1}{4}x^4\text{CosIntegral}(a$$

```
[Out] -1/4*a^4*Ci(b*x+a)/b^4+1/4*x^4*Ci(b*x+a)+3/2*cos(b*x+a)/b^4-1/4*a^2*cos(b*x
+a)/b^4+1/2*a*x*cos(b*x+a)/b^3-3/4*x^2*cos(b*x+a)/b^2-1/2*a*sin(b*x+a)/b^4+
1/4*a^3*sin(b*x+a)/b^4+3/2*x*sin(b*x+a)/b^3-1/4*a^2*x*sin(b*x+a)/b^3+1/4*a*
x^2*sin(b*x+a)/b^2-1/4*x^3*sin(b*x+a)/b
```

Rubi [A]

time = 0.28, antiderivative size = 184, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {6639, 6874, 2717, 3377, 2718, 3383}

$$-\frac{a^4\text{CosIntegral}(a+bx)}{4b^4}+\frac{a^3\sin(a+bx)}{4b^4}-\frac{a^2\cos(a+bx)}{4b^4}-\frac{a^2x\sin(a+bx)}{4b^3}-\frac{a\sin(a+bx)}{2b^4}+\frac{3\cos(a+bx)}{2b^4}+\frac{3x\sin(a+bx)}{2b^3}+\frac{ax\cos(a+bx)}{2b^3}+\frac{ax^2\sin(a+bx)}{4b^2}-\frac{3x^2\cos(a+bx)}{4b^2}+\frac{1}{4}x^4\text{CosIntegral}(a+bx)-\frac{x^3\sin(a+bx)}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*CosIntegral[a + b*x],x]
```

```
[Out] (3*Cos[a + b*x])/(2*b^4) - (a^2*Cos[a + b*x])/(4*b^4) + (a*x*Cos[a + b*x])/
(2*b^3) - (3*x^2*Cos[a + b*x])/(4*b^2) - (a^4*CosIntegral[a + b*x])/(4*b^4)
 + (x^4*CosIntegral[a + b*x])/4 - (a*Sin[a + b*x])/(2*b^4) + (a^3*Sin[a + b
*x])/(4*b^4) + (3*x*Sin[a + b*x])/(2*b^3) - (a^2*x*Sin[a + b*x])/(4*b^3) +
(a*x^2*Sin[a + b*x])/(4*b^2) - (x^3*Sin[a + b*x])/(4*b)
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 6639

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x^3\text{Ci}(a+bx)\,dx &= \frac{1}{4}x^4\text{Ci}(a+bx) - \frac{1}{4}b\int \frac{x^4\cos(a+bx)}{a+bx}\,dx \\
&= \frac{1}{4}x^4\text{Ci}(a+bx) - \frac{1}{4}b\int \left(-\frac{a^3\cos(a+bx)}{b^4} + \frac{a^2x\cos(a+bx)}{b^3} - \frac{ax^2\cos(a+bx)}{b^2} + \frac{x^3 \cdots}{\cdots} \right. \\
&= \frac{1}{4}x^4\text{Ci}(a+bx) - \frac{1}{4}\int x^3\cos(a+bx)\,dx + \frac{a^3\int\cos(a+bx)\,dx}{4b^3} - \frac{a^4\int\frac{\cos(a+bx)}{a+bx}\,dx}{4b^3} - \frac{a \cdots}{\cdots} \\
&= -\frac{a^4\text{Ci}(a+bx)}{4b^4} + \frac{1}{4}x^4\text{Ci}(a+bx) + \frac{a^3\sin(a+bx)}{4b^4} - \frac{a^2x\sin(a+bx)}{4b^3} + \frac{ax^2\sin(a+b \cdots}{4b^2} \\
&= -\frac{a^2\cos(a+bx)}{4b^4} + \frac{ax\cos(a+bx)}{2b^3} - \frac{3x^2\cos(a+bx)}{4b^2} - \frac{a^4\text{Ci}(a+bx)}{4b^4} + \frac{1}{4}x^4\text{Ci}(a+b \cdots \\
&= -\frac{a^2\cos(a+bx)}{4b^4} + \frac{ax\cos(a+bx)}{2b^3} - \frac{3x^2\cos(a+bx)}{4b^2} - \frac{a^4\text{Ci}(a+bx)}{4b^4} + \frac{1}{4}x^4\text{Ci}(a+b \cdots \\
&= \frac{3\cos(a+bx)}{2b^4} - \frac{a^2\cos(a+bx)}{4b^4} + \frac{ax\cos(a+bx)}{2b^3} - \frac{3x^2\cos(a+bx)}{4b^2} - \frac{a^4\text{Ci}(a+bx)}{4b^4} + \cdots
\end{aligned}$$

Mathematica [A]
time = 0.16, size = 95, normalized size = 0.52

$$\frac{-((-6+a^2-2abx+3b^2x^2)\cos(a+bx)) + (-a^4+b^4x^4)\,\text{CosIntegral}(a+bx) + (-2a+a^3+6bx-a^2bx+ab^2x^2-b^3x^3)\sin(a+bx)}{4b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*CosIntegral[a + b*x],x]
```

```
[Out] (-((-6 + a^2 - 2*a*b*x + 3*b^2*x^2)*Cos[a + b*x]) + (-a^4 + b^4*x^4)*CosInt
egral[a + b*x] + (-2*a + a^3 + 6*b*x - a^2*b*x + a*b^2*x^2 - b^3*x^3)*Sin[a
 + b*x])/(4*b^4)
```

Maple [A]
time = 0.25, size = 154, normalized size = 0.84

method	result
derivativedivides	$\frac{\frac{\mathrm{cosineIntegral}(bx+a)b^4x^4}{4} - \frac{a^4\,\mathrm{cosineIntegral}(bx+a)}{4} + a^3\sin(bx+a) - \frac{3a^2(\cos(bx+a)+(bx+a)\sin(bx+a))}{2} + a\Big((bx+a)^2\sin(bx+a) -}{b^4}$
default	$\frac{\frac{\mathrm{cosineIntegral}(bx+a)b^4x^4}{4} - \frac{a^4\,\mathrm{cosineIntegral}(bx+a)}{4} + a^3\sin(bx+a) - \frac{3a^2(\cos(bx+a)+(bx+a)\sin(bx+a))}{2} + a\Big((bx+a)^2\sin(bx+a) -}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Ci(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(1/4*Ci(b*x+a)*b^4*x^4-1/4*a^4*Ci(b*x+a)+a^3*sin(b*x+a)-3/2*a^2*(cos(
b*x+a)+(b*x+a)*sin(b*x+a))+a*((b*x+a)^2*sin(b*x+a)-2*sin(b*x+a)+2*(b*x+a)*c
os(b*x+a))-1/4*(b*x+a)^3*sin(b*x+a)-3/4*(b*x+a)^2*cos(b*x+a)+3/2*cos(b*x+a)
+3/2*(b*x+a)*sin(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 1.18, size = 502, normalized size = 2.73

$$\frac{1}{4}x^4C(bx+a) + \frac{\left(16\left(-i\pi^2e^{\left(\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)} + i\pi^2e^{\left(-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)}\right)a^4 + 32\left(\pi\Gamma\left(2, \frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right) + \pi\Gamma\left(2, -\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)a^2 + 16\left(\left(-i\pi^2e^{\left(\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)} + i\pi^2e^{\left(-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)}\right)a^3 + 2\left(\pi\Gamma\left(2, \frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right) + \pi\Gamma\left(2, -\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)a\right)bx + \left(\left((i-1)\sqrt{2}\pi^{\frac{5}{2}}\left(\operatorname{erf}\left(\sqrt{\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2}\right)-1\right) - (i+1)\sqrt{2}\pi^{\frac{5}{2}}\left(\operatorname{erf}\left(\sqrt{-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2}\right)-1\right)\right)a^4 + 12\left(-(i+1)\sqrt{2}\pi\Gamma\left(\frac{3}{2}, \frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right) + (i-1)\sqrt{2}\pi\Gamma\left(\frac{3}{2}, -\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)a^2 + (4i-4)\sqrt{2}\Gamma\left(\frac{5}{2}, \frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right) - (4i+4)\sqrt{2}\Gamma\left(\frac{5}{2}, -\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)\sqrt{2\pi b^2x^2+4\pi abx+2\pi a^2}\,b}{32\left(\pi^3b^6x+\pi^3ab^5\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x+a),x, algorithm="maxima")
```

```
[Out] 1/4*x^4*fresnel_cos(b*x + a) + 1/32*(16*(-I*pi^2*e^(1/2*I*pi*b^2*x^2 + I*pi
*a*b*x + 1/2*I*pi*a^2) + I*pi^2*e^(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*p
i*a^2))*a^4 + 32*(pi*gamma(2, 1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2)
 + pi*gamma(2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2))*a^2 + 16*((-
I*pi^2*e^(1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + I*pi^2*e^(-1/2*I*
pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2))*a^3 + 2*(pi*gamma(2, 1/2*I*pi*b^2*
x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + pi*gamma(2, -1/2*I*pi*b^2*x^2 - I*pi*a*b
*x - 1/2*I*pi*a^2))*a)*b*x + (((I - 1)*sqrt(2)*pi^(5/2)*(erf(sqrt(1/2*I*pi*
b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2)) - 1) - (I + 1)*sqrt(2)*pi^(5/2)*(erf(
sqrt(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2)) - 1))*a^4 + 12*(-(I +
1)*sqrt(2)*pi*gamma(3/2, 1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + (I
 - 1)*sqrt(2)*pi*gamma(3/2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2))
*a^2 + (4*I - 4)*sqrt(2)*gamma(5/2, 1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*p
i*a^2) - (4*I + 4)*sqrt(2)*gamma(5/2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*
I*pi*a^2))*sqrt(2*pi*b^2*x^2 + 4*pi*a*b*x + 2*pi*a^2))*b/(pi^3*b^6*x + pi^3
*a*b^5)
```

Fricas [A]
time = 0.35, size = 176, normalized size = 0.96

$$\frac{\pi^2b^5x^4\,C(bx+a) + 6\,\pi a^2\sqrt{b^2}\,S\left(\frac{\sqrt{b^2}\,(bx+a)}{b}\right) - (\pi^2a^4-3)\sqrt{b^2}\,C\left(\frac{\sqrt{b^2}\,(bx+a)}{b}\right) - (3\,b^2x-5\,ab)\cos\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right) - (\pi b^4x^3-\pi ab^3x^2+\pi a^2b^2x-\pi a^3b)\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)}{4\,\pi^2b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/4*(pi^2*b^5*x^4*fresnel_cos(b*x + a) + 6*pi*a^2*sqrt(b^2)*fresnel_sin(sqr
t(b^2)*(b*x + a)/b) - (pi^2*a^4 - 3)*sqrt(b^2)*fresnel_cos(sqrt(b^2)*(b*x +
 a)/b) - (3*b^2*x - 5*a*b)*cos(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2) - (p
i*b^4*x^3 - pi*a*b^3*x^2 + pi*a^2*b^2*x - pi*a^3*b)*sin(1/2*pi*b^2*x^2 + pi
*a*b*x + 1/2*pi*a^2))/(pi^2*b^5)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3 \operatorname{Ci}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Ci(b*x+a),x)
```

```
[Out] Integral(x**3*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x^3*fresnel_cos(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3\,\mathrm{cosint}(a+b\,x)\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cosint(a + b*x),x)
```

```
[Out] int(x^3*cosint(a + b*x), x)
```

3.87 $\int x^2\textbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=118

$$\frac{a\cos(a+bx)}{3b^3}-\frac{2x\cos(a+bx)}{3b^2}+\frac{a^3\text{CosIntegral}(a+bx)}{3b^3}+\frac{1}{3}x^3\text{CosIntegral}(a+bx)+\frac{2\sin(a+bx)}{3b^3}-\frac{a^2\sin(a+b}{3b^3}$$

```
[Out] 1/3*a^3*Ci(b*x+a)/b^3+1/3*x^3*Ci(b*x+a)+1/3*a*cos(b*x+a)/b^3-2/3*x*cos(b*x+
a)/b^2+2/3*sin(b*x+a)/b^3-1/3*a^2*sin(b*x+a)/b^3+1/3*a*x*sin(b*x+a)/b^2-1/3
*x^2*sin(b*x+a)/b
```

Rubi [A]
time = 0.20, antiderivative size = 118, normalized size of antiderivative = 1.00, number of steps used = 10, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}}=0.600$, Rules used = {6639, 6874, 2717, 3377, 2718, 3383}

$$\frac{a^3\text{CosIntegral}(a+bx)}{3b^3}-\frac{a^2\sin(a+bx)}{3b^3}+\frac{2\sin(a+bx)}{3b^3}+\frac{a\cos(a+bx)}{3b^3}+\frac{ax\sin(a+bx)}{3b^2}-\frac{2x\cos(a+bx)}{3b^2}+\frac{1}{3}x^3\text{CosIntegral}(a+bx)-\frac{x^2\sin(a+bx)}{3b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[a + b*x],x]
```

```
[Out] (a*Cos[a + b*x])/(3*b^3) - (2*x*Cos[a + b*x])/(3*b^2) + (a^3*CosIntegral[a
+ b*x])/(3*b^3) + (x^3*CosIntegral[a + b*x])/3 + (2*Sin[a + b*x])/(3*b^3) -
 (a^2*Sin[a + b*x])/(3*b^3) + (a*x*Sin[a + b*x])/(3*b^2) - (x^2*Sin[a + b*x
])/(3*b)
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 6639

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}\int x^2\text{Ci}(a+bx)\,dx &= \frac{1}{3}x^3\text{Ci}(a+bx)-\frac{1}{3}b\int\frac{x^3\cos(a+bx)}{a+bx}\,dx\\ &= \frac{1}{3}x^3\text{Ci}(a+bx)-\frac{1}{3}b\int\left(\frac{a^2\cos(a+bx)}{b^3}-\frac{ax\cos(a+bx)}{b^2}+\frac{x^2\cos(a+bx)}{b}-\frac{a^3\cos(\right.\\ &\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad b^3(a\\ &= \frac{1}{3}x^3\text{Ci}(a+bx)-\frac{1}{3}\int x^2\cos(a+bx)\,dx-\frac{a^2\int\cos(a+bx)\,dx}{3b^2}+\frac{a^3\int\frac{\cos(a+bx)}{a+bx}\,dx}{3b^2}+\frac{a}{}\\ &= \frac{a^3\text{Ci}(a+bx)}{3b^3}+\frac{1}{3}x^3\text{Ci}(a+bx)-\frac{a^2\sin(a+bx)}{3b^3}+\frac{ax\sin(a+bx)}{3b^2}-\frac{x^2\sin(a+bx)}{3b}-\\ &= \frac{a\cos(a+bx)}{3b^3}-\frac{2x\cos(a+bx)}{3b^2}+\frac{a^3\text{Ci}(a+bx)}{3b^3}+\frac{1}{3}x^3\text{Ci}(a+bx)-\frac{a^2\sin(a+bx)}{3b^3}+\\ &= \frac{a\cos(a+bx)}{3b^3}-\frac{2x\cos(a+bx)}{3b^2}+\frac{a^3\text{Ci}(a+bx)}{3b^3}+\frac{1}{3}x^3\text{Ci}(a+bx)+\frac{2\sin(a+bx)}{3b^3}-\frac{a}{}\end{aligned}$$

Mathematica [A]
time = 0.11, size = 64, normalized size = 0.54

$$\frac{(a-2bx)\cos(a+bx)+(a^3+b^3x^3)\,\text{CosIntegral}(a+bx)-(-2+a^2-abx+b^2x^2)\sin(a+bx)}{3b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[a + b*x],x]
```

```
[Out] ((a - 2*b*x)*Cos[a + b*x] + (a^3 + b^3*x^3)*CosIntegral[a + b*x] - (-2 + a^
2 - a*b*x + b^2*x^2)*Sin[a + b*x])/(3*b^3)
```

Maple [A]
time = 0.25, size = 99, normalized size = 0.84

method	result
derivativedivides	$\frac{\frac{\text{cosineIntegral}(bx+a)b^3x^3}{3}+\frac{a^3\,\text{cosineIntegral}(bx+a)}{3}-a^2\sin(bx+a)+a(\cos(bx+a)+(bx+a)\sin(bx+a))-\frac{(bx+a)^2\sin(bx+a)}{3}+ \cdots}{b^3}$
default	$\frac{\frac{\text{cosineIntegral}(bx+a)b^3x^3}{3}+\frac{a^3\,\text{cosineIntegral}(bx+a)}{3}-a^2\sin(bx+a)+a(\cos(bx+a)+(bx+a)\sin(bx+a))-\frac{(bx+a)^2\sin(bx+a)}{3}+ \cdots}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(1/3*Ci(b*x+a)*b^3*x^3+1/3*a^3*Ci(b*x+a)-a^2*sin(b*x+a)+a*(cos(b*x+a)
+(b*x+a)*sin(b*x+a))-1/3*(b*x+a)^2*sin(b*x+a)+2/3*sin(b*x+a)-2/3*(b*x+a)*co
s(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.91, size = 423, normalized size = 3.58

$$\frac{1}{3}x^3\,\mathrm{C}(bx+a)-\frac{\left(12\left(-i\pi e^{\left(\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)}+i\pi e^{\left(-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)}\right)a^3+4\left(3\left(-i\pi e^{\left(\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)}+i\pi e^{\left(-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)}\right)a^2+2\Gamma\left(2,\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)+2\Gamma\left(2,-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)bx+8a\left(\Gamma\left(2,\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)+\Gamma\left(2,-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)+\sqrt{2\pi b^2x^2+4\pi abx+2\pi a^2}\left(\left((i-1)\sqrt{2}\pi^{\frac{3}{2}}\left(\mathrm{erf}\left(\sqrt{\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2}\right)-1\right)-(i+1)\sqrt{2}\pi^{\frac{3}{2}}\left(\mathrm{erf}\left(\sqrt{-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2}\right)-1\right)\right)a^3+6\left(-(i+1)\sqrt{2}\,\Gamma\left(\frac{3}{2},\frac{1}{2}i\pi b^2x^2+i\pi abx+\frac{1}{2}i\pi a^2\right)+(i-1)\sqrt{2}\,\Gamma\left(\frac{3}{2},-\frac{1}{2}i\pi b^2x^2-i\pi abx-\frac{1}{2}i\pi a^2\right)\right)a\right)\right)b}{24\left(\pi^2b^5x+\pi^2ab^4\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a),x, algorithm="maxima")
```

```
[Out] 1/3*x^3*fresnel_cos(b*x + a) - 1/24*(12*(-I*pi*e^(1/2*I*pi*b^2*x^2 + I*pi*a
*b*x + 1/2*I*pi*a^2) + I*pi*e^(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^
2))*a^3 + 4*(3*(-I*pi*e^(1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + I*
pi*e^(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2))*a^2 + 2*gamma(2, 1/2*
I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + 2*gamma(2, -1/2*I*pi*b^2*x^2 -
I*pi*a*b*x - 1/2*I*pi*a^2))*b*x + 8*a*(gamma(2, 1/2*I*pi*b^2*x^2 + I*pi*a*b
*x + 1/2*I*pi*a^2) + gamma(2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2
)) + sqrt(2*pi*b^2*x^2 + 4*pi*a*b*x + 2*pi*a^2)*(((I - 1)*sqrt(2)*pi^(3/2)*
(erf(sqrt(1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2)) - 1) - (I + 1)*sqr
t(2)*pi^(3/2)*(erf(sqrt(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2)) - 1
))*a^3 + 6*(-(I + 1)*sqrt(2)*gamma(3/2, 1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2
*I*pi*a^2) + (I - 1)*sqrt(2)*gamma(3/2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/
2*I*pi*a^2))*a))*b/(pi^2*b^5*x + pi^2*a*b^4)
```

Fricas [A]
time = 0.36, size = 148, normalized size = 1.25

$$\frac{\pi^2b^4x^3\,\mathrm{C}(bx+a)+\pi^2a^3\sqrt{b^2}\,\mathrm{C}\left(\frac{\sqrt{b^2}(bx+a)}{b}\right)-3\pi a\sqrt{b^2}\,\mathrm{S}\left(\frac{\sqrt{b^2}(bx+a)}{b}\right)-2b\cos\left(\frac{1}{2}\pi b^2x^2+\pi abx+\frac{1}{2}\pi a^2\right)-\left(\pi b^3x^2-\pi ab^2x+\pi a^2b\right)\sin\left(\frac{1}{2}\pi b^2x^2+\pi abx+\frac{1}{2}\pi a^2\right)}{3\pi^2b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/3*(pi^2*b^4*x^3*fresnel_cos(b*x + a) + pi^2*a^3*sqrt(b^2)*fresnel_cos(sqr
t(b^2)*(b*x + a)/b) - 3*pi*a*sqrt(b^2)*fresnel_sin(sqrt(b^2)*(b*x + a)/b) -
```

```
2*b*cos(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2) - (pi*b^3*x^2 - pi*a*b^2*x
+ pi*a^2*b)*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2))/(pi^2*b^4)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2 \operatorname{Ci}(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x+a),x)
```

```
[Out] Integral(x**2*Ci(a + b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x^2*fresnel_cos(b*x + a), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{cosint}(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(a + b*x),x)
```

```
[Out] int(x^2*cosint(a + b*x), x)
```

3.88 $\int x\text{CosIntegral}(a + bx)\,dx$

Optimal. Leaf size=71

$$-\frac{\cos(a+bx)}{2b^2}-\frac{a^2\text{CosIntegral}(a+bx)}{2b^2}+\frac{1}{2}x^2\text{CosIntegral}(a+bx)+\frac{a\sin(a+bx)}{2b^2}-\frac{x\sin(a+bx)}{2b}$$

```
[Out] -1/2*a^2*Ci(b*x+a)/b^2+1/2*x^2*Ci(b*x+a)-1/2*cos(b*x+a)/b^2+1/2*a*sin(b*x+a
)/b^2-1/2*x*sin(b*x+a)/b
```

Rubi [A]
time = 0.15, antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {6639, 6874, 2717, 3377, 2718, 3383}

$$-\frac{a^2\text{CosIntegral}(a+bx)}{2b^2}+\frac{a\sin(a+bx)}{2b^2}-\frac{\cos(a+bx)}{2b^2}+\frac{1}{2}x^2\text{CosIntegral}(a+bx)-\frac{x\sin(a+bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[a + b*x],x]
```

```
[Out] -1/2*Cos[a + b*x]/b^2 - (a^2*CosIntegral[a + b*x])/(2*b^2) + (x^2*CosIntegr
al[a + b*x])/2 + (a*Sin[a + b*x])/(2*b^2) - (x*Sin[a + b*x])/(2*b)
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 6639

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x\text{Ci}(a+bx)\,dx &= \frac{1}{2}x^2\text{Ci}(a+bx)-\frac{1}{2}b\int\frac{x^2\cos(a+bx)}{a+bx}\,dx\\
&= \frac{1}{2}x^2\text{Ci}(a+bx)-\frac{1}{2}b\int\left(-\frac{a\cos(a+bx)}{b^2}+\frac{x\cos(a+bx)}{b}+\frac{a^2\cos(a+bx)}{b^2(a+bx)}\right)dx\\
&= \frac{1}{2}x^2\text{Ci}(a+bx)-\frac{1}{2}\int x\cos(a+bx)\,dx+\frac{a\int\cos(a+bx)\,dx}{2b}-\frac{a^2\int\frac{\cos(a+bx)}{a+bx}\,dx}{2b}\\
&= -\frac{a^2\text{Ci}(a+bx)}{2b^2}+\frac{1}{2}x^2\text{Ci}(a+bx)+\frac{a\sin(a+bx)}{2b^2}-\frac{x\sin(a+bx)}{2b}+\frac{\int\sin(a+bx)\,dx}{2b}\\
&= -\frac{\cos(a+bx)}{2b^2}-\frac{a^2\text{Ci}(a+bx)}{2b^2}+\frac{1}{2}x^2\text{Ci}(a+bx)+\frac{a\sin(a+bx)}{2b^2}-\frac{x\sin(a+bx)}{2b}
\end{aligned}$$

Mathematica [A]
time = 0.08, size = 49, normalized size = 0.69

$$\frac{-\cos(a+bx)+(-a^2+b^2x^2)\,\text{CosIntegral}(a+bx)+(a-bx)\sin(a+bx)}{2b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[a + b*x],x]
```

```
[Out] (-Cos[a + b*x] + (-a^2 + b^2*x^2)*CosIntegral[a + b*x] + (a - b*x)*Sin[a +
b*x])/(2*b^2)
```

Maple [A]
time = 0.28, size = 60, normalized size = 0.85

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)+a\sin(bx+a)-\frac{\cos(bx+a)}{2}-\frac{(bx+a)\sin(bx+a)}{2}}{b^2}$	60

default	$\frac{\text{cosineIntegral}(bx+a)\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)+a\sin(bx+a)-\frac{\cos(bx+a)}{2}-\frac{(bx+a)\sin(bx+a)}{2}}{b^2}$	60

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x+a)*(-a*(b*x+a)+1/2*(b*x+a)^2)+a*sin(b*x+a)-1/2*cos(b*x+a)-1/2
*(b*x+a)*sin(b*x+a))
```

Maxima [C] Result contains complex when optimal does not.
time = 0.86, size = 311, normalized size = 4.38

$$\frac{1}{2}x^2\,\mathrm{C}\,(bx+a)+\frac{\left(8\left(-i\,\pi e^{\left(\frac{1}{2}i\,\pi b^2x^2+i\,\pi abx+\frac{1}{2}i\,\pi a^2\right)}+i\,\pi e^{\left(-\frac{1}{2}i\,\pi b^2x^2-i\,\pi abx-\frac{1}{2}i\,\pi a^2\right)}\right)abx+8\left(-i\,\pi e^{\left(\frac{1}{2}i\,\pi b^2x^2+i\,\pi abx+\frac{1}{2}i\,\pi a^2\right)}+i\,\pi e^{\left(-\frac{1}{2}i\,\pi b^2x^2-i\,\pi abx-\frac{1}{2}i\,\pi a^2\right)}\right)a^2-\sqrt{2\,\pi b^2x^2+4\,\pi abx+2\,\pi a^2}\left(\left(-(i-1)\,\sqrt{2}\,\pi^{\frac{3}{2}}\left(\operatorname{erf}\left(\sqrt{\frac{1}{2}i\,\pi b^2x^2+i\,\pi abx+\frac{1}{2}i\,\pi a^2}\right)-1\right)+(i+1)\,\sqrt{2}\,\pi^{\frac{3}{2}}\left(\operatorname{erf}\left(\sqrt{-\frac{1}{2}i\,\pi b^2x^2-i\,\pi abx-\frac{1}{2}i\,\pi a^2}\right)-1\right)\right)a^2+(2i+2)\,\sqrt{2}\,\Gamma\left(\frac{3}{2},\frac{1}{2}i\,\pi b^2x^2+i\,\pi abx+\frac{1}{2}i\,\pi a^2\right)-(2i-2)\,\sqrt{2}\,\Gamma\left(\frac{3}{2},-\frac{1}{2}i\,\pi b^2x^2-i\,\pi abx-\frac{1}{2}i\,\pi a^2\right)\right)\right)b}{16\left(\pi^2b^4x+\pi^2ab^3\right)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*x^2*fresnel_cos(b*x + a) + 1/16*(8*(-I*pi*e^(1/2*I*pi*b^2*x^2 + I*pi*a*
b*x + 1/2*I*pi*a^2) + I*pi*e^(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2
))*a*b*x + 8*(-I*pi*e^(1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) + I*pi
*e^(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2))*a^2 - sqrt(2*pi*b^2*x^2
 + 4*pi*a*b*x + 2*pi*a^2)*((-(I - 1)*sqrt(2)*pi^(3/2)*(erf(sqrt(1/2*I*pi*b^
2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2)) - 1) + (I + 1)*sqrt(2)*pi^(3/2)*(erf(sq
rt(-1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2)) - 1))*a^2 + (2*I + 2)*sq
rt(2)*gamma(3/2, 1/2*I*pi*b^2*x^2 + I*pi*a*b*x + 1/2*I*pi*a^2) - (2*I - 2)*
sqrt(2)*gamma(3/2, -1/2*I*pi*b^2*x^2 - I*pi*a*b*x - 1/2*I*pi*a^2)))*b/(pi^2
*b^4*x + pi^2*a*b^3)
```

Fricas [A]
time = 0.37, size = 104, normalized size = 1.46

$$\frac{\pi b^3x^2\,\mathrm{C}\,(bx+a)-\pi a^2\sqrt{b^2}\,\mathrm{C}\left(\frac{\sqrt{b^2}\,(bx+a)}{b}\right)-(b^2x-ab)\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)+\sqrt{b^2}\,\mathrm{S}\left(\frac{\sqrt{b^2}\,(bx+a)}{b}\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*(pi*b^3*x^2*fresnel_cos(b*x + a) - pi*a^2*sqrt(b^2)*fresnel_cos(sqrt(b^
2)*(b*x + a)/b) - (b^2*x - a*b)*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2)
 + sqrt(b^2)*fresnel_sin(sqrt(b^2)*(b*x + a)/b))/(pi*b^3)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Ci}\,(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Integral(x*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x*fresnel_cos(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\frac{x^2\,\mathrm{cosint}(a+b\,x)}{2}-\frac{\cos\left(a+b\,x\right)-a\,\sin\left(a+b\,x\right)+a^2\,\mathrm{cosint}(a+b\,x)+b\,x\,\sin\left(a+b\,x\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(a + b*x),x)
```

```
[Out] (x^2*cosint(a + b*x))/2 - (cos(a + b*x) - a*sin(a + b*x) + a^2*cosint(a + b
*x) + b*x*sin(a + b*x))/(2*b^2)
```

3.89 $\int \text{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=27

$$\frac{(a+bx)\text{CosIntegral}(a+bx)}{b}-\frac{\sin(a+bx)}{b}$$

```
[Out] (b*x+a)*Ci(b*x+a)/b-sin(b*x+a)/b
```

Rubi [A]
time = 0.00, antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 6, $\frac{\text{number of rules}}{\text{integrand size}}=0.167$, Rules used = $\{6635\}$

$$\frac{(a+bx)\text{CosIntegral}(a+bx)}{b}-\frac{\sin(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[a + b*x],x]
```

```
[Out] ((a + b*x)*CosIntegral[a + b*x])/b - Sin[a + b*x]/b
```

Rule 6635

```
Int[CosIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(CosIntegr
al[a + b*x]/b), x] - Simp[Sin[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\int \text{Ci}(a+bx)\,dx=\frac{(a+bx)\text{Ci}(a+bx)}{b}-\frac{\sin(a+bx)}{b}$$

Mathematica [A]
time = 0.03, size = 42, normalized size = 1.56

$$\frac{a\text{CosIntegral}(a+bx)}{b}+x\text{CosIntegral}(a+bx)-\frac{\cos(bx)\sin(a)}{b}-\frac{\cos(a)\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[a + b*x],x]
```

```
[Out] (a*CosIntegral[a + b*x])/b + x*CosIntegral[a + b*x] - (Cos[b*x]*Sin[a])/b -
 (Cos[a]*Sin[b*x])/b
```

Maple [A]
time = 0.12, size = 26, normalized size = 0.96

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)(bx+a)-\sin(bx+a)}{b}$	26
default	$\frac{\text{cosineIntegral}(bx+a)(bx+a)-\sin(bx+a)}{b}$	26

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b*(Ci(b*x+a)*(b*x+a)-sin(b*x+a))
```

Maxima [A]
time = 0.26, size = 44, normalized size = 1.63

$$\frac{(bx+a)\,\mathrm{C}\,(bx+a)-\frac{\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)}{\pi}}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((b*x + a)*fresnel_cos(b*x + a) - sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^
2)/pi)/b
```

Fricas [A]
time = 0.35, size = 47, normalized size = 1.74

$$\frac{(\pi bx+\pi a)\,\mathrm{C}\,(bx+a)-\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)}{\pi b}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((pi*b*x + pi*a)*fresnel_cos(b*x + a) - sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2
*pi*a^2))/(pi*b)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \mathrm{Ci}\,(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] Integral(Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

$$\text{could not integrate}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.04

$$x\,\mathrm{cosint}(a+b\,x)-\frac{\sin\left(a+b\,x\right)-a\,\mathrm{cosint}(a+b\,x)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x),x)
```

```
[Out] x*cosint(a + b*x) - (sin(a + b*x) - a*cosint(a + b*x))/b
```

3.90 $\int \frac{\text{CosIntegral}(a+bx)}{x}\,dx$

Optimal. Leaf size=13

$$\text{Int}\left(\frac{\text{CosIntegral}(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Ci(b*x+a)/x,x)
```

Rubi [A]
time = 0.01, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[CosIntegral[a + b*x]/x,x]
[Out] Defer[Int][CosIntegral[a + b*x]/x, x]
```

Rubi steps

$$\int \frac{\text{Ci}(a+bx)}{x}\,dx = \int \frac{\text{Ci}(a+bx)}{x}\,dx$$

Mathematica [A]
time = 0.44, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[CosIntegral[a + b*x]/x,x]
[Out] Integrate[CosIntegral[a + b*x]/x, x]
```

Maple [A]
time = 0.21, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx+a\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)/x,x)
```

```
[Out] int(Ci(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)/x,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)/x,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}\left(a + bx\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)/x,x)
```

```
[Out] Integral(Ci(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)/x,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.08

$$\int \frac{\mathrm{cosint}(a+b\,x)}{x} \,d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)/x,x)
[Out] int(cosint(a + b*x)/x, x)
```

3.91 $\int \frac{\text{CosIntegral}(a+bx)}{x^2}\,dx$

Optimal. Leaf size=47

$$\frac{b\cos(a)\text{CosIntegral}(bx)}{a}-\frac{b\text{CosIntegral}(a+bx)}{a}-\frac{\text{CosIntegral}(a+bx)}{x}-\frac{b\sin(a)\text{Si}(bx)}{a}$$

```
[Out] -b*Ci(b*x+a)/a-Ci(b*x+a)/x+b*Ci(b*x)*cos(a)/a-b*Si(b*x)*sin(a)/a
```

Rubi [A]
time = 0.16, antiderivative size = 47, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {6639, 6874, 3384, 3380, 3383}

$$-\frac{b\text{CosIntegral}(a+bx)}{a}-\frac{\text{CosIntegral}(a+bx)}{x}+\frac{b\cos(a)\text{CosIntegral}(bx)}{a}-\frac{b\sin(a)\text{Si}(bx)}{a}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[a + b*x]/x^2,x]
```

```
[Out] (b*Cos[a]*CosIntegral[b*x])/a - (b*CosIntegral[a + b*x])/a - CosIntegral[a
+ b*x]/x - (b*Sin[a]*SinIntegral[b*x])/a
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 6639

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :
> Simp[(c + d*x)^(m + 1)*(CosIntegral[a + b*x]/(d*(m + 1))), x] - Dist[b/(d
*(m + 1)), Int[(c + d*x)^(m + 1)*(Cos[a + b*x]/(a + b*x)), x], x] /; FreeQ[
```

```
{a, b, c, d, m}, x] && NeQ[m, -1]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int \frac{\text{Ci}(a+bx)}{x^2}\,dx &= -\frac{\text{Ci}(a+bx)}{x}+b\int \frac{\cos(a+bx)}{x(a+bx)}\,dx\\
&= -\frac{\text{Ci}(a+bx)}{x}+b\int \left(\frac{\cos(a+bx)}{ax}-\frac{b\cos(a+bx)}{a(a+bx)}\right)dx\\
&= -\frac{\text{Ci}(a+bx)}{x}+\frac{b\int \frac{\cos(a+bx)}{x}\,dx}{a}-\frac{b^2\int \frac{\cos(a+bx)}{a+bx}\,dx}{a}\\
&= -\frac{b\text{Ci}(a+bx)}{a}-\frac{\text{Ci}(a+bx)}{x}+\frac{(b\cos(a))\int \frac{\cos(bx)}{x}\,dx}{a}-\frac{(b\sin(a))\int \frac{\sin(bx)}{x}\,dx}{a}\\
&= \frac{b\cos(a)\text{Ci}(bx)}{a}-\frac{b\text{Ci}(a+bx)}{a}-\frac{\text{Ci}(a+bx)}{x}-\frac{b\sin(a)\text{Si}(bx)}{a}
\end{aligned}$$

Mathematica [A]
time = 0.05, size = 40, normalized size = 0.85

$$\frac{bx\cos(a)\text{CosIntegral}(bx)-(a+bx)\text{CosIntegral}(a+bx)-bx\sin(a)\text{Si}(bx)}{ax}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[a + b*x]/x^2,x]
[Out] (b*x*Cos[a]*CosIntegral[b*x] - (a + b*x)*CosIntegral[a + b*x] - b*x*Sin[a]*
SinIntegral[b*x])/(a*x)
```

Maple [A]
time = 0.28, size = 49, normalized size = 1.04

method	result	size
derivativedivides	$b\left(-\frac{\text{cosineIntegral}(bx+a)}{bx}+\frac{-\text{sinIntegral}(bx)\sin(a)+\text{cosineIntegral}(bx)\cos(a)}{a}-\frac{\text{cosineIntegral}(bx+a)}{a}\right)$	49
default	$b\left(-\frac{\text{cosineIntegral}(bx+a)}{bx}+\frac{-\text{sinIntegral}(bx)\sin(a)+\text{cosineIntegral}(bx)\cos(a)}{a}-\frac{\text{cosineIntegral}(bx+a)}{a}\right)$	49

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)/x^2,x,method=_RETURNVERBOSE)
```

```
[Out] b*(-Ci(b*x+a)/b/x+1/a*(-Si(b*x)*sin(a)+Ci(b*x)*cos(a))-1/a*Ci(b*x+a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)/x^2, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(fresnel_cos(b*x + a)/x^2, x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Ci}\left(a+bx\right)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)/x**2,x)
```

```
[Out] Integral(Ci(a + b*x)/x**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)/x^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{cosint}(a+b\,x)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)/x^2,x)
```

```
[Out] int(cosint(a + b*x)/x^2, x)
```

3.92 $\int \frac{\text{CosIntegral}(a+bx)}{x^3}\,dx$

Optimal. Leaf size=111

$$-\frac{b\cos(a+bx)}{2ax}-\frac{b^2\cos(a)\text{CosIntegral}(bx)}{2a^2}+\frac{b^2\text{CosIntegral}(a+bx)}{2a^2}-\frac{\text{CosIntegral}(a+bx)}{2x^2}-\frac{b^2\text{CosIntegral}(bx)}{2a}$$

```
[Out] 1/2*b^2*Ci(b*x+a)/a^2-1/2*Ci(b*x+a)/x^2-1/2*b^2*Ci(b*x)*cos(a)/a^2-1/2*b*co
s(b*x+a)/a/x-1/2*b^2*cos(a)*Si(b*x)/a-1/2*b^2*Ci(b*x)*sin(a)/a+1/2*b^2*Si(b
*x)*sin(a)/a^2
```

Rubi [A]
time = 0.26, antiderivative size = 111, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 6, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {6639, 6874, 3378, 3384, 3380, 3383}

$$\frac{b^2\text{CosIntegral}(a+bx)}{2a^2}-\frac{b^2\cos(a)\text{CosIntegral}(bx)}{2a^2}+\frac{b^2\sin(a)\text{Si}(bx)}{2a^2}-\frac{b^2\sin(a)\text{CosIntegral}(bx)}{2a}-\frac{b^2\cos(a)\text{Si}(bx)}{2a}-\frac{\text{CosIntegral}(a+bx)}{2x^2}-\frac{b\cos(a+bx)}{2ax}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[a + b*x]/x^3,x]
```

```
[Out] -1/2*(b*Cos[a + b*x])/(a*x) - (b^2*Cos[a]*CosIntegral[b*x])/(2*a^2) + (b^2*
CosIntegral[a + b*x])/(2*a^2) - CosIntegral[a + b*x]/(2*x^2) - (b^2*CosInte
gral[b*x]*Sin[a])/(2*a) - (b^2*Cos[a]*SinIntegral[b*x])/(2*a) + (b^2*Sin[a]
*SinIntegral[b*x])/(2*a^2)
```

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 6639

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

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int \frac{\text{Ci}(a+bx)}{x^3}\,dx &= -\frac{\text{Ci}(a+bx)}{2x^2}+\frac{1}{2}b\int \frac{\cos(a+bx)}{x^2(a+bx)}\,dx\\
&= -\frac{\text{Ci}(a+bx)}{2x^2}+\frac{1}{2}b\int \left(\frac{\cos(a+bx)}{ax^2}-\frac{b\cos(a+bx)}{a^2x}+\frac{b^2\cos(a+bx)}{a^2(a+bx)}\right)dx\\
&= -\frac{\text{Ci}(a+bx)}{2x^2}+\frac{b\int \frac{\cos(a+bx)}{x^2}\,dx}{2a}-\frac{b^2\int \frac{\cos(a+bx)}{x}\,dx}{2a^2}+\frac{b^3\int \frac{\cos(a+bx)}{a+bx}\,dx}{2a^2}\\
&= -\frac{b\cos(a+bx)}{2ax}+\frac{b^2\text{Ci}(a+bx)}{2a^2}-\frac{\text{Ci}(a+bx)}{2x^2}-\frac{b^2\int \frac{\sin(a+bx)}{x}\,dx}{2a}-\frac{(b^2\cos(a))\int \frac{\cos(bx)}{x}\,d}{2a^2}\\
&= -\frac{b\cos(a+bx)}{2ax}-\frac{b^2\cos(a)\text{Ci}(bx)}{2a^2}+\frac{b^2\text{Ci}(a+bx)}{2a^2}-\frac{\text{Ci}(a+bx)}{2x^2}+\frac{b^2\sin(a)\text{Si}(bx)}{2a^2}-\frac{(b}{}\\
&= -\frac{b\cos(a+bx)}{2ax}-\frac{b^2\cos(a)\text{Ci}(bx)}{2a^2}+\frac{b^2\text{Ci}(a+bx)}{2a^2}-\frac{\text{Ci}(a+bx)}{2x^2}-\frac{b^2\text{Ci}(bx)\sin(a)}{2a}-\frac{b^2}{}
\end{aligned}$$

Mathematica [A]
time = 0.30, size = 76, normalized size = 0.68

$$-\frac{(a^2-b^2x^2)\,\text{CosIntegral}(a+bx)+b^2x^2\text{CosIntegral}(bx)(\cos(a)+a\sin(a))+bx(a\cos(a+bx)+bx(a\cos(a)-\sin(a))\text{Si}(bx))}{2a^2x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[a + b*x]/x^3,x]
```

[Out] -1/2*((a^2 - b^2*x^2)*CosIntegral[a + b*x] + b^2*x^2*CosIntegral[b*x]*(Cos[a] + a*Sin[a]) + b*x*(a*Cos[a + b*x] + b*x*(a*Cos[a] - Sin[a])*SinIntegral[b*x]))/(a^2*x^2)

Maple [A]
time = 0.27, size = 88, normalized size = 0.79

method	result
derivativedivides	$b^2\left(-\frac{\text{cosineIntegral}(bx+a)}{2b^2x^2}-\frac{-\text{sinIntegral}(bx)\sin(a)+\text{cosineIntegral}(bx)\cos(a)}{2a^2}+\frac{-\frac{\cos(bx+a)}{bx}-\text{sinIntegral}(bx)\cos}{2a}\right.$
default	$b^2\left(-\frac{\text{cosineIntegral}(bx+a)}{2b^2x^2}-\frac{-\text{sinIntegral}(bx)\sin(a)+\text{cosineIntegral}(bx)\cos(a)}{2a^2}+\frac{-\frac{\cos(bx+a)}{bx}-\text{sinIntegral}(bx)\cos}{2a}\right.$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(Ci(b*x+a)/x^3,x,method=_RETURNVERBOSE)

[Out] b^2*(-1/2*Ci(b*x+a)/b^2/x^2-1/2/a^2*(-Si(b*x)*sin(a)+Ci(b*x)*cos(a))+1/2/a*(-cos(b*x+a)/b/x-Si(b*x)*cos(a)-Ci(b*x)*sin(a))+1/2/a^2*Ci(b*x+a))

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(fresnel_cos(b*x+a)/x^3,x, algorithm="maxima")

[Out] integrate(fresnel_cos(b*x + a)/x^3, x)

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(fresnel_cos(b*x+a)/x^3,x, algorithm="fricas")

[Out] integral(fresnel_cos(b*x + a)/x^3, x)

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}(a+bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)/x**3,x)
```

```
[Out] Integral(Ci(a + b*x)/x**3, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)/x^3, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{cosint}(a+b\,x)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)/x^3,x)
```

```
[Out] int(cosint(a + b*x)/x^3, x)
```

3.93 $\int x^m \text{CosIntegral}(a+bx)^2\,dx$

Optimal. Leaf size=15

$$\text{Int}\left(x^m\text{CosIntegral}(a+bx)^2,x\right)$$

```
[Out] CannotIntegrate(x^m*Ci(b*x+a)^2,x)
```

Rubi [A]
time = 0.03, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int x^m\text{CosIntegral}(a+bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Int[x^m*CosIntegral[a + b*x]^2,x]
[Out] Defer[Int][x^m*CosIntegral[a + b*x]^2, x]
```

Rubi steps

$$\int x^m\text{Ci}(a+bx)^2\,dx = \int x^m\text{Ci}(a+bx)^2\,dx$$

Mathematica [A]
time = 5.19, size = 0, normalized size = 0.00

$$\int x^m\text{CosIntegral}(a+bx)^2\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[x^m*CosIntegral[a + b*x]^2,x]
[Out] Integrate[x^m*CosIntegral[a + b*x]^2, x]
```

Maple [A]
time = 0.09, size = 0, normalized size = 0.00

$$\int x^m\,\text{cosineIntegral}\left(bx+a\right)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*Ci(b*x+a)^2,x)
```

```
[Out] int(x^m*Ci(b*x+a)^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x+a)^2,x, algorithm="maxima")
[Out] integrate(x^m*fresnel_cos(b*x + a)^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x+a)^2,x, algorithm="fricas")
[Out] integral(x^m*fresnel_cos(b*x + a)^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^m \operatorname{Ci}^2(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**m*Ci(b*x+a)**2,x)
[Out] Integral(x**m*Ci(a + b*x)**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^m*fresnel_cos(b*x+a)^2,x, algorithm="giac")
[Out] integrate(x^m*fresnel_cos(b*x + a)^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int x^m \operatorname{cosint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^m*cosint(a + b*x)^2,x)
[Out] int(x^m*cosint(a + b*x)^2, x)
```

3.94 $\int x^2 \textbf{CosIntegral}(a+bx)^2\,dx$

Optimal. Leaf size=329

$$\frac{2x}{3b^2}+\frac{a\cos(2a+2bx)}{3b^3}-\frac{x\cos(2a+2bx)}{6b^2}+\frac{2a\cos(a+bx)\text{CosIntegral}(a+bx)}{3b^3}-\frac{4x\cos(a+bx)\text{CosIntegral}(a+$$

```
[Out] 2/3*x/b^2+1/3*a^2*(b*x+a)*Ci(b*x+a)^2/b^3-1/3*a*x*(b*x+a)*Ci(b*x+a)^2/b^2+1
/3*x^2*(b*x+a)*Ci(b*x+a)^2/b-a*Ci(2*b*x+2*a)/b^3+2/3*a*Ci(b*x+a)*cos(b*x+a)
/b^3-4/3*x*Ci(b*x+a)*cos(b*x+a)/b^2+1/3*a*cos(2*b*x+2*a)/b^3-1/6*x*cos(2*b*
x+2*a)/b^2-a*ln(b*x+a)/b^3-2/3*Si(2*b*x+2*a)/b^3+a^2*Si(2*b*x+2*a)/b^3+4/3*
Ci(b*x+a)*sin(b*x+a)/b^3-2/3*a^2*Ci(b*x+a)*sin(b*x+a)/b^3+2/3*a*x*Ci(b*x+a)
*sin(b*x+a)/b^2-2/3*x^2*Ci(b*x+a)*sin(b*x+a)/b+2/3*cos(b*x+a)*sin(b*x+a)/b^
3+1/12*sin(2*b*x+2*a)/b^3
```

Rubi [A]
time = 1.01, antiderivative size = 329, normalized size of antiderivative = 1.00, number of steps used = 39, number of rules used = 19, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 1.583$, Rules used = {6645, 6649, 4669, 6873, 6874, 2718, 3377, 2717, 3380, 6655, 2715, 8, 3393, 3383, 6647, 4491, 12, 6653, 6641}

$$\frac{a^2(a+bx)\text{CosIntegral}(a+bx)^2}{3b^3}-\frac{2a^2\text{CosIntegral}(a+bx)\sin(a+bx)}{3b^3}+\frac{a^2\text{Si}(2a+2bx)}{b^3}-\frac{a\text{CosIntegral}(2a+2bx)}{b^3}+\frac{4\text{CosIntegral}(a+bx)\sin(a+bx)}{3b^3}+\frac{2a\text{CosIntegral}(a+bx)\cos(a+bx)}{3b^3}-\frac{2\text{Si}(2a+2bx)}{3b^3}-\frac{a\log(a+bx)}{b^3}+\frac{\sin(2a+2bx)}{12b^3}+\frac{a\cos(2a+2bx)}{3b^3}+\frac{2\sin(a+bx)\cos(a+bx)}{3b^3}-\frac{ax(a+bx)\text{CosIntegral}(a+bx)^2}{3b^2}+\frac{2ax\text{CosIntegral}(a+bx)\sin(a+bx)}{3b^2}-\frac{4x\text{CosIntegral}(a+bx)\cos(a+bx)}{3b^2}-\frac{x\cos(2a+2bx)}{6b^2}+\frac{x^2(a+bx)\text{CosIntegral}(a+bx)^2}{3b}-\frac{2x^2\text{CosIntegral}(a+bx)\sin(a+bx)}{3b}+\frac{2x}{3b^2}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[a + b*x]^2,x]
```

```
[Out] (2*x)/(3*b^2) + (a*Cos[2*a + 2*b*x])/(3*b^3) - (x*Cos[2*a + 2*b*x])/(6*b^2)
 + (2*a*Cos[a + b*x]*CosIntegral[a + b*x])/(3*b^3) - (4*x*Cos[a + b*x]*CosI
ntegral[a + b*x])/(3*b^2) + (a^2*(a + b*x)*CosIntegral[a + b*x]^2)/(3*b^3)
- (a*x*(a + b*x)*CosIntegral[a + b*x]^2)/(3*b^2) + (x^2*(a + b*x)*CosIntegr
al[a + b*x]^2)/(3*b) - (a*CosIntegral[2*a + 2*b*x])/b^3 - (a*Log[a + b*x])/
b^3 + (2*Cos[a + b*x]*Sin[a + b*x])/(3*b^3) + (4*CosIntegral[a + b*x]*Sin[a
 + b*x])/(3*b^3) - (2*a^2*CosIntegral[a + b*x]*Sin[a + b*x])/(3*b^3) + (2*a
*x*CosIntegral[a + b*x]*Sin[a + b*x])/(3*b^2) - (2*x^2*CosIntegral[a + b*x]
*Sin[a + b*x])/(3*b) + Sin[2*a + 2*b*x]/(12*b^3) - (2*SinIntegral[2*a + 2*b
*x])/(3*b^3) + (a^2*SinIntegral[2*a + 2*b*x])/b^3
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6641

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(CosInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Cos[a + b*x]*CosIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6645

```
Int[CosIntegral[(a_) + (b_.)*(x_)]^2*((c_.) + (d_.)*(x_))^(m_.), x_Symbol]
:> Simp[(a + b*x)*(c + d*x)^m*(CosIntegral[a + b*x]^2/(b*(m + 1))), x] + (-
Dist[2/(m + 1), Int[(c + d*x)^m*Cos[a + b*x]*CosIntegral[a + b*x], x], x] +
 Dist[(b*c - a*d)*(m/(b*(m + 1))), Int[(c + d*x)^(m - 1)*CosIntegral[a + b*
x]^2, x], x]) /; FreeQ[{a, b, c, d}, x] && IGtQ[m, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$
\begin{aligned}
\int x^2\mathrm{Ci}(a+bx)^2\,dx &= \frac{x^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b} - \frac{2}{3}\int x^2\cos(a+bx)\mathrm{Ci}(a+bx)\,dx - \frac{(2a)\int x\mathrm{Ci}(a+bx)^2\,dx}{3b} \\
&= -\frac{ax(a+bx)\mathrm{Ci}(a+bx)^2}{3b^2} + \frac{x^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b} - \frac{2x^2\mathrm{Ci}(a+bx)\sin(a+bx)}{3b} + \frac{2}{3} \\
&= -\frac{4x\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^2} + \frac{a^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b^3} - \frac{ax(a+bx)\mathrm{Ci}(a+bx)^2}{3b^2} + \frac{x^2}{} \\
&= \frac{2a\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^3} - \frac{4x\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^2} + \frac{a^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b^3} - \\
&= \frac{2a\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^3} - \frac{4x\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^2} + \frac{a^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b^3} - \\
&= \frac{2a\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^3} - \frac{4x\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^2} + \frac{a^2(a+bx)\mathrm{Ci}(a+bx)^2}{3b^3} - \\
&= \frac{2x}{3b^2} + \frac{a\cos(2a+2bx)}{6b^3} - \frac{x\cos(2a+2bx)}{6b^2} + \frac{2a\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^3} - \\
&= \frac{2x}{3b^2} + \frac{a\cos(2a+2bx)}{3b^3} - \frac{x\cos(2a+2bx)}{6b^2} + \frac{2a\cos(a+bx)\mathrm{Ci}(a+bx)}{3b^3} -
\end{aligned}
$$

Mathematica [A]
time = 0.83, size = 159, normalized size = 0.48

$$
\frac{8a+8bx+4a\cos(2(a+bx))-2bx\cos(2(a+bx))+4(a^3+b^3x^3)\,\mathrm{CosIntegral}(a+bx)^2-12a\mathrm{CosIntegral}(2(a+bx))-12a\log(a+bx)-8\mathrm{CosIntegral}(a+bx)\left(-((a-2bx)\cos(a+bx))+(-2+a^2-abx+b^2x^2)\sin(a+bx)\right)+5\sin(2(a+bx))-8\mathrm{Si}(2(a+bx))+12a^2\mathrm{Si}(2(a+bx))}{12b^3}
$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[a + b*x]^2,x]
```

```
[Out] (8*a + 8*b*x + 4*a*Cos[2*(a + b*x)] - 2*b*x*Cos[2*(a + b*x)] + 4*(a^3 + b^3
*x^3)*CosIntegral[a + b*x]^2 - 12*a*CosIntegral[2*(a + b*x)] - 12*a*Log[a +
```

```
 b*x] - 8*CosIntegral[a + b*x]*(-((a - 2*b*x)*Cos[a + b*x]) + (-2 + a^2 - a
*b*x + b^2*x^2)*Sin[a + b*x]) + 5*Sin[2*(a + b*x)] - 8*SinIntegral[2*(a + b
*x)] + 12*a^2*SinIntegral[2*(a + b*x)])/(12*b^3)
```

Maple [F]
time = 0.10, size = 0, normalized size = 0.00

$$\int x^{2} \operatorname{cosineIntegral}\left(b x +a \right)^{2} d x$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x+a)^2,x)
[Out] int(x^2*Ci(b*x+a)^2,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)^2,x, algorithm="maxima")
[Out] integrate(x^2*fresnel_cos(b*x + a)^2, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)^2,x, algorithm="fricas")
[Out] integral(x^2*fresnel_cos(b*x + a)^2, x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{2} \operatorname{Ci}^{2}\left(a + b x\right)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x+a)**2,x)
[Out] Integral(x**2*Ci(a + b*x)**2, x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)^2,x, algorithm="giac")
[Out] integrate(x^2*fresnel_cos(b*x + a)^2, x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.00

$$\int x^2 \operatorname{cosint}(a + b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(a + b*x)^2,x)
[Out] int(x^2*cosint(a + b*x)^2, x)
```

3.95 $\int x\textbf{CosIntegral}(a+bx)^2\,dx$

Optimal. Leaf size=155

$$-\frac{\cos(2a+2bx)}{4b^2}-\frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{b^2}-\frac{a(a+bx)\text{CosIntegral}(a+bx)^2}{2b^2}+\frac{x(a+bx)\text{CosIntegral}(a$$

```
[Out] -1/2*a*(b*x+a)*Ci(b*x+a)^2/b^2+1/2*x*(b*x+a)*Ci(b*x+a)^2/b+1/2*Ci(2*b*x+2*a
)/b^2-Ci(b*x+a)*cos(b*x+a)/b^2-1/4*cos(2*b*x+2*a)/b^2+1/2*ln(b*x+a)/b^2-a*S
i(2*b*x+2*a)/b^2+a*Ci(b*x+a)*sin(b*x+a)/b^2-x*Ci(b*x+a)*sin(b*x+a)/b
```

Rubi [A]
time = 0.24, antiderivative size = 155, normalized size of antiderivative = 1.00, number of steps used = 17, number of rules used = 14, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 1.400$, Rules used = {6645, 6649, 4669, 6873, 6874, 2718, 3380, 6653, 3393, 3383, 6641, 6647, 4491, 12}

$$-\frac{a(a+bx)\text{CosIntegral}(a+bx)^2}{2b^2}+\frac{\text{CosIntegral}(2a+2bx)}{2b^2}+\frac{a\text{CosIntegral}(a+bx)\sin(a+bx)}{b^2}-\frac{\text{CosIntegral}(a+bx)\cos(a+bx)}{b^2}-\frac{a\text{Si}(2a+2bx)}{b^2}+\frac{\log(a+bx)}{2b^2}-\frac{\cos(2a+2bx)}{4b^2}+\frac{x(a+bx)\text{CosIntegral}(a+bx)^2}{2b}-\frac{x\text{CosIntegral}(a+bx)\sin(a+bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[a + b*x]^2,x]
```

```
[Out] -1/4*Cos[2*a + 2*b*x]/b^2 - (Cos[a + b*x]*CosIntegral[a + b*x])/b^2 - (a*(a
 + b*x)*CosIntegral[a + b*x]^2)/(2*b^2) + (x*(a + b*x)*CosIntegral[a + b*x]
^2)/(2*b) + CosIntegral[2*a + 2*b*x]/(2*b^2) + Log[a + b*x]/(2*b^2) + (a*Co
sIntegral[a + b*x]*Sin[a + b*x])/b^2 - (x*CosIntegral[a + b*x]*Sin[a + b*x]
)/b - (a*SinIntegral[2*a + 2*b*x])/b^2
```

Rule 12

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

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6641

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(CosInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Cos[a + b*x]*CosIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6645

```
Int[CosIntegral[(a_) + (b_.)*(x_)]^2*((c_.) + (d_.)*(x_))^(m_.), x_Symbol]
:> Simp[(a + b*x)*(c + d*x)^m*(CosIntegral[a + b*x]^2/(b*(m + 1))), x] + (-
Dist[2/(m + 1), Int[(c + d*x)^m*Cos[a + b*x]*CosIntegral[a + b*x], x], x] +
 Dist[(b*c - a*d)*(m/(b*(m + 1))), Int[(c + d*x)^(m - 1)*CosIntegral[a + b*
x]^2, x], x]) /; FreeQ[{a, b, c, d}, x] && IGtQ[m, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
```

```
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\text{Ci}(a+bx)^2\,dx = \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} - \frac{a\int \text{Ci}(a+bx)^2\,dx}{2b} - \int x\cos(a+bx)\text{Ci}(a+bx)\,dx$$
$$= -\frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} - \frac{x\text{Ci}(a+bx)\sin(a+bx)}{b} + \frac{\int \text{Ci}(a+$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} + \frac{a\text{Ci}(a+b$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} + \frac{a\text{Ci}(a+b$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} + \frac{\log(a+bx}{2b^2}$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+bx)^2}{2b} + \frac{\text{Ci}(2a+2}{2b^2}$$
$$= -\frac{\cos(2a+2bx)}{4b^2} - \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{a(a+bx)\text{Ci}(a+bx)^2}{2b^2} + \frac{x(a+bx)\text{Ci}(a+}{2b}$$

Mathematica [A]
time = 0.23, size = 96, normalized size = 0.62

$$-\frac{\cos(2(a+bx)) + 2(a^2-b^2x^2)\,\text{CosIntegral}(a+bx)^2 - 2\text{CosIntegral}(2(a+bx)) - 2\log(a+bx) + 4\text{CosIntegral}(a+bx)(\cos(a+bx) + (-a+bx)\sin(a+bx)) + 4a\text{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[a + b*x]^2,x]
```

```
[Out] -1/4*(Cos[2*(a + b*x)] + 2*(a^2 - b^2*x^2)*CosIntegral[a + b*x]^2 - 2*CosIn
tegral[2*(a + b*x)] - 2*Log[a + b*x] + 4*CosIntegral[a + b*x]*(Cos[a + b*x]
 + (-a + b*x)*Sin[a + b*x]) + 4*a*SinIntegral[2*(a + b*x)])/b^2
```

Maple [A]
time = 0.58, size = 113, normalized size = 0.73

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)^2\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-2\,\text{cosineIntegral}(bx+a)\left(-a\sin(bx+a)+\frac{\cos(bx+a)}{2}+\frac{(bx+a)\sin(bx+a)}{2}\right)-}{b^2}$
default	$\frac{\text{cosineIntegral}(bx+a)^2\left(-a(bx+a)+\frac{(bx+a)^2}{2}\right)-2\,\text{cosineIntegral}(bx+a)\left(-a\sin(bx+a)+\frac{\cos(bx+a)}{2}+\frac{(bx+a)\sin(bx+a)}{2}\right)-}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x+a)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x+a)^2*(-a*(b*x+a)+1/2*(b*x+a)^2)-2*Ci(b*x+a)*(-a*sin(b*x+a)+1/
2*cos(b*x+a)+1/2*(b*x+a)*sin(b*x+a))-a*Si(2*b*x+2*a)+1/2*ln(b*x+a)+1/2*Ci(2
*b*x+2*a)-1/2*cos(b*x+a)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)^2,x, algorithm="maxima")
```

```
[Out] integrate(x*fresnel_cos(b*x + a)^2, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)^2,x, algorithm="fricas")
```

```
[Out] integral(x*fresnel_cos(b*x + a)^2, x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\,\mathrm{Ci}^2\,(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x+a)**2,x)
```

```
[Out] Integral(x*Ci(a + b*x)**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)^2,x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(b*x + a)^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{cosint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(a + b*x)^2,x)
```

```
[Out] int(x*cosint(a + b*x)^2, x)
```

3.96 $\int \text{CosIntegral}(a+bx)^2\,dx$

Optimal. Leaf size=48

$$\frac{(a+bx)\text{CosIntegral}(a+bx)^2}{b}-\frac{2\text{CosIntegral}(a+bx)\sin(a+bx)}{b}+\frac{\text{Si}(2a+2bx)}{b}$$

```
[Out] (b*x+a)*Ci(b*x+a)^2/b+Si(2*b*x+2*a)/b-2*Ci(b*x+a)*sin(b*x+a)/b
```

Rubi [A]
time = 0.05, antiderivative size = 48, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, integrand size = 8, $\frac{\text{number of rules}}{\text{integrand size}}=0.625$, Rules used = {6641, 6647, 4491, 12, 3380}

$$\frac{(a+bx)\text{CosIntegral}(a+bx)^2}{b}-\frac{2\text{CosIntegral}(a+bx)\sin(a+bx)}{b}+\frac{\text{Si}(2a+2bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[a + b*x]^2,x]
```

```
[Out] ((a + b*x)*CosIntegral[a + b*x]^2)/b - (2*CosIntegral[a + b*x]*Sin[a + b*x]
)/b + SinIntegral[2*a + 2*b*x]/b
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6641

```
Int[CosIntegral[(a_.) + (b_.)*(x_)]^2, x_Symbol] :> Simp[(a + b*x)*(CosInte
gral[a + b*x]^2/b), x] - Dist[2, Int[Cos[a + b*x]*CosIntegral[a + b*x], x],
 x] /; FreeQ[{a, b}, x]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int \mathrm{Ci}(a+bx)^2\,dx &= \frac{(a+bx)\mathrm{Ci}(a+bx)^2}{b}-2\int \cos(a+bx)\mathrm{Ci}(a+bx)\,dx\\
&= \frac{(a+bx)\mathrm{Ci}(a+bx)^2}{b}-\frac{2\mathrm{Ci}(a+bx)\sin(a+bx)}{b}+2\int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx\\
&= \frac{(a+bx)\mathrm{Ci}(a+bx)^2}{b}-\frac{2\mathrm{Ci}(a+bx)\sin(a+bx)}{b}+2\int \frac{\sin(2a+2bx)}{2(a+bx)}\,dx\\
&= \frac{(a+bx)\mathrm{Ci}(a+bx)^2}{b}-\frac{2\mathrm{Ci}(a+bx)\sin(a+bx)}{b}+\int \frac{\sin(2a+2bx)}{a+bx}\,dx\\
&= \frac{(a+bx)\mathrm{Ci}(a+bx)^2}{b}-\frac{2\mathrm{Ci}(a+bx)\sin(a+bx)}{b}+\frac{\mathrm{Si}(2a+2bx)}{b}
\end{aligned}
$$

Mathematica [A]
time = 0.01, size = 41, normalized size = 0.85

$$\frac{(a+bx)\mathrm{CosIntegral}(a+bx)^2-2\mathrm{CosIntegral}(a+bx)\sin(a+bx)+\mathrm{Si}(2(a+bx))}{b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[a + b*x]^2,x]
[Out] ((a + b*x)*CosIntegral[a + b*x]^2 - 2*CosIntegral[a + b*x]*Sin[a + b*x] + S
inIntegral[2*(a + b*x)])/b
```

Maple [A]
time = 0.29, size = 43, normalized size = 0.90

method	result	size
derivativedivides	$\frac{\mathrm{cosineIntegral}(bx+a)^2(bx+a)-2\,\mathrm{cosineIntegral}(bx+a)\sin(bx+a)+\mathrm{sinIntegral}(2bx+2a)}{b}$	43
default	$\frac{\mathrm{cosineIntegral}(bx+a)^2(bx+a)-2\,\mathrm{cosineIntegral}(bx+a)\sin(bx+a)+\mathrm{sinIntegral}(2bx+2a)}{b}$	43

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)^2,x,method=_RETURNVERBOSE)
[Out] 1/b*(Ci(b*x+a)^2*(b*x+a)-2*Ci(b*x+a)*sin(b*x+a)+Si(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2,x, algorithm="maxima")
[Out] integrate(fresnel_cos(b*x + a)^2, x)
```

Fricas [A]
time = 0.36, size = 88, normalized size = 1.83

$$\frac{2\left(\pi b^2 x+\pi a b\right) \mathrm{C}\left(b x+a\right)^2-4\, b\, \mathrm{C}\left(b x+a\right) \sin\left(\frac{1}{2}\, \pi b^2 x^2+\pi a b x+\frac{1}{2}\, \pi a^2\right)+\sqrt{2}\, \sqrt{b^2}\, \mathrm{S}\left(\frac{\sqrt{2}\, \sqrt{b^2}\, (b x+a)}{b}\right)}{2\, \pi b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2,x, algorithm="fricas")
[Out] 1/2*(2*(pi*b^2*x + pi*a*b)*fresnel_cos(b*x + a)^2 - 4*b*fresnel_cos(b*x + a
)*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2) + sqrt(2)*sqrt(b^2)*fresnel_s
in(sqrt(2)*sqrt(b^2)*(b*x + a)/b))/(pi*b^2)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \operatorname{Ci}^2\left(a+b x\right) dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)**2,x)
[Out] Integral(Ci(a + b*x)**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2,x, algorithm="giac")
[Out] integrate(fresnel_cos(b*x + a)^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \mathrm{cosint}(a+b\,x)^2\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)^2,x)
```

```
[Out] int(cosint(a + b*x)^2, x)
```

3.97 $\int \frac{\text{CosIntegral}(a+bx)^2}{x} \, dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{CosIntegral}(a+bx)^2}{x},x\right)$$

[Out] CannotIntegrate(Ci(b*x+a)^2/x,x)

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x} \, dx$$

Verification is not applicable to the result.

[In] Int[CosIntegral[a + b*x]^2/x,x]

[Out] Defer[Int][CosIntegral[a + b*x]^2/x, x]

Rubi steps

$$\int \frac{\text{Ci}(a+bx)^2}{x} \, dx = \int \frac{\text{Ci}(a+bx)^2}{x} \, dx$$

Mathematica [A]
time = 0.92, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x} \, dx$$

Verification is not applicable to the result.

[In] Integrate[CosIntegral[a + b*x]^2/x,x]

[Out] Integrate[CosIntegral[a + b*x]^2/x, x]

Maple [A]
time = 0.06, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx+a\right)^2}{x} \, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)^2/x,x)
```

```
[Out] int(Ci(b*x+a)^2/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)^2/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(fresnel_cos(b*x + a)^2/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Ci}^2\left(a+bx\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)**2/x,x)
```

```
[Out] Integral(Ci(a + b*x)**2/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)^2/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{{\mathrm{cosint}\left(a+b\,x\right)}^2}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)^2/x,x)
```

```
[Out] int(cosint(a + b*x)^2/x, x)
```

3.98 $\int \frac{\text{CosIntegral}(a+bx)^2}{x^2} dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{CosIntegral}(a+bx)^2}{x^2},x\right)$$

```
[Out] CannotIntegrate(Ci(b*x+a)^2/x^2,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x^2} dx$$

Verification is not applicable to the result.

```
[In] Int[CosIntegral[a + b*x]^2/x^2,x]
```

```
[Out] Defer[Int][CosIntegral[a + b*x]^2/x^2, x]
```

Rubi steps

$$\int \frac{\text{Ci}(a+bx)^2}{x^2} dx = \int \frac{\text{Ci}(a+bx)^2}{x^2} dx$$

Mathematica [A]
time = 1.51, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x^2} dx$$

Verification is not applicable to the result.

```
[In] Integrate[CosIntegral[a + b*x]^2/x^2,x]
```

```
[Out] Integrate[CosIntegral[a + b*x]^2/x^2, x]
```

Maple [A]
time = 0.11, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx+a\right)^2}{x^2} dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)^2/x^2,x)
```

```
[Out] int(Ci(b*x+a)^2/x^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)^2/x^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(fresnel_cos(b*x + a)^2/x^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Ci}^{2}\left(a+bx\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)**2/x**2,x)
```

```
[Out] Integral(Ci(a + b*x)**2/x**2, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos(b*x + a)^2/x^2, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{{\mathrm{cosint}\left(a+b\,x\right)}^2}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)^2/x^2,x)
[Out] int(cosint(a + b*x)^2/x^2, x)
```

3.99 $\int \frac{\text{CosIntegral}(a+bx)^2}{x^3} \, dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{CosIntegral}(a+bx)^2}{x^3},x\right)$$

```
[Out] CannotIntegrate(Ci(b*x+a)^2/x^3,x)
```

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x^3} \, dx$$

Verification is not applicable to the result.

```
[In] Int[CosIntegral[a + b*x]^2/x^3,x]
```

```
[Out] Defer[Int][CosIntegral[a + b*x]^2/x^3, x]
```

Rubi steps

$$\int \frac{\text{Ci}(a+bx)^2}{x^3} \, dx = \int \frac{\text{Ci}(a+bx)^2}{x^3} \, dx$$

Mathematica [A]
time = 1.81, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(a+bx)^2}{x^3} \, dx$$

Verification is not applicable to the result.

```
[In] Integrate[CosIntegral[a + b*x]^2/x^3,x]
```

```
[Out] Integrate[CosIntegral[a + b*x]^2/x^3, x]
```

Maple [A]
time = 0.12, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx+a\right)^2}{x^3}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)^2/x^3,x)
```

```
[Out] int(Ci(b*x+a)^2/x^3,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2/x^3,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x + a)^2/x^3, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2/x^3,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x + a)^2/x^3, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\mathrm{Ci}^2\left(a+bx\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)**2/x**3,x)
```

```
[Out] Integral(Ci(a + b*x)**2/x**3, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)^2/x^3,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x + a)^2/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{\mathrm{cosint}(a+b\,x)^2}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)^2/x^3,x)
```

```
[Out] int(cosint(a + b*x)^2/x^3, x)
```

3.100 $\int x^2 \textbf{CosIntegral}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=133

$$\frac{1}{3}x^3\mathrm{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{6}e^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}\,\mathrm{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{6}e^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}$$

```
[Out] 1/3*x^3*Ci(d*(a+b*ln(c*x^n)))-1/6*x^3*Ei((3-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/e
xp(3*a/b/n)/((c*x^n)^(3/n))-1/6*x^3*Ei((3+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp
(3*a/b/n)/((c*x^n)^(3/n))
```

Rubi [A]
time = 0.18, antiderivative size = 133, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6662, 12, 4586, 2347, 2209}

$$\frac{1}{3}x^3\mathrm{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{6}x^3e^{-\frac{3a}{bn}}(cx^n)^{-3/n}\,\mathrm{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{6}x^3e^{-\frac{3a}{bn}}(cx^n)^{-3/n}\,\mathrm{Ei}\left(\frac{(ibdn+3)(a+b\log(cx^n))}{bn}\right)$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^3*CosIntegral[d*(a + b*Log[c*x^n])])/3 - (x^3*ExpIntegralEi[((3 - I*b*d*
n)*(a + b*Log[c*x^n]))/(b*n)])/(6*E^((3*a)/(b*n))*(c*x^n)^(3/n)) - (x^3*Exp
IntegralEi[((3 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(6*E^((3*a)/(b*n))*(c
*x^n)^(3/n))
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4586

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.), x_Symbol] :> Dist[((i*x)^
```

```
r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*n)
*(h*(e + f*Log[g*x^m]))^q, x], x] + Dist[E^(I*a*d)*(i*x)^r*((c*x^n)^(I*b*d)
/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x], x]
 /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6662

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*((e_.)*(x_))^(
m_.), x_Symbol] :> Simp[(e*x)^(m + 1)*(CosIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Cos[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$
\begin{aligned}
\int x^2\mathrm{Ci}(d(a+b\log(cx^n)))\,dx &= \frac{1}{3}x^3\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{3}(bdn)\int\frac{x^2\cos(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx\\
&= \frac{1}{3}x^3\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{3}(bn)\int\frac{x^2\cos(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx\\
&= \frac{1}{3}x^3\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{6}\left(be^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int\frac{x^{2-ibdn}}{a+b\log(cx^n)}\,dx\\
&= \frac{1}{3}x^3\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{6}\left(be^{-iad}x^3(cx^n)^{-ibd-\frac{3-ibdn}{n}}\right)\mathrm{Subst}\left(\int\frac{e^{\frac{(3-ibdn}{n}}}{a+b}\right.\\
&= \frac{1}{3}x^3\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{6}e^{-\frac{3a}{bn}}x^3(cx^n)^{-3/n}\,\mathrm{Ei}\left(\frac{(3-ibdn)(a+b\log(c}{bn}\right.
\end{aligned}
$$

Mathematica [A]
time = 1.00, size = 102, normalized size = 0.77

$$\frac{1}{6}x^3\left(2\mathrm{CosIntegral}(d(a+b\log(cx^n)))-e^{-\frac{3a}{bn}}(cx^n)^{-3/n}\left(\mathrm{Ei}\left(\frac{(3-ibdn)(a+b\log(cx^n))}{bn}\right)+\mathrm{Ei}\left(\frac{(3+ibdn)(a+b\log(cx^n))}{bn}\right)\right)\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^3*(2*CosIntegral[d*(a + b*Log[c*x^n])] - (ExpIntegralEi[((3 - I*b*d*n)*(
a + b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[((3 + I*b*d*n)*(a + b*Log[c*x^n])
)/(b*n)])/(E^((3*a)/(b*n))*(c*x^n)^(3/n))))/6
```

Maple [F]
time = 0.26, size = 0, normalized size = 0.00

$$\int x^2\,\mathrm{cosineIntegral}\left(d(a+b\ln(c\,x^n))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(x^2*Ci(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x^2*fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 448 vs. 2(125) = 250.
time = 0.41, size = 448, normalized size = 3.37

$$\frac{1}{3}x^3\,\mathrm{C}\left(bd\log\left(cx^n\right)+ad\right)-\frac{1}{6}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{3\log(c)}{n}-\frac{3a}{bn}-\frac{9i}{2\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{\left(\pi b^2d^2n^2\log\left(x\right)+\pi b^2d^2n\log\left(c\right)+\pi abd^2n+3i\right)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{6}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{3\log(c)}{n}-\frac{3a}{bn}+\frac{9i}{2\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{\left(\pi b^2d^2n^2\log\left(x\right)+\pi b^2d^2n\log\left(c\right)+\pi abd^2n-3i\right)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\frac{1}{6}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{3\log(c)}{n}-\frac{3a}{bn}-\frac{9i}{2\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{\left(\pi b^2d^2n^2\log\left(x\right)+\pi b^2d^2n\log\left(c\right)+\pi abd^2n+3i\right)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{6}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{3\log(c)}{n}-\frac{3a}{bn}+\frac{9i}{2\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{\left(\pi b^2d^2n^2\log\left(x\right)+\pi b^2d^2n\log\left(c\right)+\pi abd^2n-3i\right)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/3*x^3*fresnel_cos(b*d*log(c*x^n) + a*d) - 1/6*pi*sqrt(b^2*d^2*n^2)*e^(-3*
log(c)/n - 3*a/(b*n) - 9/2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*
log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n + 3*I)*sqrt(b^2*d^2*n^2)/(pi*b^
2*d^2*n^2)) - 1/6*pi*sqrt(b^2*d^2*n^2)*e^(-3*log(c)/n - 3*a/(b*n) + 9/2*I/(
pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) +
 pi*a*b*d^2*n - 3*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) + 1/6*I*pi*sqrt(b^
2*d^2*n^2)*e^(-3*log(c)/n - 3*a/(b*n) - 9/2*I/(pi*b^2*d^2*n^2))*fresnel_sin
((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n + 3*I)*sqrt(b^
2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 1/6*I*pi*sqrt(b^2*d^2*n^2)*e^(-3*log(c)/n -
3*a/(b*n) + 9/2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi
*b^2*d^2*n*log(c) + pi*a*b*d^2*n - 3*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2))
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\,\mathrm{Ci}\left(ad+bd\log\left(cx^n\right)\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(x**2*Ci(a*d + b*d*log(c*x**n)), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(d*(a+b*log(c*x^n))),x, algorithm="giac")
[Out] integrate(x^2*fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{cosint}(d\,(a + b\,\ln(c\,x^n)))\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(d*(a + b*log(c*x^n))),x)
[Out] int(x^2*cosint(d*(a + b*log(c*x^n))), x)
```

3.101 $\int x\textbf{CosIntegral}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=133

$$\frac{1}{2}x^2\text{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{4}e^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\text{Ei}\left(\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{4}e^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}$$

```
[Out] 1/2*x^2*Ci(d*(a+b*ln(c*x^n)))-1/4*x^2*Ei((2-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/e
xp(2*a/b/n)/((c*x^n)^(2/n))-1/4*x^2*Ei((2+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp
(2*a/b/n)/((c*x^n)^(2/n))
```

Rubi [A]

time = 0.17, antiderivative size = 133, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 15, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {6662, 12, 4586, 2347, 2209}

$$\frac{1}{2}x^2\text{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{4}x^2e^{-\frac{2a}{bn}}(cx^n)^{-2/n}\text{Ei}\left(\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{4}x^2e^{-\frac{2a}{bn}}(cx^n)^{-2/n}\text{Ei}\left(\frac{(ibdn+2)(a+b\log(cx^n))}{bn}\right)$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^2*CosIntegral[d*(a + b*Log[c*x^n])])/2 - (x^2*ExpIntegralEi[((2 - I*b*d*
n)*(a + b*Log[c*x^n]))/(b*n)])/(4*E^((2*a)/(b*n))*(c*x^n)^(2/n)) - (x^2*Exp
IntegralEi[((2 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(4*E^((2*a)/(b*n))*(c
*x^n)^(2/n))
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4586

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.), x_Symbol] :> Dist[((i*x)^
```

```
r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*n)
*(h*(e + f*Log[g*x^m]))^q, x], x] + Dist[E^(I*a*d)*(i*x)^r*((c*x^n)^(I*b*d)
/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x], x]
 /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6662

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*((e_.)*(x_))^(
m_.), x_Symbol] :> Simp[(e*x)^(m + 1)*(CosIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Cos[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int x\mathrm{Ci}(d(a+b\log(cx^n)))\,dx &= \frac{1}{2}x^2\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{2}(bdn)\int\frac{x\cos(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx\\ &= \frac{1}{2}x^2\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{2}(bn)\int\frac{x\cos(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx\\ &= \frac{1}{2}x^2\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{4}\left(be^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int\frac{x^{1-ibdn}}{a+b\log(cx^n)}\,dx\\ &= \frac{1}{2}x^2\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{4}\left(be^{-iad}x^2(cx^n)^{-ibd-\frac{2-ibdn}{n}}\right)\mathrm{Subst}\left(\int\frac{e^{\frac{(2-ibdn)}{n}}}{a+bx}\right.\\ &= \frac{1}{2}x^2\mathrm{Ci}(d(a+b\log(cx^n)))-\frac{1}{4}e^{-\frac{2a}{bn}}x^2(cx^n)^{-2/n}\,\mathrm{Ei}\left(\frac{(2-ibdn)(a+b\log(cx\right.}{bn}\end{aligned}$$

Mathematica [A]
time = 0.99, size = 102, normalized size = 0.77

$$\frac{1}{4}x^2\left(2\mathrm{CosIntegral}(d(a+b\log(cx^n)))-e^{-\frac{2a}{bn}}(cx^n)^{-2/n}\left(\mathrm{Ei}\left(\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)+\mathrm{Ei}\left(\frac{(2+ibdn)(a+b\log(cx^n))}{bn}\right)\right)\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] (x^2*(2*CosIntegral[d*(a + b*Log[c*x^n])] - (ExpIntegralEi[((2 - I*b*d*n)*(
a + b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[((2 + I*b*d*n)*(a + b*Log[c*x^n])
)/(b*n)])/(E^((2*a)/(b*n))*(c*x^n)^(2/n))))/4
```

Maple [F]
time = 0.20, size = 0, normalized size = 0.00

$$\int x\,\mathrm{cosineIntegral}\left(d(a+b\ln(c\,x^n))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(x*Ci(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x*fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 448 vs. $2(125) = 250$.
time = 0.43, size = 448, normalized size = 3.37

$$-\frac{1}{4}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{2\log(c)}{n}-\frac{2a}{bn}-\frac{2i}{\pi b^2d^2n^2}\right)}\operatorname{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+2i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{4}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{2\log(c)}{n}-\frac{2a}{bn}+\frac{2i}{\pi b^2d^2n^2}\right)}\operatorname{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-2i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\frac{1}{4}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{2\log(c)}{n}-\frac{2a}{bn}-\frac{2i}{\pi b^2d^2n^2}\right)}\operatorname{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+2i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{4}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{2\log(c)}{n}-\frac{2a}{bn}+\frac{2i}{\pi b^2d^2n^2}\right)}\operatorname{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-2i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\frac{1}{2}x^2\operatorname{C}\left(bd\log\left(cx^n\right)+ad\right)$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/4*pi*sqrt(b^2*d^2*n^2)*e^(-2*log(c)/n - 2*a/(b*n) - 2*I/(pi*b^2*d^2*n^2)
)*fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n +
 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 1/4*pi*sqrt(b^2*d^2*n^2)*e^(-2*
log(c)/n - 2*a/(b*n) + 2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*lo
g(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*
d^2*n^2)) + 1/4*I*pi*sqrt(b^2*d^2*n^2)*e^(-2*log(c)/n - 2*a/(b*n) - 2*I/(pi
*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + p
i*a*b*d^2*n + 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 1/4*I*pi*sqrt(b^2*
d^2*n^2)*e^(-2*log(c)/n - 2*a/(b*n) + 2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi
*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - 2*I)*sqrt(b^2*d^
2*n^2)/(pi*b^2*d^2*n^2)) + 1/2*x^2*fresnel_cos(b*d*log(c*x^n) + a*d)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\operatorname{Ci}\left(ad+bd\log\left(cx^n\right)\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(x*Ci(a*d + b*d*log(c*x**n)), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(x*fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{cosint}(d\,(a+b\,\ln\left(c\,x^n\right)))\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(d*(a + b*log(c*x^n))),x)
```

```
[Out] int(x*cosint(d*(a + b*log(c*x^n))), x)
```

3.102 $\int \mathbf{CosIntegral}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=124

$$x\text{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{2}e^{-\frac{a}{bn}}x(cx^n)^{-1/n}\,\text{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{2}e^{-\frac{a}{bn}}x(cx^n)^{-1/n}\,\text{Ei}\Bigg($$

```
[Out] x*Ci(d*(a+b*ln(c*x^n)))-1/2*x*Ei((1-I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a/b/n
)/((c*x^n)^(1/n))-1/2*x*Ei((1+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a/b/n)/((c*
x^n)^(1/n))
```

Rubi [A]
time = 0.16, antiderivative size = 124, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6659, 12, 4584, 2347, 2209}

$$x\text{CosIntegral}(d(a+b\log(cx^n)))-\frac{1}{2}xe^{-\frac{a}{bn}}(cx^n)^{-1/n}\,\text{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)-\frac{1}{2}xe^{-\frac{a}{bn}}(cx^n)^{-1/n}\,\text{Ei}\left(\frac{(ibdn+1)(a+b\log(cx^n))}{bn}\right)$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[d*(a + b*Log[c*x^n])],x]
```

```
[Out] x*CosIntegral[d*(a + b*Log[c*x^n])] - (x*ExpIntegralEi[((1 - I*b*d*n)*(a +
b*Log[c*x^n]))/(b*n)])/(2*E^(a/(b*n))*(c*x^n)^n^(-1)) - (x*ExpIntegralEi[((
1 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(2*E^(a/(b*n))*(c*x^n)^n^(-1))
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4584

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.), x_Symbol] :> Dist[1/((c*x^n)^(I*b*d)*(2/x^(I
```

```
*b*d*n)))/E^(I*a*d), Int[(h*(e + f*Log[g*x^m]))^q/x^(I*b*d*n), x], x] + Dis
t[E^(I*a*d)*((c*x^n)^(I*b*d)/(2*x^(I*b*d*n))), Int[x^(I*b*d*n)*(h*(e + f*Lo
g[g*x^m]))^q, x], x] /; FreeQ[{a, b, c, d, e, f, g, h, m, n, q}, x]
```

Rule 6659

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :>
Simp[x*CosIntegral[d*(a + b*Log[c*x^n])], x] - Dist[b*d*n, Int[Cos[d*(a + b
*Log[c*x^n])]/(d*(a + b*Log[c*x^n])), x], x] /; FreeQ[{a, b, c, d, n}, x]
```

Rubi steps

$$\begin{aligned}
\int \text{Ci}(d(a+b\log(cx^n)))\,dx &= x\text{Ci}(d(a+b\log(cx^n))) - (bdn)\int \frac{\cos(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx \\
&= x\text{Ci}(d(a+b\log(cx^n))) - (bn)\int \frac{\cos(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx \\
&= x\text{Ci}(d(a+b\log(cx^n))) - \frac{1}{2}\left(be^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int \frac{x^{-ibdn}}{a+b\log(cx^n)}\,dx - \frac{1}{2} \\
&= x\text{Ci}(d(a+b\log(cx^n))) - \frac{1}{2}\left(be^{-iad}x(cx^n)^{-ibd-\frac{1-ibdn}{n}}\right)\text{Subst}\left(\int \frac{e^{\frac{(1-ibdn)x}{n}}}{a+bx}\,dx,\right. \\
&= x\text{Ci}(d(a+b\log(cx^n))) - \frac{1}{2}e^{-\frac{a}{bn}}x(cx^n)^{-1/n}\,\text{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)
\end{aligned}$$

Mathematica [A]
time = 0.96, size = 98, normalized size = 0.79

$$x\text{CosIntegral}(d(a+b\log(cx^n))) - \frac{1}{2}e^{-\frac{a}{bn}}x(cx^n)^{-1/n}\left(\text{Ei}\left(\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)+\text{Ei}\left(\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)\right)$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[d*(a + b*Log[c*x^n])],x]
[Out] x*CosIntegral[d*(a + b*Log[c*x^n])] - (x*(ExpIntegralEi[((1 - I*b*d*n)*(a +
 b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[((1 + I*b*d*n)*(a + b*Log[c*x^n]))/(
b*n)]))/(2*E^(a/(b*n))*(c*x^n)^n^(-1))
```

Maple [F]
time = 0.24, size = 0, normalized size = 0.00

$$\int \text{cosineIntegral}\left(d(a+b\ln(c\,x^n))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*(a+b*ln(c*x^n))),x)
```

```
[Out] int(Ci(d*(a+b*ln(c*x^n))),x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 445 vs. $2(114) = 228$.
time = 0.38, size = 445, normalized size = 3.59

$$-\frac{1}{2}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{\log(c)}{n}-\frac{a}{bn}-\frac{i}{2\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{2}\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{\log(c)}{n}-\frac{a}{bn}+\frac{i}{2\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\frac{1}{2}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{\log(c)}{n}-\frac{a}{bn}-\frac{i}{2\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-\frac{1}{2}i\pi\sqrt{b^2d^2n^2}\,e^{\left(-\frac{\log(c)}{n}-\frac{a}{bn}+\frac{i}{2\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+x\,\mathrm{C}\left(bd\log\left(cx^n\right)+ad\right)$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/2*pi*sqrt(b^2*d^2*n^2)*e^(-log(c)/n - a/(b*n) - 1/2*I/(pi*b^2*d^2*n^2))*
fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n + I
)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 1/2*pi*sqrt(b^2*d^2*n^2)*e^(-log(c)
/n - a/(b*n) + 1/2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*log(x) +
 pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)
) + 1/2*I*pi*sqrt(b^2*d^2*n^2)*e^(-log(c)/n - a/(b*n) - 1/2*I/(pi*b^2*d^2*n
^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*
n + I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 1/2*I*pi*sqrt(b^2*d^2*n^2)*e^(
-log(c)/n - a/(b*n) + 1/2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*l
og(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d
^2*n^2)) + x*fresnel_cos(b*d*log(c*x^n) + a*d)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \mathrm{Ci}\left(d(a+b\log\left(cx^n\right))\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*(a+b*ln(c*x**n))),x)
```

```
[Out] Integral(Ci(d*(a + b*log(c*x**n))), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*(a+b*log(c*x^n))),x, algorithm="giac")
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{cosint}(d\,(a+b\,\ln\left(c\,x^n\right)))\;dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(d*(a + b*log(c*x^n))),x)
[Out] int(cosint(d*(a + b*log(c*x^n))), x)
```

3.103 $\int \frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{x}\,dx$

Optimal. Leaf size=55

$$\frac{\text{CosIntegral}(d(a+b\log(cx^n)))\,(a+b\log(cx^n))}{bn}-\frac{\sin(d(a+b\log(cx^n)))}{bdn}$$

```
[Out] Ci(d*(a+b*ln(c*x^n)))*(a+b*ln(c*x^n))/b/n-sin(d*(a+b*ln(c*x^n)))/b/d/n
```

Rubi [A]
time = 0.02, antiderivative size = 55, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {6635}

$$\frac{(a+b\log(cx^n))\,\text{CosIntegral}(d(a+b\log(cx^n)))}{bn}-\frac{\sin(d(a+b\log(cx^n)))}{bdn}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[d*(a + b*Log[c*x^n])]/x,x]
```

```
[Out] (CosIntegral[d*(a + b*Log[c*x^n])]*(a + b*Log[c*x^n]))/(b*n) - Sin[d*(a + b
*Log[c*x^n])]/(b*d*n)
```

Rule 6635

```
Int[CosIntegral[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[(a + b*x)*(CosIntegr
al[a + b*x]/b), x] - Simp[Sin[a + b*x]/b, x] /; FreeQ[{a, b}, x]
```

Rubi steps

$$\begin{aligned}\int \frac{\text{Ci}(d(a+b\log(cx^n)))}{x}\,dx &= \frac{\text{Subst}\left(\int \text{Ci}(d(a+bx))\,dx,x,\log(cx^n)\right)}{n}\\ &= \frac{\text{Subst}\left(\int \text{Ci}(x)\,dx,x,ad+bd\log(cx^n)\right)}{bdn}\\ &= \frac{\text{Ci}(ad+bd\log(cx^n))\,(a+b\log(cx^n))}{bn}-\frac{\sin(ad+bd\log(cx^n))}{bdn}\end{aligned}$$

Mathematica [A]
time = 0.06, size = 96, normalized size = 1.75

$$\frac{a\text{CosIntegral}(ad+bd\log(cx^n))}{bn}+\frac{\text{CosIntegral}(d(a+b\log(cx^n)))\log(cx^n)}{n}-\frac{\cos(bd\log(cx^n))\sin(ad)}{bdn}-\frac{\cos(ad)\sin(bd\log(cx^n))}{bdn}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[d*(a + b*Log[c*x^n])]/x,x]
```

```
[Out] (a*CosIntegral[a*d + b*d*Log[c*x^n]])/(b*n) + (CosIntegral[d*(a + b*Log[c*x
^n])]*Log[c*x^n])/n - (Cos[b*d*Log[c*x^n]]*Sin[a*d])/(b*d*n) - (Cos[a*d]*Si
n[b*d*Log[c*x^n]])/(b*d*n)
```

Maple [A]
time = 0.97, size = 56, normalized size = 1.02

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(ad+bd\ln(c\,x^n))(ad+bd\ln(c\,x^n))-\sin(ad+bd\ln(c\,x^n))}{nbd}$	56
default	$\frac{\text{cosineIntegral}(ad+bd\ln(c\,x^n))(ad+bd\ln(c\,x^n))-\sin(ad+bd\ln(c\,x^n))}{nbd}$	56

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*(a+b*ln(c*x^n)))/x,x,method=_RETURNVERBOSE)
```

```
[Out] 1/n/b/d*(Ci(a*d+b*d*ln(c*x^n))*(a*d+b*d*ln(c*x^n))-sin(a*d+b*d*ln(c*x^n)))
```

Maxima [A]
time = 0.26, size = 82, normalized size = 1.49

$$\frac{(b\log{(cx^n)}+a)d\,\mathrm{C}\left((b\log{(cx^n)}+a)d\right)-\frac{\sin\left(\frac{1}{2}\pi b^2d^2\log(cx^n)^2+\pi abd^2\log(cx^n)+\frac{1}{2}\pi a^2d^2\right)}{\pi}}{bdn}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((b*log(c*x^n) + a)*d*fresnel_cos((b*log(c*x^n) + a)*d) - sin(1/2*pi*b^2*d^
2*log(c*x^n)^2 + pi*a*b*d^2*log(c*x^n) + 1/2*pi*a^2*d^2)/pi)/(b*d*n)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 121 vs. $2(55) = 110$.
time = 0.40, size = 121, normalized size = 2.20

$$\frac{(\pi bdn\log{(x)}+\pi bd\log{(c)}+\pi ad)\,\mathrm{C}\left(bd\log{(cx^n)}+ad\right)-\sin\left(\frac{1}{2}\pi b^2d^2n^2\log{(x)}^2+\pi b^2d^2n\log{(c)}\log{(x)}+\frac{1}{2}\pi b^2d^2\log{(c)}^2+\pi abd^2n\log{(x)}+\pi abd^2\log{(c)}+\frac{1}{2}\pi a^2d^2\right)}{\pi bdn}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] ((pi*b*d*n*log(x) + pi*b*d*log(c) + pi*a*d)*fresnel_cos(b*d*log(c*x^n) + a*
d) - sin(1/2*pi*b^2*d^2*n^2*log(x)^2 + pi*b^2*d^2*n*log(c)*log(x) + 1/2*pi*
b^2*d^2*log(c)^2 + pi*a*b*d^2*n*log(x) + pi*a*b*d^2*log(c) + 1/2*pi*a^2*d^2
))/(pi*b*d*n)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}\left(ad + bd\log\left(cx^{n}\right)\right)}{x}\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*(a+b*ln(c*x**n)))/x,x)
```

```
[Out] Integral(Ci(a*d + b*d*log(c*x**n))/x, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d)/x, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{\ln\left(c\,x^n\right)\,\mathrm{cosint}(d\,\left(a+b\,\ln\left(c\,x^n\right)\right))}{n}+\frac{a\,\mathrm{cosint}(d\,\left(a+b\,\ln\left(c\,x^n\right)\right))}{b\,n}-\frac{\sin\left(d\,\left(a+b\,\ln\left(c\,x^n\right)\right)\right)}{b\,d\,n}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(d*(a + b*log(c*x^n)))/x,x)
```

```
[Out] (log(c*x^n)*cosint(d*(a + b*log(c*x^n))))/n + (a*cosint(d*(a + b*log(c*x^n)
)))/(b*n) - sin(d*(a + b*log(c*x^n)))/(b*d*n)
```

3.104 $\int \frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{x^2}\,dx$

Optimal. Leaf size=127

$$-\frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\text{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\text{Ei}\left(-\frac{(1+ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}$$

```
[Out] -Ci(d*(a+b*ln(c*x^n)))/x+1/2*exp(a/b/n)*(c*x^n)^(1/n)*Ei(-(1-I*b*d*n)*(a+b*
ln(c*x^n))/b/n)/x+1/2*exp(a/b/n)*(c*x^n)^(1/n)*Ei(-(1+I*b*d*n)*(a+b*ln(c*x^
n))/b/n)/x
```

Rubi [A]
time = 0.17, antiderivative size = 127, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6662, 12, 4586, 2347, 2209}

$$-\frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\text{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\text{Ei}\left(-\frac{(ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2x}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[d*(a + b*Log[c*x^n])]/x^2,x]
```

```
[Out] -(CosIntegral[d*(a + b*Log[c*x^n])]/x) + (E^(a/(b*n))*(c*x^n)^n^(-1)*ExpInt
egralEi[-(((1 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n))])/(2*x) + (E^(a/(b*n))*
(c*x^n)^n^(-1)*ExpIntegralEi[-(((1 + I*b*d*n)*(a + b*Log[c*x^n]))/(b*n))])/
(2*x)
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4586

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.), x_Symbol] :> Dist[((i*x)^
r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*n)
*(h*(e + f*Log[g*x^m]))^q, x], x] + Dist[E^(I*a*d)*(i*x)^r*((c*x^n)^(I*b*d)
/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x], x]
 /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6662

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*((e_.)*(x_))^(
m_.), x_Symbol] :> Simp[(e*x)^(m + 1)*(CosIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Cos[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x^2}\,dx &= -\frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x}+(bdn)\int \frac{\cos(d(a+b\log(cx^n)))}{dx^2(a+b\log(cx^n))}\,dx\\ &= -\frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x}+(bn)\int \frac{\cos(d(a+b\log(cx^n)))}{x^2(a+b\log(cx^n))}\,dx\\ &= -\frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x}+\frac{1}{2}\left(be^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int \frac{x^{-2-ibdn}}{a+b\log(cx^n)}\,dx+\frac{1}{2}\\ &= -\frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x}+\frac{\left(be^{-iad}(cx^n)^{-ibd-\frac{-1-ibdn}{n}}\right)\mathrm{Subst}\left(\int \frac{e^{\frac{(-1-ibdn)x}{n}}}{a+bx}\,dx,x\right.}{2x}\\ &= -\frac{\mathrm{Ci}(d(a+b\log(cx^n)))}{x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\mathrm{Ei}\left(-\frac{(1-ibdn)(a+b\log(cx^n))}{bn}\right)}{2x}+\frac{e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\,\mathrm{E}}{}\end{aligned}$$

Mathematica [A]
time = 1.02, size = 102, normalized size = 0.80

$$\frac{-2\mathrm{CosIntegral}(d(a+b\log(cx^n)))+e^{\frac{a}{bn}}(cx^n)^{\frac{1}{n}}\left(\mathrm{Ei}\left(-\frac{i(-i+bdn)(a+b\log(cx^n))}{bn}\right)+\mathrm{Ei}\left(\frac{i(i+bdn)(a+b\log(cx^n))}{bn}\right)\right)}{2x}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[d*(a + b*Log[c*x^n])]/x^2,x]
```

```
[Out] (-2*CosIntegral[d*(a + b*Log[c*x^n])] + E^(a/(b*n))*(c*x^n)^n^(-1)*(ExpInte
gralEi[((-I)*(-I + b*d*n)*(a + b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[(I*(I
+ b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(2*x)
```

Maple [F]
time = 0.20, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(d(a+b\ln\left(c\,x^{n}\right))\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*(a+b*ln(c*x^n)))/x^2,x)
```

```
[Out] int(Ci(d*(a+b*ln(c*x^n)))/x^2,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d)/x^2, x)
```

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 444 vs. $2(115) = 230$.
time = 0.44, size = 444, normalized size = 3.50

$$\frac{\pi\sqrt{b^2d^2n^2}\,xe^{\left(\frac{\log(c)}{n}+\frac{a}{bn}+\frac{i}{2\,\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\pi\sqrt{b^2d^2n^2}\,xe^{\left(\frac{\log(c)}{n}+\frac{a}{bn}-\frac{i}{2\,\pi b^2d^2n^2}\right)}\,\mathrm{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+i\,\pi\sqrt{b^2d^2n^2}\,xe^{\left(\frac{\log(c)}{n}+\frac{a}{bn}+\frac{i}{2\,\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-i\,\pi\sqrt{b^2d^2n^2}\,xe^{\left(\frac{\log(c)}{n}+\frac{a}{bn}-\frac{i}{2\,\pi b^2d^2n^2}\right)}\,\mathrm{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-2\,\mathrm{C}\left(bd\log\left(cx^{n}\right)+ad\right)}{2\,x}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/2*(pi*sqrt(b^2*d^2*n^2)*x*e^(log(c)/n + a/(b*n) + 1/2*I/(pi*b^2*d^2*n^2))
*fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n +
I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) + pi*sqrt(b^2*d^2*n^2)*x*e^(log(c)/n
 + a/(b*n) - 1/2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*log(x) + p
i*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2))
+ I*pi*sqrt(b^2*d^2*n^2)*x*e^(log(c)/n + a/(b*n) + 1/2*I/(pi*b^2*d^2*n^2))*
fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n + I
)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - I*pi*sqrt(b^2*d^2*n^2)*x*e^(log(c)/
n + a/(b*n) - 1/2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) +
pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2))
 - 2*fresnel_cos(b*d*log(c*x^n) + a*d))/x
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}\left(ad+bd\log\left(cx^{n}\right)\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*(a+b*ln(c*x**n)))/x**2,x)
```

```
[Out] Integral(Ci(a*d + b*d*log(c*x**n))/x**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d)/x^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{cosint}(d\,(a+b\,\ln\left(c\,x^n\right)))}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(d*(a + b*log(c*x^n)))/x^2,x)
```

```
[Out] int(cosint(d*(a + b*log(c*x^n)))/x^2, x)
```

3.105 $\int \frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{x^3}\,dx$

Optimal. Leaf size=135

$$-\frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{2x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/n}\operatorname{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/n}\operatorname{Ei}\left(-\frac{(2+ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}$$

```
[Out] -1/2*Ci(d*(a+b*ln(c*x^n)))/x^2+1/4*exp(2*a/b/n)*(c*x^n)^(2/n)*Ei(-(2-I*b*d*
n)*(a+b*ln(c*x^n))/b/n)/x^2+1/4*exp(2*a/b/n)*(c*x^n)^(2/n)*Ei(-(2+I*b*d*n)*
(a+b*ln(c*x^n))/b/n)/x^2
```

Rubi [A]
time = 0.17, antiderivative size = 135, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.294$, Rules used = {6662, 12, 4586, 2347, 2209}

$$-\frac{\text{CosIntegral}(d(a+b\log(cx^n)))}{2x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/n}\operatorname{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/n}\operatorname{Ei}\left(-\frac{(ibdn+2)(a+b\log(cx^n))}{bn}\right)}{4x^2}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[d*(a + b*Log[c*x^n])]/x^3,x]
```

```
[Out] -1/2*CosIntegral[d*(a + b*Log[c*x^n])]/x^2 + (E^((2*a)/(b*n))*(c*x^n)^(2/n)
*ExpIntegralEi[-(((2 - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n))])/(4*x^2) + (E^(
(2*a)/(b*n))*(c*x^n)^(2/n)*ExpIntegralEi[-(((2 + I*b*d*n)*(a + b*Log[c*x^n]
))/(b*n))])/(4*x^2)
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4586

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.), x_Symbol] :> Dist[((i*x)^
r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*n)
*(h*(e + f*Log[g*x^m]))^q, x], x] + Dist[E^(I*a*d)*(i*x)^r*((c*x^n)^(I*b*d)
/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x], x]
 /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6662

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*((e_.)*(x_))^(
m_.), x_Symbol] :> Simp[(e*x)^(m + 1)*(CosIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Cos[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\begin{aligned}\int \frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{x^3}\,dx &= -\frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{2}(bdn)\int \frac{\cos(d(a+b\log(cx^n)))}{dx^3(a+b\log(cx^n))}\,dx\\ &= -\frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{2}(bn)\int \frac{\cos(d(a+b\log(cx^n)))}{x^3(a+b\log(cx^n))}\,dx\\ &= -\frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{2x^2}+\frac{1}{4}\left(be^{-iad}nx^{ibdn}(cx^n)^{-ibd}\right)\int \frac{x^{-3-ibdn}}{a+b\log(cx^n)}\,dx+\frac{1}{4}\\ &= -\frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{2x^2}+\frac{\left(be^{-iad}(cx^n)^{-ibd-\frac{-2-ibdn}{n}}\right)\operatorname{Subst}\left(\int \frac{e^{\frac{(-2-ibdn)x}{n}}}{a+bx}\,dx,x\right.}{4x^2}\\ &= -\frac{\operatorname{Ci}(d(a+b\log(cx^n)))}{2x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/n}\operatorname{Ei}\left(-\frac{(2-ibdn)(a+b\log(cx^n))}{bn}\right)}{4x^2}+\frac{e^{\frac{2a}{bn}}(cx^n)^{2/}}{}\end{aligned}$$

Mathematica [A]
time = 1.00, size = 105, normalized size = 0.78

$$\frac{-2\text{CosIntegral}(d(a+b\log(cx^n)))+e^{\frac{2a}{bn}}(cx^n)^{2/n}\left(\operatorname{Ei}\left(-\frac{i(-2i+bdn)(a+b\log(cx^n))}{bn}\right)+\operatorname{Ei}\left(\frac{i(2i+bdn)(a+b\log(cx^n))}{bn}\right)\right)}{4x^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[d*(a + b*Log[c*x^n])]/x^3,x]
```

```
[Out] (-2*CosIntegral[d*(a + b*Log[c*x^n])] + E^((2*a)/(b*n))*(c*x^n)^(2/n)*(ExpI
ntegralEi[((-I)*(-2*I + b*d*n)*(a + b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[(
I*(2*I + b*d*n)*(a + b*Log[c*x^n]))/(b*n)]))/(4*x^2)
```

Maple [F]
time = 0.22, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(d(a + b\ln\left(c\,x^{n}\right))\right)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*(a+b*ln(c*x^n)))/x^3,x)
```

```
[Out] int(Ci(d*(a+b*ln(c*x^n)))/x^3,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d)/x^3, x)
```

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 460 vs. $2(121) = 242$.
time = 0.38, size = 460, normalized size = 3.41

$$\frac{\pi\sqrt{b^{2}d^{2}n^{2}}\,x^{2}e^{\left(\frac{2\,\log(c)}{n}+\frac{2\,a}{bn}+\frac{2i}{\pi b^{2}d^{2}n^{2}}\right)}\,\mathrm{C}\left(\frac{(\pi b^{2}d^{2}n^{2}\log(x)+\pi b^{2}d^{2}n\log(c)+\pi abd^{2}n+2i)\sqrt{b^{2}d^{2}n^{2}}}{\pi b^{2}d^{2}n^{2}}\right)+\pi\sqrt{b^{2}d^{2}n^{2}}\,x^{2}e^{\left(\frac{2\,\log(c)}{n}+\frac{2\,a}{bn}-\frac{2i}{\pi b^{2}d^{2}n^{2}}\right)}\,\mathrm{C}\left(\frac{(\pi b^{2}d^{2}n^{2}\log(x)+\pi b^{2}d^{2}n\log(c)+\pi abd^{2}n-2i)\sqrt{b^{2}d^{2}n^{2}}}{\pi b^{2}d^{2}n^{2}}\right)+i\,\pi\sqrt{b^{2}d^{2}n^{2}}\,x^{2}e^{\left(\frac{2\,\log(c)}{n}+\frac{2\,a}{bn}+\frac{2i}{\pi b^{2}d^{2}n^{2}}\right)}\,\mathrm{S}\left(\frac{(\pi b^{2}d^{2}n^{2}\log(x)+\pi b^{2}d^{2}n\log(c)+\pi abd^{2}n+2i)\sqrt{b^{2}d^{2}n^{2}}}{\pi b^{2}d^{2}n^{2}}\right)-i\,\pi\sqrt{b^{2}d^{2}n^{2}}\,x^{2}e^{\left(\frac{2\,\log(c)}{n}+\frac{2\,a}{bn}-\frac{2i}{\pi b^{2}d^{2}n^{2}}\right)}\,\mathrm{S}\left(\frac{(\pi b^{2}d^{2}n^{2}\log(x)+\pi b^{2}d^{2}n\log(c)+\pi abd^{2}n-2i)\sqrt{b^{2}d^{2}n^{2}}}{\pi b^{2}d^{2}n^{2}}\right)-2\,\mathrm{C}\left(bd\log\left(cx^{n}\right)+ad\right)}{4\,x^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] 1/4*(pi*sqrt(b^2*d^2*n^2)*x^2*e^(2*log(c)/n + 2*a/(b*n) + 2*I/(pi*b^2*d^2*n
^2))*fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*
n + 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) + pi*sqrt(b^2*d^2*n^2)*x^2*e^(
2*log(c)/n + 2*a/(b*n) - 2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2*n^2*
log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^
2*d^2*n^2)) + I*pi*sqrt(b^2*d^2*n^2)*x^2*e^(2*log(c)/n + 2*a/(b*n) + 2*I/(p
i*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) +
pi*a*b*d^2*n + 2*I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - I*pi*sqrt(b^2*d^2
*n^2)*x^2*e^(2*log(c)/n + 2*a/(b*n) - 2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi
*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - 2*I)*sqrt(b^2*d^
2*n^2)/(pi*b^2*d^2*n^2)) - 2*fresnel_cos(b*d*log(c*x^n) + a*d))/x^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\operatorname{Ci}\left(ad + bd\log\left(cx^{n}\right)\right)}{x^{3}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*(a+b*ln(c*x**n)))/x**3,x)
```

```
[Out] Integral(Ci(a*d + b*d*log(c*x**n))/x**3, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(fresnel_cos((b*log(c*x^n) + a)*d)/x^3, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{cosint}(d\,(a+b\,\ln(c\,x^n)))}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(d*(a + b*log(c*x^n)))/x^3,x)
```

```
[Out] int(cosint(d*(a + b*log(c*x^n)))/x^3, x)
```

3.106 $\int (ex)^m \textbf{CosIntegral}(d(a+b\log(cx^n)))\,dx$

Optimal. Leaf size=172

$$\frac{(ex)^{1+m}\text{CosIntegral}(d(a+b\log(cx^n)))}{e(1+m)}-\frac{e^{-\frac{a(1+m)}{bn}}x(ex)^m(cx^n)^{-\frac{1+m}{n}}\text{Ei}\left(\frac{(1+m-ibdn)(a+b\log(cx^n))}{bn}\right)}{2(1+m)}-\frac{e^{-\frac{a(1+m)}{bn}}x(e}{}$$

```
[Out] (e*x)^(1+m)*Ci(d*(a+b*ln(c*x^n)))/e/(1+m)-1/2*x*(e*x)^m*Ei((1+m-I*b*d*n)*(a
+b*ln(c*x^n))/b/n)/exp(a*(1+m)/b/n)/(1+m)/((c*x^n)^((1+m)/n))-1/2*x*(e*x)^m
*Ei((1+m+I*b*d*n)*(a+b*ln(c*x^n))/b/n)/exp(a*(1+m)/b/n)/(1+m)/((c*x^n)^((1+
m)/n))
```

Rubi [A]
time = 0.21, antiderivative size = 172, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 5, integrand size = 19, $\frac{\text{number of rules}}{\text{integrand size}} = 0.263$, Rules used = {6662, 12, 4586, 2347, 2209}

$$\frac{(ex)^{m+1}\text{CosIntegral}(d(a+b\log(cx^n)))}{e(m+1)}-\frac{x(ex)^m e^{-\frac{a(m+1)}{bn}}(cx^n)^{-\frac{m+1}{n}}\text{Ei}\left(\frac{(m-ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2(m+1)}-\frac{x(ex)^m e^{-\frac{a(m+1)}{bn}}(cx^n)^{-\frac{m+1}{n}}\text{Ei}\left(\frac{(m+ibdn+1)(a+b\log(cx^n))}{bn}\right)}{2(m+1)}$$

Antiderivative was successfully verified.

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

```
[Out] ((e*x)^(1 + m)*CosIntegral[d*(a + b*Log[c*x^n])])/(e*(1 + m)) - (x*(e*x)^m*
ExpIntegralEi[((1 + m - I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(2*E^((a*(1 +
m))/(b*n))*(1 + m)*(c*x^n)^((1 + m)/n)) - (x*(e*x)^m*ExpIntegralEi[((1 + m
+ I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)])/(2*E^((a*(1 + m))/(b*n))*(1 + m)*(c*
x^n)^((1 + m)/n))
```

Rule 12

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

Rule 2209

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

Rule 2347

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_)*((d_.)*(x_))^(m_.), x_Symbol
] :> Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^((m + 1)/n)), Subst[Int[E^(((m + 1)/n)
*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]
```

Rule 4586

```
Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*(((e_.) + Log[(g_.)*(x
_)^(m_.)]*(f_.))*(h_.))^(q_.)*((i_.)*(x_))^(r_.), x_Symbol] :> Dist[((i*x)^
r*(1/((c*x^n)^(I*b*d)*(2*x^(r - I*b*d*n)))))/E^(I*a*d), Int[x^(r - I*b*d*n)
*(h*(e + f*Log[g*x^m]))^q, x], x] + Dist[E^(I*a*d)*(i*x)^r*((c*x^n)^(I*b*d)
/(2*x^(r + I*b*d*n))), Int[x^(r + I*b*d*n)*(h*(e + f*Log[g*x^m]))^q, x], x]
 /; FreeQ[{a, b, c, d, e, f, g, h, i, m, n, q, r}, x]
```

Rule 6662

```
Int[CosIntegral[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)]*((e_.)*(x_))^(
m_.), x_Symbol] :> Simp[(e*x)^(m + 1)*(CosIntegral[d*(a + b*Log[c*x^n])]/(e
*(m + 1))), x] - Dist[b*d*(n/(m + 1)), Int[(e*x)^m*(Cos[d*(a + b*Log[c*x^n]
)]/(d*(a + b*Log[c*x^n]))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && Ne
Q[m, -1]
```

Rubi steps

$$\int (ex)^m \text{Ci}(d(a+b\log(cx^n)))\,dx = \frac{(ex)^{1+m}\text{Ci}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{(bdn)\int \frac{(ex)^m\cos(d(a+b\log(cx^n)))}{d(a+b\log(cx^n))}\,dx}{1+m}$$

$$= \frac{(ex)^{1+m}\text{Ci}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{(bn)\int \frac{(ex)^m\cos(d(a+b\log(cx^n)))}{a+b\log(cx^n)}\,dx}{1+m}$$

$$= \frac{(ex)^{1+m}\text{Ci}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{\left(be^{-iad}nx^{-m+ibdn}(ex)^m\left(cx^n\right)^{-ibd}\right)\int \frac{x}{a+}}{2(1+m)}$$

$$= \frac{(ex)^{1+m}\text{Ci}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{\left(be^{-iad}x(ex)^m\left(cx^n\right)^{-ibd-\frac{1+m-ibdn}{n}}\right)\text{Subs}}{2(1+m}$$

$$= \frac{(ex)^{1+m}\text{Ci}(d(a+b\log(cx^n)))}{e(1+m)} - \frac{e^{-\frac{a(1+m)}{bn}}x(ex)^m\left(cx^n\right)^{-\frac{1+m}{n}}\text{Ei}\left(\frac{(1+m-ibdn}{}\right.}{2(1+m)}$$

Mathematica [A]
time = 1.79, size = 124, normalized size = 0.72

$$\frac{(ex)^m\left(2x\text{CosIntegral}(d(a+b\log(cx^n))) - e^{-\frac{(1+m)(a-bn\log(x)+b\log(cx^n))}{bn}}x^{-m}\left(\text{Ei}\left(\frac{(1+m-ibdn)(a+b\log(cx^n))}{bn}\right)+\text{Ei}\left(\frac{(1+m+ibdn)(a+b\log(cx^n))}{bn}\right)\right)\right)}{2(1+m)}$$

Antiderivative was successfully verified.

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

```
[Out] ((e*x)^m*(2*x*CosIntegral[d*(a + b*Log[c*x^n])] - (ExpIntegralEi[((1 + m -
I*b*d*n)*(a + b*Log[c*x^n]))/(b*n)] + ExpIntegralEi[((1 + m + I*b*d*n)*(a +
 b*Log[c*x^n]))/(b*n)])/(E^(((1 + m)*(a - b*n*Log[x] + b*Log[c*x^n]))/(b*n)
)*x^m)))/(2*(1 + m))
```

Maple [F]
time = 0.04, size = 0, normalized size = 0.00

$$\int (ex)^m \operatorname{cosineIntegral}\left(d(a+b\ln\left(c\,x^n\right))\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

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

Fricas [B] Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 674 vs. $2(166) = 332$.
time = 0.40, size = 674, normalized size = 3.92

$$-\frac{\pi\sqrt{b^2d^2n^2}\,e^{\left(m-\frac{m\log(c)}{n}-\frac{am}{bn}-\frac{\log(c)}{n}-\frac{a}{bn}-\frac{i\,m^2}{2\,\pi b^2d^2n^2}-\frac{i\,m}{\pi b^2d^2n^2}-\frac{i}{2\,\pi b^2d^2n^2}\right)}\operatorname{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i\,m+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+\pi\sqrt{b^2d^2n^2}\,e^{\left(m-\frac{m\log(c)}{n}-\frac{am}{bn}-\frac{\log(c)}{n}-\frac{a}{bn}+\frac{i\,m^2}{2\,\pi b^2d^2n^2}+\frac{i\,m}{\pi b^2d^2n^2}+\frac{i}{2\,\pi b^2d^2n^2}\right)}\operatorname{C}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i\,m-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-i\,\pi\sqrt{b^2d^2n^2}\,e^{\left(m-\frac{m\log(c)}{n}-\frac{am}{bn}-\frac{\log(c)}{n}-\frac{a}{bn}-\frac{i\,m^2}{2\,\pi b^2d^2n^2}-\frac{i\,m}{\pi b^2d^2n^2}-\frac{i}{2\,\pi b^2d^2n^2}\right)}\operatorname{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n+i\,m+i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)+i\,\pi\sqrt{b^2d^2n^2}\,e^{\left(m-\frac{m\log(c)}{n}-\frac{am}{bn}-\frac{\log(c)}{n}-\frac{a}{bn}+\frac{i\,m^2}{2\,\pi b^2d^2n^2}+\frac{i\,m}{\pi b^2d^2n^2}+\frac{i}{2\,\pi b^2d^2n^2}\right)}\operatorname{S}\left(\frac{(\pi b^2d^2n^2\log(x)+\pi b^2d^2n\log(c)+\pi abd^2n-i\,m-i)\sqrt{b^2d^2n^2}}{\pi b^2d^2n^2}\right)-2\,xe^{(m\log(x)+m)}\operatorname{C}\left(bd\log\left(cx^n\right)+ad\right)}{2\,(m+1)}$$

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] -1/2*(pi*sqrt(b^2*d^2*n^2)*e^(m - m*log(c)/n - a*m/(b*n) - log(c)/n - a/(b*
n) - 1/2*I*m^2/(pi*b^2*d^2*n^2) - I*m/(pi*b^2*d^2*n^2) - 1/2*I/(pi*b^2*d^2*
n^2))*fresnel_cos((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2
*n + I*m + I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) + pi*sqrt(b^2*d^2*n^2)*e^
(m - m*log(c)/n - a*m/(b*n) - log(c)/n - a/(b*n) + 1/2*I*m^2/(pi*b^2*d^2*n^
2) + I*m/(pi*b^2*d^2*n^2) + 1/2*I/(pi*b^2*d^2*n^2))*fresnel_cos((pi*b^2*d^2
*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I*m - I)*sqrt(b^2*d^2*n^
2)/(pi*b^2*d^2*n^2)) - I*pi*sqrt(b^2*d^2*n^2)*e^(m - m*log(c)/n - a*m/(b*n)
 - log(c)/n - a/(b*n) - 1/2*I*m^2/(pi*b^2*d^2*n^2) - I*m/(pi*b^2*d^2*n^2) -
 1/2*I/(pi*b^2*d^2*n^2))*fresnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*
log(c) + pi*a*b*d^2*n + I*m + I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) + I*pi
```

```
*sqrt(b^2*d^2*n^2)*e^(m - m*log(c)/n - a*m/(b*n) - log(c)/n - a/(b*n) + 1/2
*I*m^2/(pi*b^2*d^2*n^2) + I*m/(pi*b^2*d^2*n^2) + 1/2*I/(pi*b^2*d^2*n^2))*fr
esnel_sin((pi*b^2*d^2*n^2*log(x) + pi*b^2*d^2*n*log(c) + pi*a*b*d^2*n - I*m
 - I)*sqrt(b^2*d^2*n^2)/(pi*b^2*d^2*n^2)) - 2*x*e^(m*log(x) + m)*fresnel_co
s(b*d*log(c*x^n) + a*d))/(m + 1)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int (ex)^m \operatorname{Ci}(ad + bd\log(cx^n))\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate((e*x)**m*Ci(d*(a+b*ln(c*x**n))),x)
[Out] Integral((e*x)**m*Ci(a*d + b*d*log(c*x**n)), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{cosint}(d\,(a + b\,\ln(c\,x^n)))\,(e\,x)^m\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

3.107 $\int \frac{\textbf{CosIntegral}(bx)\sin(bx)}{x^3}\,dx$

Optimal. Leaf size=103

$$-\frac{b\cos^2(bx)}{2x}-\frac{b\cos(2bx)}{4x}-\frac{b\cos(bx)\text{CosIntegral}(bx)}{2x}-\frac{\text{CosIntegral}(bx)\sin(bx)}{2x^2}-\frac{\sin(2bx)}{8x^2}-b^2\text{Si}(2bx)-\frac{1}{2}b^2\text{Int}$$

```
[Out] -1/2*b^2*CannotIntegrate(Ci(b*x)*sin(b*x)/x,x)-1/2*b*Ci(b*x)*cos(b*x)/x-1/2
*b*cos(b*x)^2/x-1/4*b*cos(2*b*x)/x-b^2*Si(2*b*x)-1/2*Ci(b*x)*sin(b*x)/x^2-1
/8*sin(2*b*x)/x^2
```

Rubi [A]
time = 0.18, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(bx)\sin(bx)}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(CosIntegral[b*x]*Sin[b*x])/x^3,x]
```

```
[Out] -1/2*(b*Cos[b*x]^2)/x - (b*Cos[2*b*x])/(4*x) - (b*Cos[b*x]*CosIntegral[b*x]
)/(2*x) - (CosIntegral[b*x]*Sin[b*x])/(2*x^2) - Sin[2*b*x]/(8*x^2) - b^2*Si
nIntegral[2*b*x] - (b^2*Defer[Int][(CosIntegral[b*x]*Sin[b*x])/x, x])/2
```

Rubi steps

$$\begin{aligned}
\int \frac{\text{Ci}(bx)\sin(bx)}{x^3}\,dx &= -\frac{\text{Ci}(bx)\sin(bx)}{2x^2}+\frac{1}{2}b\int \frac{\cos(bx)\text{Ci}(bx)}{x^2}\,dx+\frac{1}{2}b\int \frac{\cos(bx)\sin(bx)}{bx^3}\,dx\\
&= -\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}+\frac{1}{2}\int \frac{\cos(bx)\sin(bx)}{x^3}\,dx+\frac{1}{2}b^2\int \frac{\cos^2(bx)}{bx^2}\,dx -\\
&= -\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}+\frac{1}{2}\int \frac{\sin(2bx)}{2x^3}\,dx+\frac{1}{2}b\int \frac{\cos^2(bx)}{x^2}\,dx-\frac{1}{2}b^2\int\\
&= -\frac{b\cos^2(bx)}{2x}-\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}+\frac{1}{4}\int \frac{\sin(2bx)}{x^3}\,dx-\frac{1}{2}b^2\int \frac{\text{Ci}(bx)}{}\\
&= -\frac{b\cos^2(bx)}{2x}-\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}-\frac{\sin(2bx)}{8x^2}+\frac{1}{4}b\int \frac{\cos(2bx)}{x^2}\,dx-\\
&= -\frac{b\cos^2(bx)}{2x}-\frac{b\cos(2bx)}{4x}-\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}-\frac{\sin(2bx)}{8x^2}-\frac{1}{2}b^2\text{Si}(2\\
&= -\frac{b\cos^2(bx)}{2x}-\frac{b\cos(2bx)}{4x}-\frac{b\cos(bx)\text{Ci}(bx)}{2x}-\frac{\text{Ci}(bx)\sin(bx)}{2x^2}-\frac{\sin(2bx)}{8x^2}-b^2\text{Si}(2bx
\end{aligned}$$

Mathematica [A]
time = 1.00, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(bx)\sin(bx)}{x^3}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(CosIntegral[b*x]*Sin[b*x])/x^3,x]
[Out] Integrate[(CosIntegral[b*x]*Sin[b*x])/x^3, x]
```

Maple [A]
time = 0.07, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx\right)\sin\left(bx\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*sin(b*x)/x^3,x)
[Out] int(Ci(b*x)*sin(b*x)/x^3,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^3,x, algorithm="maxima")
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x^3, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^3,x, algorithm="fricas")
[Out] integral(fresnel_cos(b*x)*sin(b*x)/x^3, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin\left(bx\right)\operatorname{Ci}\left(bx\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*sin(b*x)/x**3,x)
```

```
[Out] Integral(sin(b*x)*Ci(b*x)/x**3, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^3,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x^3, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\mathrm{cosint}(b\,x)\,\sin\left(b\,x\right)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*sin(b*x))/x^3,x)
```

```
[Out] int((cosint(b*x)*sin(b*x))/x^3, x)
```

3.108 $\int \frac{\textbf{CosIntegral}(bx)\sin(bx)}{x^2}\,dx$

Optimal. Leaf size=44

$$\frac{1}{2}b\text{CosIntegral}(bx)^2+b\text{CosIntegral}(2bx)-\frac{\text{CosIntegral}(bx)\sin(bx)}{x}-\frac{\sin(2bx)}{2x}$$

```
[Out] 1/2*b*Ci(b*x)^2+b*Ci(2*b*x)-Ci(b*x)*sin(b*x)/x-1/2*sin(2*b*x)/x
```

Rubi [A]
time = 0.07, antiderivative size = 44, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.500, Rules used = {6657, 6818, 12, 4491, 3378, 3383}

$$\frac{1}{2}b\text{CosIntegral}(bx)^2+b\text{CosIntegral}(2bx)-\frac{\text{CosIntegral}(bx)\sin(bx)}{x}-\frac{\sin(2bx)}{2x}$$

Antiderivative was successfully verified.

```
[In] Int[(CosIntegral[b*x]*Sin[b*x])/x^2,x]
```

```
[Out] (b*CosIntegral[b*x]^2)/2 + b*CosIntegral[2*b*x] - (CosIntegral[b*x]*Sin[b*x
])/x - Sin[2*b*x]/(2*x)
```

Rule 12

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

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
```

```
tQ[p, 0]
```

Rule 6657

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_)*Sin[(a_.) + (
b_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^(m + 1)*Sin[a + b*x]*(CosIntegral[c
 + d*x]/(f*(m + 1))), x] + (-Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Cos[
a + b*x]*CosIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$
\begin{aligned}
\int \frac{\text{Ci}(bx)\sin(bx)}{x^2}\,dx &= -\frac{\text{Ci}(bx)\sin(bx)}{x} + b\int \frac{\cos(bx)\text{Ci}(bx)}{x}\,dx + b\int \frac{\cos(bx)\sin(bx)}{bx^2}\,dx \\
&= \frac{1}{2}b\text{Ci}(bx)^2 - \frac{\text{Ci}(bx)\sin(bx)}{x} + \int \frac{\cos(bx)\sin(bx)}{x^2}\,dx \\
&= \frac{1}{2}b\text{Ci}(bx)^2 - \frac{\text{Ci}(bx)\sin(bx)}{x} + \int \frac{\sin(2bx)}{2x^2}\,dx \\
&= \frac{1}{2}b\text{Ci}(bx)^2 - \frac{\text{Ci}(bx)\sin(bx)}{x} + \frac{1}{2}\int \frac{\sin(2bx)}{x^2}\,dx \\
&= \frac{1}{2}b\text{Ci}(bx)^2 - \frac{\text{Ci}(bx)\sin(bx)}{x} - \frac{\sin(2bx)}{2x} + b\int \frac{\cos(2bx)}{x}\,dx \\
&= \frac{1}{2}b\text{Ci}(bx)^2 + b\text{Ci}(2bx) - \frac{\text{Ci}(bx)\sin(bx)}{x} - \frac{\sin(2bx)}{2x}
\end{aligned}
$$

Mathematica [A]
time = 0.01, size = 44, normalized size = 1.00

$$\frac{1}{2}b\text{CosIntegral}(bx)^2 + b\text{CosIntegral}(2bx) - \frac{\text{CosIntegral}(bx)\sin(bx)}{x} - \frac{\sin(2bx)}{2x}$$

Antiderivative was successfully verified.

```
[In] Integrate[(CosIntegral[b*x]*Sin[b*x])/x^2,x]
```

```
[Out] (b*CosIntegral[b*x]^2)/2 + b*CosIntegral[2*b*x] - (CosIntegral[b*x]*Sin[b*x
])/x - Sin[2*b*x]/(2*x)
```

Maple [F]
time = 0.08, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(bx\right)\sin\left(bx\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*sin(b*x)/x^2,x)
```

```
[Out] int(Ci(b*x)*sin(b*x)/x^2,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^2,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x^2, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^2,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x)*sin(b*x)/x^2, x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin\left(bx\right)\text{Ci}\left(bx\right)}{x^{2}}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*sin(b*x)/x**2,x)
```

```
[Out] Integral(sin(b*x)*Ci(b*x)/x**2, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x^2,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x^2, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\operatorname{cosint}(b\,x)\,\sin\left(b\,x\right)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*sin(b*x))/x^2,x)
```

```
[Out] int((cosint(b*x)*sin(b*x))/x^2, x)
```

3.109 $\int \frac{\textbf{CosIntegral}(bx)\sin(bx)}{x}\,dx$

Optimal. Leaf size=15

$$\text{Int}\left(\frac{\text{CosIntegral}(bx)\sin(bx)}{x},x\right)$$

[Out] CannotIntegrate(Ci(b*x)*sin(b*x)/x,x)

Rubi [A]
time = 0.02, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(bx)\sin(bx)}{x}\,dx$$

Verification is not applicable to the result.

[In] Int[(CosIntegral[b*x]*Sin[b*x])/x,x]

[Out] Defer[Int][(CosIntegral[b*x]*Sin[b*x])/x, x]

Rubi steps

$$\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx = \int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx$$

Mathematica [A]
time = 1.43, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(bx)\sin(bx)}{x}\,dx$$

Verification is not applicable to the result.

[In] Integrate[(CosIntegral[b*x]*Sin[b*x])/x,x]

[Out] Integrate[(CosIntegral[b*x]*Sin[b*x])/x, x]

Maple [A]
time = 0.10, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx)\sin\,(bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*sin(b*x)/x,x)
```

```
[Out] int(Ci(b*x)*sin(b*x)/x,x)
```

Maxima [**A**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x,x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x, x)
```

Fricas [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x,x, algorithm="fricas")
```

```
[Out] integral(fresnel_cos(b*x)*sin(b*x)/x, x)
```

Sympy [**A**]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin(bx)\,\mathrm{Ci}(bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*sin(b*x)/x,x)
```

```
[Out] Integral(sin(b*x)*Ci(b*x)/x, x)
```

Giac [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x)/x,x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x)/x, x)
```

Mupad [**A**]
time = 0.00, size = -1, normalized size = -0.07

$$\int \frac{\mathrm{cosint}(b\,x)\,\sin(b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*sin(b*x))/x,x)
```

```
[Out] int((cosint(b*x)*sin(b*x))/x, x)
```

3.110 $\int \text{CosIntegral}(bx)\sin(bx)\,dx$

Optimal. Leaf size=35

$$-\frac{\cos(bx)\text{CosIntegral}(bx)}{b}+\frac{\text{CosIntegral}(2bx)}{2b}+\frac{\log(x)}{2b}$$

```
[Out] 1/2*Ci(2*b*x)/b-Ci(b*x)*cos(b*x)/b+1/2*ln(x)/b
```

Rubi [A]
time = 0.04, antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.444, Rules used = {6653, 12, 3393, 3383}

$$\frac{\text{CosIntegral}(2bx)}{2b}-\frac{\text{CosIntegral}(bx)\cos(bx)}{b}+\frac{\log(x)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] -((Cos[b*x]*CosIntegral[b*x])/b) + CosIntegral[2*b*x]/(2*b) + Log[x]/(2*b)
```

Rule 12

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

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \mathrm{Ci}(bx)\sin(bx)\,dx &= -\frac{\cos(bx)\mathrm{Ci}(bx)}{b} + \int \frac{\cos^2(bx)}{bx}\,dx \\ &= -\frac{\cos(bx)\mathrm{Ci}(bx)}{b} + \frac{\int \frac{\cos^2(bx)}{x}\,dx}{b} \\ &= -\frac{\cos(bx)\mathrm{Ci}(bx)}{b} + \frac{\int \left(\frac{1}{2x} + \frac{\cos(2bx)}{2x}\right)dx}{b} \\ &= -\frac{\cos(bx)\mathrm{Ci}(bx)}{b} + \frac{\log(x)}{2b} + \frac{\int \frac{\cos(2bx)}{x}\,dx}{2b} \\ &= -\frac{\cos(bx)\mathrm{Ci}(bx)}{b} + \frac{\mathrm{Ci}(2bx)}{2b} + \frac{\log(x)}{2b}\end{aligned}$$

Mathematica [**A**]
time = 0.01, size = 37, normalized size = 1.06

$$-\frac{\cos(bx)\mathrm{CosIntegral}(bx)}{b} + \frac{\mathrm{CosIntegral}(2bx)}{2b} + \frac{\log(bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[b*x]*Sin[b*x],x]
[Out] -((Cos[b*x]*CosIntegral[b*x])/b) + CosIntegral[2*b*x]/(2*b) + Log[b*x]/(2*b
)
```

Maple [**A**]
time = 0.35, size = 29, normalized size = 0.83

method	result	size
derivativedivides	$\frac{-\mathrm{cosineIntegral}(bx)\cos(bx)+\frac{\ln(bx)}{2}+\frac{\mathrm{cosineIntegral}(2bx)}{2}}{b}$	29
default	$\frac{-\mathrm{cosineIntegral}(bx)\cos(bx)+\frac{\ln(bx)}{2}+\frac{\mathrm{cosineIntegral}(2bx)}{2}}{b}$	29

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b*(-Ci(b*x)*cos(b*x)+1/2*ln(b*x)+1/2*Ci(2*b*x))
```

Maxima [**F**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 145 vs. 2(31) = 62.
time = 0.37, size = 145, normalized size = 4.14

$$-\frac{2\,b\cos\left(bx\right)\mathrm{C}\left(bx\right)-\sqrt{b^2}\,\cos\left(\frac{1}{2\pi}\right)\mathrm{C}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\,\cos\left(\frac{1}{2\pi}\right)\mathrm{C}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\pi}\right)-\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\pi}\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*b*cos(b*x)*fresnel_cos(b*x) - sqrt(b^2)*cos(1/2/pi)*fresnel_cos((pi
*b*x + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*cos(1/2/pi)*fresnel_cos((pi*b*x - 1
)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b))*
sin(1/2/pi) - sqrt(b^2)*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(pi*b))*sin(1/2/
pi))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\sin\left(bx\right)\mathrm{Ci}\left(bx\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*sin(b*x),x)
```

```
[Out] Integral(sin(b*x)*Ci(b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x)*sin(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\frac{\ln\left(x\right)}{2\,b}+\frac{\mathrm{cosint}(2\,b\,x)}{2\,b}-\frac{\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(b*x)*sin(b*x),x)
```

```
[Out] log(x)/(2*b) + cosint(2*b*x)/(2*b) - (cosint(b*x)*cos(b*x))/b
```

3.111 $\int x\textbf{CosIntegral}(bx)\sin(bx)\,dx$

Optimal. Leaf size=62

$$\frac{x}{2b}-\frac{x\cos(bx)\text{CosIntegral}(bx)}{b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\text{CosIntegral}(bx)\sin(bx)}{b^2}-\frac{\text{Si}(2bx)}{2b^2}$$

```
[Out] 1/2*x/b-x*Ci(b*x)*cos(b*x)/b-1/2*Si(2*b*x)/b^2+Ci(b*x)*sin(b*x)/b^2+1/2*cos
(b*x)*sin(b*x)/b^2
```

Rubi [A]
time = 0.05, antiderivative size = 62, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.700$, Rules used = {6655, 12, 2715, 8, 6647, 4491, 3380}

$$\frac{\text{CosIntegral}(bx)\sin(bx)}{b^2}-\frac{\text{Si}(2bx)}{2b^2}+\frac{\sin(bx)\cos(bx)}{2b^2}-\frac{x\text{CosIntegral}(bx)\cos(bx)}{b}+\frac{x}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] x/(2*b) - (x*Cos[b*x]*CosIntegral[b*x])/b + (Cos[b*x]*Sin[b*x])/(2*b^2) + (
CosIntegral[b*x]*Sin[b*x])/b^2 - SinIntegral[2*b*x]/(2*b^2)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\begin{aligned}
\int x\text{Ci}(bx)\sin(bx)\,dx &= -\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\int\cos(bx)\text{Ci}(bx)\,dx}{b}+\int\frac{\cos^2(bx)}{b}\,dx\\
&= -\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\text{Ci}(bx)\sin(bx)}{b^2}+\frac{\int\cos^2(bx)\,dx}{b}-\frac{\int\frac{\cos(bx)\sin(bx)}{bx}\,dx}{b}\\
&= -\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\text{Ci}(bx)\sin(bx)}{b^2}-\frac{\int\frac{\cos(bx)\sin(bx)}{x}\,dx}{b^2}+\frac{\int 1\,dx}{2b}\\
&= \frac{x}{2b}-\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\text{Ci}(bx)\sin(bx)}{b^2}-\frac{\int\frac{\sin(2bx)}{2x}\,dx}{b^2}\\
&= \frac{x}{2b}-\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\text{Ci}(bx)\sin(bx)}{b^2}-\frac{\int\frac{\sin(2bx)}{x}\,dx}{2b^2}\\
&= \frac{x}{2b}-\frac{x\cos(bx)\text{Ci}(bx)}{b}+\frac{\cos(bx)\sin(bx)}{2b^2}+\frac{\text{Ci}(bx)\sin(bx)}{b^2}-\frac{\text{Si}(2bx)}{2b^2}
\end{aligned}$$

Mathematica [A]
time = 0.04, size = 44, normalized size = 0.71

$$\frac{2bx+\text{CosIntegral}(bx)(-4bx\cos(bx)+4\sin(bx))+\sin(2bx)-2\text{Si}(2bx)}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[b*x]*Sin[b*x],x]
```

[Out] (2*b*x + CosIntegral[b*x]*(-4*b*x*Cos[b*x] + 4*Sin[b*x]) + Sin[2*b*x] - 2*SinIntegral[2*b*x])/(4*b^2)

Maple [A]
time = 0.41, size = 45, normalized size = 0.73

method	result	size
derivativedivides	$\frac{\mathrm{cosineIntegral}(bx)(\sin(bx)-bx\cos(bx))-\frac{\mathrm{sinIntegral}(2bx)}{2}+\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}}{b^2}$	45
default	$\frac{\mathrm{cosineIntegral}(bx)(\sin(bx)-bx\cos(bx))-\frac{\mathrm{sinIntegral}(2bx)}{2}+\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}}{b^2}$	45

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x)*(sin(b*x)-b*x*cos(b*x))-1/2*Si(2*b*x)+1/2*sin(b*x)*cos(b*x)+1/2*b*x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x*fresnel_cos(b*x)*sin(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 219 vs. 2(56) = 112.
time = 0.41, size = 219, normalized size = 3.53

$$-\frac{2\,\pi b^2 x\cos\left(bx\right)\mathrm{C}\left(bx\right)-2\,\pi b\,\mathrm{C}\left(bx\right)\sin\left(bx\right)-2\,b\cos\left(bx\right)\sin\left(\frac{1}{2}\,\pi b^2x^2\right)-\sqrt{b^2}\left(\pi\sin\left(\frac{1}{2\,\pi}\right)-\cos\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\left(\pi\sin\left(\frac{1}{2\,\pi}\right)-\cos\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*pi*b^2*x*cos(b*x)*fresnel_cos(b*x) - 2*pi*b*fresnel_cos(b*x)*sin(b*x) - 2*b*cos(b*x)*sin(1/2*pi*b^2*x^2) - sqrt(b^2)*(pi*sin(1/2/pi) - cos(1/2/pi))*fresnel_cos((pi*b*x + 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*(pi*sin(1/2/pi) - cos(1/2/pi))*fresnel_cos((pi*b*x - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*(pi*cos(1/2/pi) + sin(1/2/pi))*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi) + sin(1/2/pi))*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(pi*b)))/(pi*b^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\sin(bx)\operatorname{Ci}(bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x)*sin(b*x),x)
```

```
[Out] Integral(x*sin(b*x)*Ci(b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(b*x)*sin(b*x), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.02

$$\int x\,\mathrm{cosint}(b\,x)\,\sin(b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(b*x)*sin(b*x),x)
```

```
[Out] int(x*cosint(b*x)*sin(b*x), x)
```

3.112 $\int x^2 \textbf{CosIntegral}(bx)\sin(bx)\,dx$

Optimal. Leaf size=111

$$\frac{x^2}{4b}+\frac{\cos^2(bx)}{4b^3}+\frac{2\cos(bx)\text{CosIntegral}(bx)}{b^3}-\frac{x^2\cos(bx)\text{CosIntegral}(bx)}{b}-\frac{\text{CosIntegral}(2bx)}{b^3}-\frac{\log(x)}{b^3}+\frac{x\cos(bx)}{2b^2}$$

```
[Out] 1/4*x^2/b-Ci(2*b*x)/b^3+2*Ci(b*x)*cos(b*x)/b^3-x^2*Ci(b*x)*cos(b*x)/b+1/4*c
os(b*x)^2/b^3-ln(x)/b^3+2*x*Ci(b*x)*sin(b*x)/b^2+1/2*x*cos(b*x)*sin(b*x)/b^
2-sin(b*x)^2/b^3
```

Rubi [A]

time = 0.09, antiderivative size = 111, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {6655, 12, 3391, 30, 6649, 2644, 6653, 3393, 3383}

$$-\frac{\text{CosIntegral}(2bx)}{b^3}+\frac{2\text{CosIntegral}(bx)\cos(bx)}{b^3}-\frac{\log(x)}{b^3}-\frac{\sin^2(bx)}{b^3}+\frac{\cos^2(bx)}{4b^3}+\frac{2x\text{CosIntegral}(bx)\sin(bx)}{b^2}+\frac{x\sin(bx)\cos(bx)}{2b^2}-\frac{x^2\text{CosIntegral}(bx)\cos(bx)}{b}+\frac{x^2}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] x^2/(4*b) + Cos[b*x]^2/(4*b^3) + (2*Cos[b*x]*CosIntegral[b*x])/b^3 - (x^2*C
os[b*x]*CosIntegral[b*x])/b - CosIntegral[2*b*x]/b^3 - Log[x]/b^3 + (x*Cos[
b*x]*Sin[b*x])/(2*b^2) + (2*x*CosIntegral[b*x]*Sin[b*x])/b^2 - Sin[b*x]^2/b
^3
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
```

```
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\text{Ci}(bx)\sin(bx)\,dx = -\frac{x^2\cos(bx)\text{Ci}(bx)}{b} + \frac{2\int x\cos(bx)\text{Ci}(bx)\,dx}{b} + \int \frac{x\cos^2(bx)}{b}\,dx$$

$$= -\frac{x^2\cos(bx)\text{Ci}(bx)}{b} + \frac{2x\text{Ci}(bx)\sin(bx)}{b^2} - \frac{2\int \text{Ci}(bx)\sin(bx)\,dx}{b^2} + \frac{\int x\cos^2(bx)\,dx}{b} -$$

$$= \frac{\cos^2(bx)}{4b^3} + \frac{2\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^2\cos(bx)\text{Ci}(bx)}{b} + \frac{x\cos(bx)\sin(bx)}{2b^2} + \frac{2x\text{Ci}(bx)\sin(}{b^2}$$

$$= \frac{x^2}{4b} + \frac{\cos^2(bx)}{4b^3} + \frac{2\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^2\cos(bx)\text{Ci}(bx)}{b} + \frac{x\cos(bx)\sin(bx)}{2b^2} + \frac{2x\text{Ci}(b}{}$$

$$= \frac{x^2}{4b} + \frac{\cos^2(bx)}{4b^3} + \frac{2\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^2\cos(bx)\text{Ci}(bx)}{b} + \frac{x\cos(bx)\sin(bx)}{2b^2} + \frac{2x\text{Ci}(b}{}$$

$$= \frac{x^2}{4b} + \frac{\cos^2(bx)}{4b^3} + \frac{2\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^2\cos(bx)\text{Ci}(bx)}{b} - \frac{\log(x)}{b^3} + \frac{x\cos(bx)\sin(bx)}{2b^2}$$

$$= \frac{x^2}{4b} + \frac{\cos^2(bx)}{4b^3} + \frac{2\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^2\cos(bx)\text{Ci}(bx)}{b} - \frac{\text{Ci}(2bx)}{b^3} - \frac{\log(x)}{b^3} + \frac{x\cos(}{}$$

Mathematica [A]
time = 0.07, size = 72, normalized size = 0.65

$$\frac{2b^2x^2 + 5\cos(2bx) - 8\text{CosIntegral}(2bx) - 8\log(x) - 8\text{CosIntegral}(bx)\left((-2+b^2x^2)\cos(bx) - 2bx\sin(bx)\right) + 2bx\sin(2bx)}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] (2*b^2*x^2 + 5*Cos[2*b*x] - 8*CosIntegral[2*b*x] - 8*Log[x] - 8*CosIntegral
[b*x]*((-2 + b^2*x^2)*Cos[b*x] - 2*b*x*Sin[b*x]) + 2*b*x*Sin[2*b*x])/(8*b^3
)
```

Maple [A]
time = 0.32, size = 91, normalized size = 0.82

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx)\left(-b^2x^2\cos(bx)+2\cos(bx)+2bx\sin(bx)\right)+bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)-\frac{b^2x^2}{4}-\frac{\left(\sin^2(bx)\right)}{4}-\ln(bx)-\text{cosineInt}}{b^3}$
default	$\frac{\text{cosineIntegral}(bx)\left(-b^2x^2\cos(bx)+2\cos(bx)+2bx\sin(bx)\right)+bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)-\frac{b^2x^2}{4}-\frac{\left(\sin^2(bx)\right)}{4}-\ln(bx)-\text{cosineInt}}{b^3}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Ci(b*x)*(-b^2*x^2*cos(b*x)+2*cos(b*x)+2*b*x*sin(b*x))+b*x*(1/2*sin(b
*x)*cos(b*x)+1/2*b*x)-1/4*b^2*x^2-1/4*sin(b*x)^2-ln(b*x)-Ci(2*b*x)+cos(b*x)
^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^2*fresnel_cos(b*x)*sin(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 296 vs. 2(105) = 210.
time = 0.41, size = 296, normalized size = 2.67

$$-\frac{2\left(\pi^{2}b^{3}x^{2}-2\pi^{2}b\right)\cos\left(bx\right)C\left(bx\right)+\sqrt{b^{2}}\left(\left(2\pi^{2}-1\right)\cos\left(\frac{1}{2\pi}\right)+\pi\sin\left(\frac{1}{2\pi}\right)\right)C\left(\frac{(\pi bx+1)\sqrt{b^{2}}}{\pi b}\right)+\sqrt{b^{2}}\left(\left(2\pi^{2}-1\right)\cos\left(\frac{1}{2\pi}\right)+\pi\sin\left(\frac{1}{2\pi}\right)\right)C\left(\frac{(\pi bx-1)\sqrt{b^{2}}}{\pi b}\right)-\sqrt{b^{2}}\left(\pi\cos\left(\frac{1}{2\pi}\right)-\left(2\pi^{2}-1\right)\sin\left(\frac{1}{2\pi}\right)\right)S\left(\frac{(\pi bx+1)\sqrt{b^{2}}}{\pi b}\right)-\sqrt{b^{2}}\left(\pi\cos\left(\frac{1}{2\pi}\right)-\left(2\pi^{2}-1\right)\sin\left(\frac{1}{2\pi}\right)\right)S\left(\frac{(\pi bx-1)\sqrt{b^{2}}}{\pi b}\right)-2\left(\pi b^{2}x\cos\left(bx\right)-2\pi b\sin\left(bx\right)\right)\sin\left(\frac{1}{2}\pi b^{2}x^{2}\right)-2\left(2\pi^{2}b^{2}xC\left(bx\right)-b\cos\left(\frac{1}{2}\pi b^{2}x^{2}\right)\right)\sin\left(bx\right)}{2\pi^{2}b^{4}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*(pi^2*b^3*x^2 - 2*pi^2*b)*cos(b*x)*fresnel_cos(b*x) + sqrt(b^2)*((2
*pi^2 - 1)*cos(1/2/pi) + pi*sin(1/2/pi))*fresnel_cos((pi*b*x + 1)*sqrt(b^2)
/(pi*b)) + sqrt(b^2)*((2*pi^2 - 1)*cos(1/2/pi) + pi*sin(1/2/pi))*fresnel_co
s((pi*b*x - 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi) - (2*pi^2 - 1)
*sin(1/2/pi))*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*co
s(1/2/pi) - (2*pi^2 - 1)*sin(1/2/pi))*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(p
i*b)) - 2*(pi*b^2*x*cos(b*x) - 2*pi*b*sin(b*x))*sin(1/2*pi*b^2*x^2) - 2*(2*
pi^2*b^2*x*fresnel_cos(b*x) - b*cos(1/2*pi*b^2*x^2))*sin(b*x))/(pi^2*b^4)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{2}\sin\left(bx\right)\operatorname{Ci}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x)*sin(b*x),x)
```

```
[Out] Integral(x**2*sin(b*x)*Ci(b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] integrate(x^2*fresnel_cos(b*x)*sin(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2 \operatorname{cosint}(b\,x)\,\sin\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(b*x)*sin(b*x),x)
```

```
[Out] int(x^2*cosint(b*x)*sin(b*x), x)
```

3.113 $\int x^3 \mathbf{CosIntegral}(bx) \sin(bx)\,dx$

Optimal. Leaf size=147

$$-\frac{5x}{2b^3}+\frac{x^3}{6b}+\frac{x\cos^2(bx)}{2b^3}+\frac{6x\cos(bx)\text{CosIntegral}(bx)}{b^3}-\frac{x^3\cos(bx)\text{CosIntegral}(bx)}{b}-\frac{4\cos(bx)\sin(bx)}{b^4}+\frac{x^2\cos(}{}$$

```
[Out] -5/2*x/b^3+1/6*x^3/b+6*x*Ci(b*x)*cos(b*x)/b^3-x^3*Ci(b*x)*cos(b*x)/b+1/2*x*
cos(b*x)^2/b^3+3*Si(2*b*x)/b^4-6*Ci(b*x)*sin(b*x)/b^4+3*x^2*Ci(b*x)*sin(b*x
)/b^2-4*cos(b*x)*sin(b*x)/b^4+1/2*x^2*cos(b*x)*sin(b*x)/b^2-3/2*x*sin(b*x)^
2/b^3
```

Rubi [A]
time = 0.13, antiderivative size = 147, normalized size of antiderivative = 1.00, number of steps used = 20, number of rules used = 11, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.917$, Rules used = {6655, 12, 3392, 30, 2715, 8, 6649, 3524, 6647, 4491, 3380}

$$-\frac{6\text{CosIntegral}(bx)\sin(bx)}{b^4}+\frac{3\text{Si}(2bx)}{b^4}-\frac{4\sin(bx)\cos(bx)}{b^4}+\frac{6x\text{CosIntegral}(bx)\cos(bx)}{b^3}-\frac{5x}{2b^3}-\frac{3x\sin^2(bx)}{2b^3}+\frac{x\cos^2(bx)}{2b^3}+\frac{3x^2\text{CosIntegral}(bx)\sin(bx)}{b^2}+\frac{x^2\sin(bx)\cos(bx)}{2b^2}-\frac{x^3\text{CosIntegral}(bx)\cos(bx)}{b}+\frac{x^3}{6b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] (-5*x)/(2*b^3) + x^3/(6*b) + (x*Cos[b*x]^2)/(2*b^3) + (6*x*Cos[b*x]*CosInte
gral[b*x])/b^3 - (x^3*Cos[b*x]*CosIntegral[b*x])/b - (4*Cos[b*x]*Sin[b*x])/
b^4 + (x^2*Cos[b*x]*Sin[b*x])/(2*b^2) - (6*CosIntegral[b*x]*Sin[b*x])/b^4 +
 (3*x^2*CosIntegral[b*x]*Sin[b*x])/b^2 - (3*x*Sin[b*x]^2)/(2*b^3) + (3*SinI
ntegral[2*b*x])/b^4
```

Rule 8

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

Rule 12

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

Rule 30

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
```

```
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3392

```
Int[((c_.) + (d_.)*(x_))^(m_)*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbo
l] :> Simp[d*m*(c + d*x)^(m - 1)*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist
[b^2*((n - 1)/n), Int[(c + d*x)^m*(b*Sin[e + f*x])^(n - 2), x], x] - Dist[d
^2*m*((m - 1)/(f^2*n^2)), Int[(c + d*x)^(m - 2)*(b*Sin[e + f*x])^n, x], x]
- Simp[b*(c + d*x)^m*Cos[e + f*x]*((b*Sin[e + f*x])^(n - 1)/(f*n)), x]) /;
FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 1]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^3\text{Ci}(bx)\sin(bx)\,dx = -\frac{x^3\cos(bx)\text{Ci}(bx)}{b} + \frac{3\int x^2\cos(bx)\text{Ci}(bx)\,dx}{b} + \int \frac{x^2\cos^2(bx)}{b}\,dx$$
$$= -\frac{x^3\cos(bx)\text{Ci}(bx)}{b} + \frac{3x^2\text{Ci}(bx)\sin(bx)}{b^2} - \frac{6\int x\text{Ci}(bx)\sin(bx)\,dx}{b^2} + \frac{\int x^2\cos^2(bx)\,d}{b}$$
$$= \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} + \frac{x^2\cos(bx)\sin(bx)}{2b^2} + \frac{3x^2\text{Ci}(b}{}$$
$$= \frac{x^3}{6b} + \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} - \frac{\cos(bx)\sin(bx)}{4b^4} + \frac{x^2\text{c}}{}$$
$$= -\frac{x}{4b^3} + \frac{x^3}{6b} + \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} - \frac{4\cos(bx)\sin(b}{b^4}$$
$$= -\frac{5x}{2b^3} + \frac{x^3}{6b} + \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} - \frac{4\cos(bx)\sin(b}{b^4}$$
$$= -\frac{5x}{2b^3} + \frac{x^3}{6b} + \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} - \frac{4\cos(bx)\sin(b}{b^4}$$
$$= -\frac{5x}{2b^3} + \frac{x^3}{6b} + \frac{x\cos^2(bx)}{2b^3} + \frac{6x\cos(bx)\text{Ci}(bx)}{b^3} - \frac{x^3\cos(bx)\text{Ci}(bx)}{b} - \frac{4\cos(bx)\sin(b}{b^4}$$

Mathematica [A]
time = 0.08, size = 94, normalized size = 0.64

$$\frac{-36bx + 2b^3x^3 + 12bx\cos(2bx) - 12\text{CosIntegral}(bx)\left(bx(-6+b^2x^2)\cos(bx) - 3(-2+b^2x^2)\sin(bx)\right) - 24\sin(2bx) + 3b^2x^2\sin(2bx) + 36\text{Si}(2bx)}{12b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*CosIntegral[b*x]*Sin[b*x],x]
```

```
[Out] (-36*b*x + 2*b^3*x^3 + 12*b*x*Cos[2*b*x] - 12*CosIntegral[b*x]*(b*x*(-6 + b
^2*x^2)*Cos[b*x] - 3*(-2 + b^2*x^2)*Sin[b*x]) - 24*Sin[2*b*x] + 3*b^2*x^2*S
in[2*b*x] + 36*SinIntegral[2*b*x])/(12*b^4)
```

Maple [A]
time = 0.40, size = 111, normalized size = 0.76

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx)\left(-b^3x^3\cos(bx)+3b^2x^2\sin(bx)-6\sin(bx)+6bx\cos(bx)\right)+b^2x^2\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+2bx\left(\cos^2(bx)\right)-4\,\mathrm{s}}{b^4}$
default	$\frac{\text{cosineIntegral}(bx)\left(-b^3x^3\cos(bx)+3b^2x^2\sin(bx)-6\sin(bx)+6bx\cos(bx)\right)+b^2x^2\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+2bx\left(\cos^2(bx)\right)-4\,\mathrm{s}}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Ci(b*x)*sin(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(Ci(b*x)*(-b^3*x^3*cos(b*x)+3*b^2*x^2*sin(b*x)-6*sin(b*x)+6*b*x*cos(b
*x))+b^2*x^2*(1/2*sin(b*x)*cos(b*x)+1/2*b*x)+2*cos(b*x)^2*b*x-4*sin(b*x)*co
s(b*x)-4*b*x-1/3*b^3*x^3+3*Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*sin(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^3*fresnel_cos(b*x)*sin(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 361 vs. $2(137) = 274$.
time = 0.44, size = 361, normalized size = 2.46

$$-\frac{2\,\pi b\cos\left(\frac{1}{2}\,\pi b^2x^2\right)\cos\left(bx\right)+2\left(\pi^3b^4x^3-6\,\pi^3b^2x\right)\cos\left(bx\right)\mathrm{C}\left(bx\right)+\left(6\,\pi^3\sin\left(\frac{1}{2\,\pi}\right)-\left(3\,\pi^2-1\right)\cos\left(\frac{1}{2\,\pi}\right)\right)\sqrt{b^2}\,\mathrm{C}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)-\left(6\,\pi^3\sin\left(\frac{1}{2\,\pi}\right)-\left(3\,\pi^2-1\right)\cos\left(\frac{1}{2\,\pi}\right)\right)\sqrt{b^2}\,\mathrm{C}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)-\left(6\,\pi^3\cos\left(\frac{1}{2\,\pi}\right)+\left(3\,\pi^2-1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)+\left(6\,\pi^3\cos\left(\frac{1}{2\,\pi}\right)+\left(3\,\pi^2-1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)+2\left(3\,\pi^2b^2x\sin\left(bx\right)-\left(\pi^2b^3x^2-6\,\pi^2b+b\right)\cos\left(bx\right)\right)\sin\left(\frac{1}{2}\,\pi b^2x^2\right)+2\left(\pi b^2x\cos\left(\frac{1}{2}\,\pi b^2x^2\right)-3\left(\pi^3b^3x^2-2\,\pi^3b\right)\mathrm{C}\left(bx\right)\right)\sin\left(bx\right)}{2\,\pi^3b^5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*sin(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*pi*b*cos(1/2*pi*b^2*x^2)*cos(b*x) + 2*(pi^3*b^4*x^3 - 6*pi^3*b^2*x)
*cos(b*x)*fresnel_cos(b*x) + (6*pi^3*sin(1/2/pi) - (3*pi^2 - 1)*cos(1/2/pi)
)*sqrt(b^2)*fresnel_cos((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - (6*pi^3*sin(1/2/pi
) - (3*pi^2 - 1)*cos(1/2/pi))*sqrt(b^2)*fresnel_cos((pi*b*x - 1)*sqrt(b^2)/
(pi*b)) - (6*pi^3*cos(1/2/pi) + (3*pi^2 - 1)*sin(1/2/pi))*sqrt(b^2)*fresnel
_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) + (6*pi^3*cos(1/2/pi) + (3*pi^2 - 1)*si
n(1/2/pi))*sqrt(b^2)*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(pi*b)) + 2*(3*pi^2
*b^2*x*sin(b*x) - (pi^2*b^3*x^2 - 6*pi^2*b + b)*cos(b*x))*sin(1/2*pi*b^2*x^
2) + 2*(pi*b^2*x*cos(1/2*pi*b^2*x^2) - 3*(pi^3*b^3*x^2 - 2*pi^3*b)*fresnel_
cos(b*x))*sin(b*x))/(pi^3*b^5)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^3 \sin(bx) \operatorname{Ci}(bx)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Ci(b*x)*sin(b*x),x)
```

```
[Out] Integral(x**3*sin(b*x)*Ci(b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*sin(b*x),x, algorithm="giac")
```

```
[Out] integrate(x^3*fresnel_cos(b*x)*sin(b*x), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3 \operatorname{cosint}(b\,x)\, \sin(b\,x)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cosint(b*x)*sin(b*x),x)
```

```
[Out] int(x^3*cosint(b*x)*sin(b*x), x)
```

3.114 $\int \frac{\cos(bx)\mathbf{CosIntegral}(bx)}{x^3}\,dx$

Optimal. Leaf size=97

$$-\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{CosIntegral}(bx)}{2x^2}-\frac{1}{4}b^2\text{CosIntegral}(bx)^2-b^2\text{CosIntegral}(2bx)+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{CosInte}}{}$$

```
[Out] -1/4*b^2*Ci(b*x)^2-b^2*Ci(2*b*x)-1/2*Ci(b*x)*cos(b*x)/x^2-1/4*cos(b*x)^2/x^
2+1/2*b*Ci(b*x)*sin(b*x)/x+1/2*b*cos(b*x)*sin(b*x)/x+1/4*b*sin(2*b*x)/x
```

Rubi [A]
time = 0.14, antiderivative size = 97, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {6651, 6657, 6818, 12, 4491, 3378, 3383, 3395, 29, 3393}

$$-\frac{1}{4}b^2\text{CosIntegral}(bx)^2-b^2\text{CosIntegral}(2bx)-\frac{\text{CosIntegral}(bx)\cos(bx)}{2x^2}+\frac{b\text{CosIntegral}(bx)\sin(bx)}{2x}-\frac{\cos^2(bx)}{4x^2}+\frac{b\sin(2bx)}{4x}+\frac{b\sin(bx)\cos(bx)}{2x}$$

Antiderivative was successfully verified.

```
[In] Int[(Cos[b*x]*CosIntegral[b*x])/x^3,x]
```

```
[Out] -1/4*Cos[b*x]^2/x^2 - (Cos[b*x]*CosIntegral[b*x])/(2*x^2) - (b^2*CosIntegra
l[b*x]^2)/4 - b^2*CosIntegral[2*b*x] + (b*Cos[b*x]*Sin[b*x])/(2*x) + (b*Cos
Integral[b*x]*Sin[b*x])/(2*x) + (b*Sin[2*b*x])/(4*x)
```

Rule 12

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

Rule 29

```
Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]
```

Rule 3378

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(c
 + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
 + d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3395

```
Int[((c_.) + (d_.)*(x_))^(m_)*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbo
l] :> Simp[(c + d*x)^(m + 1)*((b*Sin[e + f*x])^n/(d*(m + 1))), x] + (Dist[b
^2*f^2*n*((n - 1)/(d^2*(m + 1)*(m + 2))), Int[(c + d*x)^(m + 2)*(b*Sin[e +
f*x])^(n - 2), x], x] - Dist[f^2*(n^2/(d^2*(m + 1)*(m + 2))), Int[(c + d*x)
^(m + 2)*(b*Sin[e + f*x])^n, x], x] - Simp[b*f*n*(c + d*x)^(m + 2)*Cos[e +
f*x]*((b*Sin[e + f*x])^(n - 1)/(d^2*(m + 1)*(m + 2))), x]) /; FreeQ[{b, c,
d, e, f}, x] && GtQ[n, 1] && LtQ[m, -2]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6651

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^(m + 1)*Cos[a + b*x]*(CosIntegral[
c + d*x]/(f*(m + 1))), x] + (Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Sin[
a + b*x]*CosIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Cos[a + b*x]*(Cos[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6657

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_)*Sin[(a_.) + (
b_.)*(x_)], x_Symbol] :> Simp[(e + f*x)^(m + 1)*Sin[a + b*x]*(CosIntegral[c
 + d*x]/(f*(m + 1))), x] + (-Dist[b/(f*(m + 1)), Int[(e + f*x)^(m + 1)*Cos[
a + b*x]*CosIntegral[c + d*x], x], x] - Dist[d/(f*(m + 1)), Int[(e + f*x)^(
m + 1)*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x)), x], x]) /; FreeQ[{a, b, c, d,
 e, f}, x] && ILtQ[m, -1]
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cos(bx)\text{Ci}(bx)}{x^3}\,dx &= -\frac{\cos(bx)\text{Ci}(bx)}{2x^2}+\frac{1}{2}b\int \frac{\cos^2(bx)}{bx^3}\,dx-\frac{1}{2}b\int \frac{\text{Ci}(bx)\sin(bx)}{x^2}\,dx \\
&= -\frac{\cos(bx)\text{Ci}(bx)}{2x^2}+\frac{b\text{Ci}(bx)\sin(bx)}{2x}+\frac{1}{2}\int \frac{\cos^2(bx)}{x^3}\,dx-\frac{1}{2}b^2\int \frac{\cos(bx)\text{Ci}(bx)}{x}\,dx-\frac{1}{2} \\
&= -\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{Ci}(bx)}{2x^2}-\frac{1}{4}b^2\text{Ci}(bx)^2+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{Ci}(bx)\sin(bx)}{2x}-\frac{1}{2}b \\
&= -\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{Ci}(bx)}{2x^2}-\frac{1}{4}b^2\text{Ci}(bx)^2+\frac{1}{2}b^2\log(x)+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{Ci}(bx)}{2} \\
&= -\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{Ci}(bx)}{2x^2}-\frac{1}{4}b^2\text{Ci}(bx)^2+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{Ci}(bx)\sin(bx)}{2x}-\frac{1}{4}b \\
&= -\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{Ci}(bx)}{2x^2}-\frac{1}{4}b^2\text{Ci}(bx)^2-\frac{1}{2}b^2\text{Ci}(2bx)+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{Ci}(bx}{} \\
&= -\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{Ci}(bx)}{2x^2}-\frac{1}{4}b^2\text{Ci}(bx)^2-b^2\text{Ci}(2bx)+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{Ci}(bx)}{2x}
\end{aligned}$$

Mathematica [A]
time = 0.01, size = 97, normalized size = 1.00

$$-\frac{\cos^2(bx)}{4x^2}-\frac{\cos(bx)\text{CosIntegral}(bx)}{2x^2}-\frac{1}{4}b^2\text{CosIntegral}(bx)^2-b^2\text{CosIntegral}(2bx)+\frac{b\cos(bx)\sin(bx)}{2x}+\frac{b\text{CosIntegral}(bx)\sin(bx)}{2x}+\frac{b\sin(2bx)}{4x}$$

Antiderivative was successfully verified.

```
[In] Integrate[(Cos[b*x]*CosIntegral[b*x])/x^3,x]
[Out] -1/4*Cos[b*x]^2/x^2 - (Cos[b*x]*CosIntegral[b*x])/(2*x^2) - (b^2*CosIntegra
l[b*x]^2)/4 - b^2*CosIntegral[2*b*x] + (b*Cos[b*x]*Sin[b*x])/(2*x) + (b*Cos
Integral[b*x]*Sin[b*x])/(2*x) + (b*Sin[2*b*x])/(4*x)
```

Maple [F]
time = 0.19, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx)\cos\,(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*cos(b*x)/x^3,x)
[Out] int(Ci(b*x)*cos(b*x)/x^3,x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^3,x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x^3, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^3,x, algorithm="fricas")
```

```
[Out] integral(cos(b*x)*fresnel_cos(b*x)/x^3, x)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\operatorname{Ci}(bx)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*cos(b*x)/x**3,x)
```

```
[Out] Integral(cos(b*x)*Ci(b*x)/x**3, x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^3,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x^3, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \frac{\operatorname{cosint}(b\,x)\,\cos(b\,x)}{x^3}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*cos(b*x))/x^3,x)
```

```
[Out] int((cosint(b*x)*cos(b*x))/x^3, x)
```

3.115 $\int \frac{\cos(bx)\textbf{CosIntegral}(bx)}{x^2}\,dx$

Optimal. Leaf size=51

$$-\frac{\cos^2(bx)}{x}-\frac{\cos(bx)\text{CosIntegral}(bx)}{x}-b\text{Si}(2bx)-b\text{Int}\left(\frac{\text{CosIntegral}(bx)\sin(bx)}{x},x\right)$$

```
[Out] -b*CannotIntegrate(Ci(b*x)*sin(b*x)/x,x)-Ci(b*x)*cos(b*x)/x-cos(b*x)^2/x-b*
Si(2*b*x)
```

Rubi [A]
time = 0.07, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}}=0.000$, Rules used = {}

$$\int \frac{\cos(bx)\text{CosIntegral}(bx)}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[b*x]*CosIntegral[b*x])/x^2,x]
```

```
[Out] -(Cos[b*x]^2/x) - (Cos[b*x]*CosIntegral[b*x])/x - b*SinIntegral[2*b*x] - b*
Defer[Int][(CosIntegral[b*x]*Sin[b*x])/x, x]
```

Rubi steps

$$\begin{aligned}
\int \frac{\cos(bx)\text{Ci}(bx)}{x^2}\,dx &= -\frac{\cos(bx)\text{Ci}(bx)}{x}+b\int \frac{\cos^2(bx)}{bx^2}\,dx-b\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx\\
&= -\frac{\cos(bx)\text{Ci}(bx)}{x}-b\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx+\int \frac{\cos^2(bx)}{x^2}\,dx\\
&= -\frac{\cos^2(bx)}{x}-\frac{\cos(bx)\text{Ci}(bx)}{x}-b\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx+(2b)\int -\frac{\sin(2bx)}{2x}\,dx\\
&= -\frac{\cos^2(bx)}{x}-\frac{\cos(bx)\text{Ci}(bx)}{x}-b\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx-b\int \frac{\sin(2bx)}{x}\,dx\\
&= -\frac{\cos^2(bx)}{x}-\frac{\cos(bx)\text{Ci}(bx)}{x}-b\text{Si}(2bx)-b\int \frac{\text{Ci}(bx)\sin(bx)}{x}\,dx
\end{aligned}$$

Mathematica [A]
time = 0.32, size = 0, normalized size = 0.00

$$\int \frac{\cos(bx)\text{CosIntegral}(bx)}{x^2}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[b*x]*CosIntegral[b*x])/x^2,x]
```

```
[Out] Integrate[(Cos[b*x]*CosIntegral[b*x])/x^2, x]
```

Maple [A]
time = 0.18, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx)\cos\,(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*cos(b*x)/x^2,x)
```

```
[Out] int(Ci(b*x)*cos(b*x)/x^2,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^2,x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x^2, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^2,x, algorithm="fricas")
```

```
[Out] integral(cos(b*x)*fresnel_cos(b*x)/x^2, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos\,(bx)\,\text{Ci}\,(bx)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*cos(b*x)/x**2,x)
```

```
[Out] Integral(cos(b*x)*Ci(b*x)/x**2, x)
```

<u>**Giac**</u> [**A**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x^2,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x^2, x)
```

<u>**Mupad**</u> [**A**]
time = 0.00, size = -1, normalized size = -0.02

$$\int \frac{\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)}{x^2}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*cos(b*x))/x^2,x)
```

```
[Out] int((cosint(b*x)*cos(b*x))/x^2, x)
```

3.116 $\int \frac{\cos(bx)\textbf{CosIntegral}(bx)}{x}\,dx$

Optimal. Leaf size=10

$$\frac{1}{2}\text{CosIntegral}(bx)^2$$

```
[Out] 1/2*Ci(b*x)^2
```

Rubi [A]
time = 0.01, antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.083$, Rules used = {6818}

$$\frac{1}{2}\text{CosIntegral}(bx)^2$$

Antiderivative was successfully verified.

```
[In] Int[(Cos[b*x]*CosIntegral[b*x])/x,x]
```

```
[Out] CosIntegral[b*x]^2/2
```

Rule 6818

```
Int[(u_)*(y_)^(m_.), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Si
mp[q*(y^(m + 1)/(m + 1)), x] /;  !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]
```

Rubi steps

$$\int \frac{\cos(bx)\text{Ci}(bx)}{x}\,dx = \frac{\text{Ci}(bx)^2}{2}$$

Mathematica [A]
time = 0.01, size = 10, normalized size = 1.00

$$\frac{1}{2}\text{CosIntegral}(bx)^2$$

Antiderivative was successfully verified.

```
[In] Integrate[(Cos[b*x]*CosIntegral[b*x])/x,x]
```

```
[Out] CosIntegral[b*x]^2/2
```

Maple [A]
time = 0.12, size = 9, normalized size = 0.90

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx)^2}{2}$	9
default	$\frac{\text{cosineIntegral}(bx)^2}{2}$	9

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*cos(b*x)/x,x,method=_RETURNVERBOSE)
[Out] 1/2*Ci(b*x)^2
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x,x, algorithm="maxima")
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x, x)
```

Fricas [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x,x, algorithm="fricas")
[Out] integral(cos(b*x)*fresnel_cos(b*x)/x, x)
```

Sympy [A]
time = 0.24, size = 7, normalized size = 0.70

$$\frac{\text{Ci}^2\,(bx)}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x)*cos(b*x)/x,x)
[Out] Ci(b*x)**2/2
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x)*cos(b*x)/x,x, algorithm="giac")
```

```
[Out] integrate(cos(b*x)*fresnel_cos(b*x)/x, x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.10

$$\frac{\mathrm{cosint}(b\,x)^2}{2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(b*x)*cos(b*x))/x,x)
```

```
[Out] cosint(b*x)^2/2
```

3.117 $\int \cos(bx)\textbf{CosIntegral}(bx)\,dx$

Optimal. Leaf size=25

$$\frac{\text{CosIntegral}(bx)\sin(bx)}{b}-\frac{\text{Si}(2bx)}{2b}$$

```
[Out] -1/2*Si(2*b*x)/b+Ci(b*x)*sin(b*x)/b
```

Rubi [A]
time = 0.03, antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}}=0.444$, Rules used = {6647, 12, 4491, 3380}

$$\frac{\text{CosIntegral}(bx)\sin(bx)}{b}-\frac{\text{Si}(2bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (CosIntegral[b*x]*Sin[b*x])/b - SinIntegral[2*b*x]/(2*b)
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \cos(bx)\text{Ci}(bx)\,dx &= \frac{\text{Ci}(bx)\sin(bx)}{b} - \int \frac{\cos(bx)\sin(bx)}{bx}\,dx \\ &= \frac{\text{Ci}(bx)\sin(bx)}{b} - \frac{\int \frac{\cos(bx)\sin(bx)}{x}\,dx}{b} \\ &= \frac{\text{Ci}(bx)\sin(bx)}{b} - \frac{\int \frac{\sin(2bx)}{2x}\,dx}{b} \\ &= \frac{\text{Ci}(bx)\sin(bx)}{b} - \frac{\int \frac{\sin(2bx)}{x}\,dx}{2b} \\ &= \frac{\text{Ci}(bx)\sin(bx)}{b} - \frac{\text{Si}(2bx)}{2b}\end{aligned}$$

Mathematica [A]
time = 0.01, size = 25, normalized size = 1.00

$$\frac{\text{CosIntegral}(bx)\sin(bx)}{b} - \frac{\text{Si}(2bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[b*x]*CosIntegral[b*x],x]
[Out] (CosIntegral[b*x]*Sin[b*x])/b - SinIntegral[2*b*x]/(2*b)
```

Maple [A]
time = 0.23, size = 22, normalized size = 0.88

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx)\sin(bx)-\frac{\text{sinIntegral}(2bx)}{2}}{b}$	22
default	$\frac{\text{cosineIntegral}(bx)\sin(bx)-\frac{\text{sinIntegral}(2bx)}{2}}{b}$	22

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x)*cos(b*x),x,method=_RETURNVERBOSE)
[Out] 1/b*(Ci(b*x)*sin(b*x)-1/2*Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(fresnel_cos(b*x)*cos(b*x),x, algorithm="maxima")

[Out] integrate(cos(b*x)*fresnel_cos(b*x), x)

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 143 vs. $2(23) = 46$.
time = 0.36, size = 143, normalized size = 5.72

$$\frac{2\,b\,\mathrm{C}\left(bx\right)\sin\left(bx\right)-\sqrt{b^2}\,\cos\left(\frac{1}{2\,\pi}\right)\mathrm{S}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\,\cos\left(\frac{1}{2\,\pi}\right)\mathrm{S}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\,\mathrm{C}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)-\sqrt{b^2}\,\mathrm{C}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(fresnel_cos(b*x)*cos(b*x),x, algorithm="fricas")

[Out] 1/2*(2*b*fresnel_cos(b*x)*sin(b*x) - sqrt(b^2)*cos(1/2/pi)*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*cos(1/2/pi)*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*fresnel_cos((pi*b*x + 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi) - sqrt(b^2)*fresnel_cos((pi*b*x - 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi))/b^2

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\cos\left(bx\right)\mathrm{Ci}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(Ci(b*x)*cos(b*x),x)

[Out] Integral(cos(b*x)*Ci(b*x), x)

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

[In] integrate(fresnel_cos(b*x)*cos(b*x),x, algorithm="giac")

[Out] integrate(cos(b*x)*fresnel_cos(b*x), x)

Mupad [F]
time = 0.00, size = -1, normalized size = -0.04

$$\int\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

[In] int(cosint(b*x)*cos(b*x),x)

[Out] int(cosint(b*x)*cos(b*x), x)

3.118 $\int x \cos(bx)\mathbf{CosIntegral}(bx)\,dx$

Optimal. Leaf size=60

$$\frac{\cos(bx)\text{CosIntegral}(bx)}{b^2}-\frac{\text{CosIntegral}(2bx)}{2b^2}-\frac{\log(x)}{2b^2}+\frac{x\text{CosIntegral}(bx)\sin(bx)}{b}-\frac{\sin^2(bx)}{2b^2}$$

```
[Out] -1/2*Ci(2*b*x)/b^2+Ci(b*x)*cos(b*x)/b^2-1/2*ln(x)/b^2+x*Ci(b*x)*sin(b*x)/b-
1/2*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.05, antiderivative size = 60, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 7, integrand size = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.700$, Rules used = {6649, 12, 2644, 30, 6653, 3393, 3383}

$$-\frac{\text{CosIntegral}(2bx)}{2b^2}+\frac{\text{CosIntegral}(bx)\cos(bx)}{b^2}-\frac{\log(x)}{2b^2}-\frac{\sin^2(bx)}{2b^2}+\frac{x\text{CosIntegral}(bx)\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (Cos[b*x]*CosIntegral[b*x])/b^2 - CosIntegral[2*b*x]/(2*b^2) - Log[x]/(2*b^
2) + (x*CosIntegral[b*x]*Sin[b*x])/b - Sin[b*x]^2/(2*b^2)
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}
\int x\cos(bx)\text{Ci}(bx)\,dx &= \frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\int \text{Ci}(bx)\sin(bx)\,dx}{b}-\int \frac{\cos(bx)\sin(bx)}{b}\,dx\\
&= \frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\int \frac{\cos^2(bx)}{bx}\,dx}{b}-\frac{\int \cos(bx)\sin(bx)\,dx}{b}\\
&= \frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\int \frac{\cos^2(bx)}{x}\,dx}{b^2}-\frac{\text{Subst}(\int x\,dx,x,\sin(bx))}{b^2}\\
&= \frac{\cos(bx)\text{Ci}(bx)}{b^2}+\frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\sin^2(bx)}{2b^2}-\frac{\int \left(\frac{1}{2x}+\frac{\cos(2bx)}{2x}\right)\,dx}{b^2}\\
&= \frac{\cos(bx)\text{Ci}(bx)}{b^2}-\frac{\log(x)}{2b^2}+\frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\sin^2(bx)}{2b^2}-\frac{\int \frac{\cos(2bx)}{x}\,dx}{2b^2}\\
&= \frac{\cos(bx)\text{Ci}(bx)}{b^2}-\frac{\text{Ci}(2bx)}{2b^2}-\frac{\log(x)}{2b^2}+\frac{x\text{Ci}(bx)\sin(bx)}{b}-\frac{\sin^2(bx)}{2b^2}
\end{aligned}$$

Mathematica [A]
time = 0.04, size = 42, normalized size = 0.70

$$\frac{\cos(2bx)-2\text{CosIntegral}(2bx)-2\log(x)+4\text{CosIntegral}(bx)(\cos(bx)+bx\sin(bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (Cos[2*b*x] - 2*CosIntegral[2*b*x] - 2*Log[x] + 4*CosIntegral[b*x]*(Cos[b*x
] + b*x*Sin[b*x]))/(4*b^2)
```

Maple [A]
time = 0.39, size = 44, normalized size = 0.73

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx)(\cos(bx)+bx\sin(bx))-\frac{\ln(bx)}{2}-\frac{\text{cosineIntegral}(2bx)}{2}+\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	44
default	$\frac{\text{cosineIntegral}(bx)(\cos(bx)+bx\sin(bx))-\frac{\ln(bx)}{2}-\frac{\text{cosineIntegral}(2bx)}{2}+\frac{\left(\cos^2(bx)\right)}{2}}{b^2}$	44

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x)*cos(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x)*(cos(b*x)+b*x*sin(b*x))-1/2*ln(b*x)-1/2*Ci(2*b*x)+1/2*cos(b*
x)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*cos(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x)*fresnel_cos(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 221 vs. 2(54) = 108.
time = 0.43, size = 221, normalized size = 3.68

$$\frac{2\,\pi b^2 x\,\mathrm{C}\left(bx\right)\sin\left(bx\right)+2\,\pi b\cos\left(bx\right)\mathrm{C}\left(bx\right)-2\,b\sin\left(\frac{1}{2}\,\pi b^2x^2\right)\sin\left(bx\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\sin\left(\frac{1}{2\,\pi}\right)-\cos\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\sin\left(\frac{1}{2\,\pi}\right)-\cos\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx-1)\sqrt{b^2}}{\pi b}\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*cos(b*x),x, algorithm="fricas")
```

```
[Out] 1/2*(2*pi*b^2*x*fresnel_cos(b*x)*sin(b*x) + 2*pi*b*cos(b*x)*fresnel_cos(b*x
) - 2*b*sin(1/2*pi*b^2*x^2)*sin(b*x) - sqrt(b^2)*(pi*cos(1/2/pi) + sin(1/2/
pi))*fresnel_cos((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi)
 + sin(1/2/pi))*fresnel_cos((pi*b*x - 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*
sin(1/2/pi) - cos(1/2/pi))*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - sqr
t(b^2)*(pi*sin(1/2/pi) - cos(1/2/pi))*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(p
i*b)))/(pi*b^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos\left(bx\right)\operatorname{Ci}\left(bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x)*cos(b*x),x)
```

```
[Out] Integral(x*cos(b*x)*Ci(b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x)*cos(b*x),x, algorithm="giac")
```

```
[Out] integrate(x*cos(b*x)*fresnel_cos(b*x), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.02

$$\int x\,\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(b*x)*cos(b*x),x)
```

```
[Out] int(x*cosint(b*x)*cos(b*x), x)
```

3.119 $\int x^2 \cos(bx)\textbf{CosIntegral}(bx)\,dx$

Optimal. Leaf size=89

$$-\frac{3x}{4b^2}+\frac{2x\cos(bx)\text{CosIntegral}(bx)}{b^2}-\frac{5\cos(bx)\sin(bx)}{4b^3}-\frac{2\text{CosIntegral}(bx)\sin(bx)}{b^3}+\frac{x^2\text{CosIntegral}(bx)\sin(bx)}{b}$$

```
[Out] -3/4*x/b^2+2*x*Ci(b*x)*cos(b*x)/b^2+Si(2*b*x)/b^3-2*Ci(b*x)*sin(b*x)/b^3+x^
2*Ci(b*x)*sin(b*x)/b-5/4*cos(b*x)*sin(b*x)/b^3-1/2*x*sin(b*x)^2/b^2
```

Rubi [A]
time = 0.08, antiderivative size = 89, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 9, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {6649, 12, 3524, 2715, 8, 6655, 6647, 4491, 3380}

$$-\frac{2\text{CosIntegral}(bx)\sin(bx)}{b^3}+\frac{\text{Si}(2bx)}{b^3}-\frac{5\sin(bx)\cos(bx)}{4b^3}+\frac{2x\text{CosIntegral}(bx)\cos(bx)}{b^2}-\frac{3x}{4b^2}-\frac{x\sin^2(bx)}{2b^2}+\frac{x^2\text{CosIntegral}(bx)\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (-3*x)/(4*b^2) + (2*x*Cos[b*x]*CosIntegral[b*x])/b^2 - (5*Cos[b*x]*Sin[b*x]
)/(4*b^3) - (2*CosIntegral[b*x]*Sin[b*x])/b^3 + (x^2*CosIntegral[b*x]*Sin[b
*x])/b - (x*Sin[b*x]^2)/(2*b^2) + SinIntegral[2*b*x]/b^3
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^2\cos(bx)\text{Ci}(bx)\,dx = \frac{x^2\text{Ci}(bx)\sin(bx)}{b} - \frac{2\int x\text{Ci}(bx)\sin(bx)\,dx}{b} - \int \frac{x\cos(bx)\sin(bx)}{b}\,dx$$
$$= \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} + \frac{x^2\text{Ci}(bx)\sin(bx)}{b} - \frac{2\int\cos(bx)\text{Ci}(bx)\,dx}{b^2} - \frac{\int x\cos(bx)\sin(bx)}{b}$$
$$= \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} - \frac{2\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^2\text{Ci}(bx)\sin(bx)}{b} - \frac{x\sin^2(bx)}{2b^2} + \frac{\int\sin^2(bx)}{2b^2}$$
$$= \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} - \frac{5\cos(bx)\sin(bx)}{4b^3} - \frac{2\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^2\text{Ci}(bx)\sin(bx)}{b} - \frac{x\,\text{si}}{}$$
$$= -\frac{3x}{4b^2} + \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} - \frac{5\cos(bx)\sin(bx)}{4b^3} - \frac{2\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^2\text{Ci}(bx)\sin(bx}{b}$$
$$= -\frac{3x}{4b^2} + \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} - \frac{5\cos(bx)\sin(bx)}{4b^3} - \frac{2\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^2\text{Ci}(bx)\sin(bx}{b}$$
$$= -\frac{3x}{4b^2} + \frac{2x\cos(bx)\text{Ci}(bx)}{b^2} - \frac{5\cos(bx)\sin(bx)}{4b^3} - \frac{2\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^2\text{Ci}(bx)\sin(bx}{b}$$

Mathematica [A]
time = 0.06, size = 64, normalized size = 0.72

$$\frac{-8bx + 2bx\cos(2bx) + 8\text{CosIntegral}(bx)\left(2bx\cos(bx) + (-2+b^2x^2)\sin(bx)\right) - 5\sin(2bx) + 8\text{Si}(2bx)}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (-8*b*x + 2*b*x*Cos[2*b*x] + 8*CosIntegral[b*x]*(2*b*x*Cos[b*x] + (-2 + b^2
*x^2)*Sin[b*x]) - 5*Sin[2*b*x] + 8*SinIntegral[2*b*x])/(8*b^3)
```

Maple [A]
time = 0.50, size = 66, normalized size = 0.74

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx)\left(b^2x^2\sin(bx)-2\sin(bx)+2bx\cos(bx)\right)+\frac{bx\left(\cos^2(bx)\right)}{2}-\frac{5\sin(bx)\cos(bx)}{4}-\frac{5bx}{4}+\text{sinIntegral}(2bx)}{b^3}$	66
default	$\frac{\text{cosineIntegral}(bx)\left(b^2x^2\sin(bx)-2\sin(bx)+2bx\cos(bx)\right)+\frac{bx\left(\cos^2(bx)\right)}{2}-\frac{5\sin(bx)\cos(bx)}{4}-\frac{5bx}{4}+\text{sinIntegral}(2bx)}{b^3}$	66

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x)*cos(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Ci(b*x)*(b^2*x^2*sin(b*x)-2*sin(b*x)+2*b*x*cos(b*x))+1/2*cos(b*x)^2*
b*x-5/4*sin(b*x)*cos(b*x)-5/4*b*x+Si(2*b*x))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*cos(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^2*cos(b*x)*fresnel_cos(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 297 vs. 2(83) = 166.
time = 0.42, size = 297, normalized size = 3.34

$$\frac{4\,\pi^2 b^2 x\cos\left(bx\right)\mathrm{C}\left(bx\right) - 2\,b\cos\left(\frac{1}{2}\,\pi b^2 x^2\right)\cos\left(bx\right) + 2\left(\pi^2 b^3 x^2 - 2\,\pi^2 b\right)\mathrm{C}\left(bx\right)\sin\left(bx\right) + \sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right) - \left(2\,\pi^2 - 1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx + 1\right)\sqrt{b^2}}{\pi b}\right) - \sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right) - \left(2\,\pi^2 - 1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx - 1\right)\sqrt{b^2}}{\pi b}\right) + \sqrt{b^2}\left(\left(2\,\pi^2 - 1\right)\cos\left(\frac{1}{2\,\pi}\right) + \pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx + 1\right)\sqrt{b^2}}{\pi b}\right) - \sqrt{b^2}\left(\left(2\,\pi^2 - 1\right)\cos\left(\frac{1}{2\,\pi}\right) + \pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx - 1\right)\sqrt{b^2}}{\pi b}\right) - 2\left(\pi b^2 x\sin\left(bx\right) + 2\,\pi b\cos\left(bx\right)\right)\sin\left(\frac{1}{2}\,\pi b^2 x^2\right)}{2\,\pi^2 b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*cos(b*x),x, algorithm="fricas")
```

```
[Out] 1/2*(4*pi^2*b^2*x*cos(b*x)*fresnel_cos(b*x) - 2*b*cos(1/2*pi*b^2*x^2)*cos(b
*x) + 2*(pi^2*b^3*x^2 - 2*pi^2*b)*fresnel_cos(b*x)*sin(b*x) + sqrt(b^2)*(pi
*cos(1/2/pi) - (2*pi^2 - 1)*sin(1/2/pi))*fresnel_cos((pi*b*x + 1)*sqrt(b^2)
/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi) - (2*pi^2 - 1)*sin(1/2/pi))*fresnel_co
s((pi*b*x - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*((2*pi^2 - 1)*cos(1/2/pi) + pi
*sin(1/2/pi))*fresnel_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*((2*pi
^2 - 1)*cos(1/2/pi) + pi*sin(1/2/pi))*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(p
i*b)) - 2*(pi*b^2*x*sin(b*x) + 2*pi*b*cos(b*x))*sin(1/2*pi*b^2*x^2))/(pi^2*
b^4)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2\cos\left(bx\right)\mathrm{Ci}\left(bx\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x)*cos(b*x),x)
```

```
[Out] Integral(x**2*cos(b*x)*Ci(b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x)*cos(b*x),x, algorithm="giac")
[Out] integrate(x^2*cos(b*x)*fresnel_cos(b*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2\,\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(b*x)*cos(b*x),x)
[Out] int(x^2*cosint(b*x)*cos(b*x), x)
```

3.120 $\int x^3 \cos(bx)\textbf{CosIntegral}(bx)\,dx$

Optimal. Leaf size=142

$$-\frac{x^2}{2b^2}-\frac{3\cos^2(bx)}{4b^4}-\frac{6\cos(bx)\text{CosIntegral}(bx)}{b^4}+\frac{3x^2\cos(bx)\text{CosIntegral}(bx)}{b^2}+\frac{3\text{CosIntegral}(2bx)}{b^4}+\frac{3\log(x)}{b^4}-$$

```
[Out] -1/2*x^2/b^2+3*Ci(2*b*x)/b^4-6*Ci(b*x)*cos(b*x)/b^4+3*x^2*Ci(b*x)*cos(b*x)/
b^2-3/4*cos(b*x)^2/b^4+3*ln(x)/b^4-6*x*Ci(b*x)*sin(b*x)/b^3+x^3*Ci(b*x)*sin
(b*x)/b-2*x*cos(b*x)*sin(b*x)/b^3+13/4*sin(b*x)^2/b^4-1/2*x^2*sin(b*x)^2/b^
2
```

Rubi [A]
time = 0.13, antiderivative size = 142, normalized size of antiderivative = 1.00, number of steps used = 18, number of rules used = 10, integrand size = 12, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {6649, 12, 3524, 3391, 30, 6655, 2644, 6653, 3393, 3383}

$$\frac{3\text{CosIntegral}(2bx)}{b^4}-\frac{6\text{CosIntegral}(bx)\cos(bx)}{b^4}+\frac{3\log(x)}{b^4}+\frac{13\sin^2(bx)}{4b^4}-\frac{3\cos^2(bx)}{4b^4}-\frac{6x\text{CosIntegral}(bx)\sin(bx)}{b^3}-\frac{2x\sin(bx)\cos(bx)}{b^3}+\frac{3x^2\text{CosIntegral}(bx)\cos(bx)}{b^2}-\frac{x^2}{2b^2}-\frac{x^2\sin^2(bx)}{2b^2}+\frac{x^3\text{CosIntegral}(bx)\sin(bx)}{b}$$

Antiderivative was successfully verified.

```
[In] Int[x^3*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] -1/2*x^2/b^2 - (3*Cos[b*x]^2)/(4*b^4) - (6*Cos[b*x]*CosIntegral[b*x])/b^4 +
 (3*x^2*Cos[b*x]*CosIntegral[b*x])/b^2 + (3*CosIntegral[2*b*x])/b^4 + (3*Lo
g[x])/b^4 - (2*x*Cos[b*x]*Sin[b*x])/b^3 - (6*x*CosIntegral[b*x]*Sin[b*x])/b
^3 + (x^3*CosIntegral[b*x]*Sin[b*x])/b + (13*Sin[b*x]^2)/(4*b^4) - (x^2*Sin
[b*x]^2)/(2*b^2)
```

Rule 12

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

Rule 30

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

Rule 2644

```
Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_
Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*
Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&  !(In
tegerQ[(m - 1)/2] && LtQ[0, m, n])
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 3524

```
Int[Cos[(a_.) + (b_.)*(x_)^(n_.)]*(x_)^(m_.)*Sin[(a_.) + (b_.)*(x_)^(n_.)]^
(p_.), x_Symbol] :> Simp[x^(m - n + 1)*(Sin[a + b*x^n]^(p + 1)/(b*n*(p + 1)
)), x] - Dist[(m - n + 1)/(b*n*(p + 1)), Int[x^(m - n)*Sin[a + b*x^n]^(p +
1), x], x] /; FreeQ[{a, b, p}, x] && LtQ[0, n, m + 1] && NeQ[p, -1]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rubi steps

$$\int x^3\cos(bx)\text{Ci}(bx)\,dx = \frac{x^3\text{Ci}(bx)\sin(bx)}{b} - \frac{3\int x^2\text{Ci}(bx)\sin(bx)\,dx}{b} - \int \frac{x^2\cos(bx)\sin(bx)}{b}\,dx$$

$$= \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} + \frac{x^3\text{Ci}(bx)\sin(bx)}{b} - \frac{6\int x\cos(bx)\text{Ci}(bx)\,dx}{b^2} - \frac{\int x^2\cos(bx)\sin(}{b}$$

$$= \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} - \frac{6x\text{Ci}(bx)\sin(bx)}{b^3} + \frac{x^3\text{Ci}(bx)\sin(bx)}{b} - \frac{x^2\sin^2(bx)}{2b^2} + \frac{6\int \text{Ci}(b}{}$$

$$= -\frac{3\cos^2(bx)}{4b^4} - \frac{6\cos(bx)\text{Ci}(bx)}{b^4} + \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} - \frac{2x\cos(bx)\sin(bx)}{b^3} - \frac{6x\text{Ci}(b}{}$$

$$= -\frac{x^2}{2b^2} - \frac{3\cos^2(bx)}{4b^4} - \frac{6\cos(bx)\text{Ci}(bx)}{b^4} + \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} - \frac{2x\cos(bx)\sin(bx)}{b^3} -$$

$$= -\frac{x^2}{2b^2} - \frac{3\cos^2(bx)}{4b^4} - \frac{6\cos(bx)\text{Ci}(bx)}{b^4} + \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} - \frac{2x\cos(bx)\sin(bx)}{b^3} -$$

$$= -\frac{x^2}{2b^2} - \frac{3\cos^2(bx)}{4b^4} - \frac{6\cos(bx)\text{Ci}(bx)}{b^4} + \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} + \frac{3\log(x)}{b^4} - \frac{2x\cos(bx)}{b^3}$$

$$= -\frac{x^2}{2b^2} - \frac{3\cos^2(bx)}{4b^4} - \frac{6\cos(bx)\text{Ci}(bx)}{b^4} + \frac{3x^2\cos(bx)\text{Ci}(bx)}{b^2} + \frac{3\text{Ci}(2bx)}{b^4} + \frac{3\log(x)}{b^4}$$

Mathematica [A]
time = 0.08, size = 93, normalized size = 0.65

$$\frac{-3b^2x^2 - 8\cos(2bx) + b^2x^2\cos(2bx) + 12\text{CosIntegral}(2bx) + 12\log(x) + 4\text{CosIntegral}(bx)\left(3(-2+b^2x^2)\cos(bx) + bx(-6+b^2x^2)\sin(bx)\right) - 4bx\sin(2bx)}{4b^4}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^3*Cos[b*x]*CosIntegral[b*x],x]
```

```
[Out] (-3*b^2*x^2 - 8*Cos[2*b*x] + b^2*x^2*Cos[2*b*x] + 12*CosIntegral[2*b*x] + 1
2*Log[x] + 4*CosIntegral[b*x]*(3*(-2 + b^2*x^2)*Cos[b*x] + b*x*(-6 + b^2*x^
2)*Sin[b*x]) - 4*b*x*Sin[2*b*x])/(4*b^4)
```

Maple [A]
time = 0.38, size = 116, normalized size = 0.82

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx)\left(b^3x^3\sin(bx)+3b^2x^2\cos(bx)-6\cos(bx)-6bx\sin(bx)\right)+\frac{b^2x^2\left(\cos^2(bx)\right)}{2}-4bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+b^2x^2}{b^4}$
default	$\frac{\text{cosineIntegral}(bx)\left(b^3x^3\sin(bx)+3b^2x^2\cos(bx)-6\cos(bx)-6bx\sin(bx)\right)+\frac{b^2x^2\left(\cos^2(bx)\right)}{2}-4bx\left(\frac{\sin(bx)\cos(bx)}{2}+\frac{bx}{2}\right)+b^2x^2}{b^4}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*Ci(b*x)*cos(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^4*(Ci(b*x)*(b^3*x^3*sin(b*x)+3*b^2*x^2*cos(b*x)-6*cos(b*x)-6*b*x*sin(b*
x))+1/2*cos(b*x)^2*b^2*x^2-4*b*x*(1/2*sin(b*x)*cos(b*x)+1/2*b*x)+b^2*x^2+si
n(b*x)^2+3*ln(b*x)+3*Ci(2*b*x)-3*cos(b*x)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*cos(b*x),x, algorithm="maxima")
```

```
[Out] integrate(x^3*cos(b*x)*fresnel_cos(b*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 361 vs. $2(134) = 268$.
time = 0.41, size = 361, normalized size = 2.54

$$-\frac{2\,\pi b^{2} x \cos\left(\frac{1}{2}\,\pi b^{2} x^{2}\right) \cos\left(bx\right) - 6\,\left(\pi^{3} b^{3} x^{2} - 2\,\pi^{3} b\right) \cos\left(bx\right) \mathrm{C}\left(bx\right) - \left(6\,\pi^{3} \cos\left(\frac{1}{2\,\pi}\right) + \left(3\,\pi^{2} - 1\right) \sin\left(\frac{1}{2\,\pi}\right)\right) \sqrt{b^{2}}\,\mathrm{C}\left(\frac{\left(\pi bx + 1\right)\sqrt{b^{2}}}{\pi b}\right) - \left(6\,\pi^{3} \cos\left(\frac{1}{2\,\pi}\right) + \left(3\,\pi^{2} - 1\right) \sin\left(\frac{1}{2\,\pi}\right)\right) \sqrt{b^{2}}\,\mathrm{C}\left(\frac{\left(\pi bx - 1\right)\sqrt{b^{2}}}{\pi b}\right) - \left(6\,\pi^{3} \sin\left(\frac{1}{2\,\pi}\right) - \left(3\,\pi^{2} - 1\right) \cos\left(\frac{1}{2\,\pi}\right)\right) \sqrt{b^{2}}\,\mathrm{S}\left(\frac{\left(\pi bx + 1\right)\sqrt{b^{2}}}{\pi b}\right) - \left(6\,\pi^{3} \sin\left(\frac{1}{2\,\pi}\right) - \left(3\,\pi^{2} - 1\right) \cos\left(\frac{1}{2\,\pi}\right)\right) \sqrt{b^{2}}\,\mathrm{S}\left(\frac{\left(\pi bx - 1\right)\sqrt{b^{2}}}{\pi b}\right) + 2\,\left(3\,\pi^{2} b^{2} x \cos\left(bx\right) + \left(\pi^{2} b^{3} x^{2} - 6\,\pi^{2} b + b\right) \sin\left(bx\right)\right) \sin\left(\frac{1}{2}\,\pi b^{2} x^{2}\right) - 2\,\left(\pi b \cos\left(\frac{1}{2}\,\pi b^{2} x^{2}\right) + \left(\pi^{3} b^{4} x^{3} - 6\,\pi^{3} b^{2} x\right) \mathrm{C}\left(bx\right)\right) \sin\left(bx\right)}{2\,\pi^{3} b^{5}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*cos(b*x),x, algorithm="fricas")
```

```
[Out] -1/2*(2*pi*b^2*x*cos(1/2*pi*b^2*x^2)*cos(b*x) - 6*(pi^3*b^3*x^2 - 2*pi^3*b)
*cos(b*x)*fresnel_cos(b*x) - (6*pi^3*cos(1/2/pi) + (3*pi^2 - 1)*sin(1/2/pi)
)*sqrt(b^2)*fresnel_cos((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - (6*pi^3*cos(1/2/pi
) + (3*pi^2 - 1)*sin(1/2/pi))*sqrt(b^2)*fresnel_cos((pi*b*x - 1)*sqrt(b^2)/
(pi*b)) - (6*pi^3*sin(1/2/pi) - (3*pi^2 - 1)*cos(1/2/pi))*sqrt(b^2)*fresnel
_sin((pi*b*x + 1)*sqrt(b^2)/(pi*b)) - (6*pi^3*sin(1/2/pi) - (3*pi^2 - 1)*co
s(1/2/pi))*sqrt(b^2)*fresnel_sin((pi*b*x - 1)*sqrt(b^2)/(pi*b)) + 2*(3*pi^2
*b^2*x*cos(b*x) + (pi^2*b^3*x^2 - 6*pi^2*b + b)*sin(b*x))*sin(1/2*pi*b^2*x^
2) - 2*(pi*b*cos(1/2*pi*b^2*x^2) + (pi^3*b^4*x^3 - 6*pi^3*b^2*x)*fresnel_co
s(b*x))*sin(b*x))/(pi^3*b^5)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^{3} \cos\left(bx\right) \operatorname{Ci}\left(bx\right)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**3*Ci(b*x)*cos(b*x),x)
```

```
[Out] Integral(x**3*cos(b*x)*Ci(b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^3*fresnel_cos(b*x)*cos(b*x),x, algorithm="giac")
```

```
[Out] integrate(x^3*cos(b*x)*fresnel_cos(b*x), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^3\,\mathrm{cosint}(b\,x)\,\cos\left(b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^3*cosint(b*x)*cos(b*x),x)
```

```
[Out] int(x^3*cosint(b*x)*cos(b*x), x)
```

3.121 $\int \textbf{CosIntegral}(2x)\sin(5x)\,dx$

Optimal. Leaf size=29

$$-\frac{1}{5}\cos(5x)\text{CosIntegral}(2x)+\frac{1}{10}\text{CosIntegral}(3x)+\frac{1}{10}\text{CosIntegral}(7x)$$

```
[Out] 1/10*Ci(3*x)+1/10*Ci(7*x)-1/5*Ci(2*x)*cos(5*x)
```

Rubi [A]
time = 0.04, antiderivative size = 29, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {6653, 12, 4514, 3383}

$$\frac{1}{10}\text{CosIntegral}(3x)+\frac{1}{10}\text{CosIntegral}(7x)-\frac{1}{5}\text{CosIntegral}(2x)\cos(5x)$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[2*x]*Sin[5*x],x]
```

```
[Out] -1/5*(Cos[5*x]*CosIntegral[2*x]) + CosIntegral[3*x]/10 + CosIntegral[7*x]/1
0
```

Rule 12

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

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 4514

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f
_.)*(x_))^(m_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Cos[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int \text{Ci}(2x)\sin(5x)\,dx &= -\frac{1}{5}\cos(5x)\text{Ci}(2x)+\frac{2}{5}\int \frac{\cos(2x)\cos(5x)}{2x}\,dx\\
&= -\frac{1}{5}\cos(5x)\text{Ci}(2x)+\frac{1}{5}\int \frac{\cos(2x)\cos(5x)}{x}\,dx\\
&= -\frac{1}{5}\cos(5x)\text{Ci}(2x)+\frac{1}{5}\int \left(\frac{\cos(3x)}{2x}+\frac{\cos(7x)}{2x}\right)dx\\
&= -\frac{1}{5}\cos(5x)\text{Ci}(2x)+\frac{1}{10}\int \frac{\cos(3x)}{x}\,dx+\frac{1}{10}\int \frac{\cos(7x)}{x}\,dx\\
&= -\frac{1}{5}\cos(5x)\text{Ci}(2x)+\frac{\text{Ci}(3x)}{10}+\frac{\text{Ci}(7x)}{10}
\end{aligned}
$$

Mathematica [A]
time = 0.02, size = 23, normalized size = 0.79

$$\frac{1}{10}(-2\cos(5x)\text{CosIntegral}(2x)+\text{CosIntegral}(3x)+\text{CosIntegral}(7x))$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[2*x]*Sin[5*x],x]
[Out] (-2*Cos[5*x]*CosIntegral[2*x] + CosIntegral[3*x] + CosIntegral[7*x])/10
```

Maple [A]
time = 0.69, size = 24, normalized size = 0.83

method	result	size
default	$\frac{\text{cosineIntegral}(3x)}{10}+\frac{\text{cosineIntegral}(7x)}{10}-\frac{\text{cosineIntegral}(2x)\cos(5x)}{5}$	24

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(2*x)*sin(5*x),x,method=_RETURNVERBOSE)
[Out] 1/10*Ci(3*x)+1/10*Ci(7*x)-1/5*Ci(2*x)*cos(5*x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*sin(5*x),x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(2*x)*sin(5*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 84 vs. $2(23) = 46$.
time = 0.36, size = 84, normalized size = 2.90

$$-\frac{1}{5}\cos(5x)\,C(2x)+\frac{1}{10}\cos\left(\frac{25}{8\pi}\right)C\left(\frac{4\pi x+5}{2\pi}\right)+\frac{1}{10}\cos\left(\frac{25}{8\pi}\right)C\left(\frac{4\pi x-5}{2\pi}\right)+\frac{1}{10}\left(S\left(\frac{4\pi x+5}{2\pi}\right)+S\left(\frac{4\pi x-5}{2\pi}\right)\right)\sin\left(\frac{25}{8\pi}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*sin(5*x),x, algorithm="fricas")
[Out] -1/5*cos(5*x)*fresnel_cos(2*x) + 1/10*cos(25/8/pi)*fresnel_cos(1/2*(4*pi*x
+ 5)/pi) + 1/10*cos(25/8/pi)*fresnel_cos(1/2*(4*pi*x - 5)/pi) + 1/10*(fresn
el_sin(1/2*(4*pi*x + 5)/pi) + fresnel_sin(1/2*(4*pi*x - 5)/pi))*sin(25/8/pi
)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \sin(5x)\,\mathrm{Ci}(2x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(2*x)*sin(5*x),x)
[Out] Integral(sin(5*x)*Ci(2*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*sin(5*x),x, algorithm="giac")
[Out] integrate(fresnel_cos(2*x)*sin(5*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\frac{\mathrm{cosint}(3x)}{10}+\frac{\mathrm{cosint}(7x)}{10}-\frac{\mathrm{cosint}(2x)\cos(5x)}{5}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(2*x)*sin(5*x),x)
[Out] cosint(3*x)/10 + cosint(7*x)/10 - (cosint(2*x)*cos(5*x))/5
```

3.122 $\int \cos(5x)\textbf{CosIntegral}(2x)\,dx$

Optimal. Leaf size=29

$$\frac{1}{5}\text{CosIntegral}(2x)\sin(5x)-\frac{\text{Si}(3x)}{10}-\frac{\text{Si}(7x)}{10}$$

```
[Out] -1/10*Si(3*x)-1/10*Si(7*x)+1/5*Ci(2*x)*sin(5*x)
```

Rubi [A]
time = 0.04, antiderivative size = 29, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, integrand size = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {6647, 12, 4515, 3380}

$$\frac{1}{5}\text{CosIntegral}(2x)\sin(5x)-\frac{\text{Si}(3x)}{10}-\frac{\text{Si}(7x)}{10}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[5*x]*CosIntegral[2*x],x]
[Out] (CosIntegral[2*x]*Sin[5*x])/5 - SinIntegral[3*x]/10 - SinIntegral[7*x]/10
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \cos(5x)\mathrm{Ci}(2x)\,dx &= \frac{1}{5}\mathrm{Ci}(2x)\sin(5x) - \frac{2}{5}\int \frac{\cos(2x)\sin(5x)}{2x}\,dx\\ &= \frac{1}{5}\mathrm{Ci}(2x)\sin(5x) - \frac{1}{5}\int \frac{\cos(2x)\sin(5x)}{x}\,dx\\ &= \frac{1}{5}\mathrm{Ci}(2x)\sin(5x) - \frac{1}{5}\int \left(\frac{\sin(3x)}{2x} + \frac{\sin(7x)}{2x}\right)dx\\ &= \frac{1}{5}\mathrm{Ci}(2x)\sin(5x) - \frac{1}{10}\int \frac{\sin(3x)}{x}\,dx - \frac{1}{10}\int \frac{\sin(7x)}{x}\,dx\\ &= \frac{1}{5}\mathrm{Ci}(2x)\sin(5x) - \frac{\mathrm{Si}(3x)}{10} - \frac{\mathrm{Si}(7x)}{10}\end{aligned}$$

Mathematica [A]
time = 0.02, size = 27, normalized size = 0.93

$$\frac{1}{10}(2\mathrm{CosIntegral}(2x)\sin(5x) - \mathrm{Si}(3x) - \mathrm{Si}(7x))$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[5*x]*CosIntegral[2*x],x]
[Out] (2*CosIntegral[2*x]*Sin[5*x] - SinIntegral[3*x] - SinIntegral[7*x])/10
```

Maple [A]
time = 0.72, size = 24, normalized size = 0.83

method	result	size
default	$-\frac{\mathrm{sinIntegral}(3x)}{10} - \frac{\mathrm{sinIntegral}(7x)}{10} + \frac{\mathrm{cosineIntegral}(2x)\sin(5x)}{5}$	24

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(2*x)*cos(5*x),x,method=_RETURNVERBOSE)
[Out] -1/10*Si(3*x)-1/10*Si(7*x)+1/5*Ci(2*x)*sin(5*x)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*cos(5*x),x, algorithm="maxima")
[Out] integrate(cos(5*x)*fresnel_cos(2*x), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 86 vs. $2(23) = 46$.
time = 0.37, size = 86, normalized size = 2.97

$$-\frac{1}{10}\cos\left(\frac{25}{8\pi}\right)\mathrm{S}\left(\frac{4\pi x+5}{2\pi}\right)+\frac{1}{10}\cos\left(\frac{25}{8\pi}\right)\mathrm{S}\left(\frac{4\pi x-5}{2\pi}\right)+\frac{1}{5}\mathrm{C}\left(2x\right)\sin\left(5x\right)+\frac{1}{10}\left(\mathrm{C}\left(\frac{4\pi x+5}{2\pi}\right)-\mathrm{C}\left(\frac{4\pi x-5}{2\pi}\right)\right)\sin\left(\frac{25}{8\pi}\right)$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*cos(5*x),x, algorithm="fricas")
```

```
[Out] -1/10*cos(25/8/pi)*fresnel_sin(1/2*(4*pi*x + 5)/pi) + 1/10*cos(25/8/pi)*fre
snel_sin(1/2*(4*pi*x - 5)/pi) + 1/5*fresnel_cos(2*x)*sin(5*x) + 1/10*(fresn
el_cos(1/2*(4*pi*x + 5)/pi) - fresnel_cos(1/2*(4*pi*x - 5)/pi))*sin(25/8/pi
)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\cos\left(5x\right)\mathrm{Ci}\left(2x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(2*x)*cos(5*x),x)
```

```
[Out] Integral(cos(5*x)*Ci(2*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(2*x)*cos(5*x),x, algorithm="giac")
```

```
[Out] integrate(cos(5*x)*fresnel_cos(2*x), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int\mathrm{cosint}(2\,x)\,\cos\left(5\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(2*x)*cos(5*x),x)
```

```
[Out] int(cosint(2*x)*cos(5*x), x)
```

3.123 $\int x^2 \textbf{CosIntegral}(a+bx)\sin(a+bx)\,dx$

Optimal. Leaf size=220

$$-\frac{ax}{2b^2}+\frac{x^2}{4b}+\frac{\cos^2(a+bx)}{4b^3}+\frac{\cos(2a+2bx)}{2b^3}+\frac{2\cos(a+bx)\text{CosIntegral}(a+bx)}{b^3}-\frac{x^2\cos(a+bx)\text{CosIntegral}(a}{b}$$

```
[Out] -1/2*a*x/b^2+1/4*x^2/b-Ci(2*b*x+2*a)/b^3+1/2*a^2*Ci(2*b*x+2*a)/b^3+2*Ci(b*x
+a)*cos(b*x+a)/b^3-x^2*Ci(b*x+a)*cos(b*x+a)/b+1/4*cos(b*x+a)^2/b^3+1/2*cos(
2*b*x+2*a)/b^3-ln(b*x+a)/b^3+1/2*a^2*ln(b*x+a)/b^3+a*Si(2*b*x+2*a)/b^3+2*x*
Ci(b*x+a)*sin(b*x+a)/b^2-1/2*a*cos(b*x+a)*sin(b*x+a)/b^3+1/2*x*cos(b*x+a)*s
in(b*x+a)/b^2
```

Rubi [A]
time = 0.57, antiderivative size = 220, normalized size of antiderivative = 1.00, number of steps used = 21, number of rules used = 14, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 0.875$, Rules used = {6655, 6874, 2715, 8, 3391, 30, 3393, 3383, 6649, 4669, 6873, 2718, 3380, 6653}

$$\frac{a^2\text{CosIntegral}(2a+2bx)}{2b^3}+\frac{a^2\log(a+bx)}{2b^3}-\frac{\text{CosIntegral}(2a+2bx)}{b^3}+\frac{2\text{CosIntegral}(a+bx)\cos(a+bx)}{b^3}+\frac{a\text{Si}(2a+2bx)}{b^3}-\frac{\log(a+bx)}{b^3}+\frac{\cos^2(a+bx)}{4b^3}+\frac{\cos(2a+2bx)}{2b^3}-\frac{a\sin(a+bx)\cos(a+bx)}{2b^3}+\frac{2x\text{CosIntegral}(a+bx)\sin(a+bx)}{b^2}-\frac{ax}{2b^2}+\frac{x\sin(a+bx)\cos(a+bx)}{2b^2}-\frac{x^2\text{CosIntegral}(a+bx)\cos(a+bx)}{b}+\frac{x^2}{4b}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*CosIntegral[a + b*x]*Sin[a + b*x],x]
```

```
[Out] -1/2*(a*x)/b^2 + x^2/(4*b) + Cos[a + b*x]^2/(4*b^3) + Cos[2*a + 2*b*x]/(2*b
^3) + (2*Cos[a + b*x]*CosIntegral[a + b*x])/b^3 - (x^2*Cos[a + b*x]*CosInte
gral[a + b*x])/b - CosIntegral[2*a + 2*b*x]/b^3 + (a^2*CosIntegral[2*a + 2*
b*x])/(2*b^3) - Log[a + b*x]/b^3 + (a^2*Log[a + b*x])/(2*b^3) - (a*Cos[a +
b*x]*Sin[a + b*x])/(2*b^3) + (x*Cos[a + b*x]*Sin[a + b*x])/(2*b^2) + (2*x*C
osIntegral[a + b*x]*Sin[a + b*x])/b^2 + (a*SinIntegral[2*a + 2*b*x])/b^3
```

Rule 8

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

Rule 30

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3391

```
Int[((c_.) + (d_.)*(x_))*((b_.)*sin[(e_.) + (f_.)*(x_)])^(n_), x_Symbol] :>
 Simp[d*((b*Sin[e + f*x])^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x]) /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}\int x^2\text{Ci}(a+bx)\sin(a+bx)\,dx &= -\frac{x^2\cos(a+bx)\text{Ci}(a+bx)}{b}+\frac{2\int x\cos(a+bx)\text{Ci}(a+bx)\,dx}{b}+\int\frac{x^2\cos^2}{a-}\\
&= -\frac{x^2\cos(a+bx)\text{Ci}(a+bx)}{b}+\frac{2x\text{Ci}(a+bx)\sin(a+bx)}{b^2}-\frac{2\int\text{Ci}(a+bx)\,s}{b^2}\\
&= \frac{2\cos(a+bx)\text{Ci}(a+bx)}{b^3}-\frac{x^2\cos(a+bx)\text{Ci}(a+bx)}{b}+\frac{2x\text{Ci}(a+bx)\sin(a}{b^2}\\
&= \frac{\cos^2(a+bx)}{4b^3}+\frac{2\cos(a+bx)\text{Ci}(a+bx)}{b^3}-\frac{x^2\cos(a+bx)\text{Ci}(a+bx)}{b}-\frac{a\,c}{}\\
&= -\frac{ax}{2b^2}+\frac{x^2}{4b}+\frac{\cos^2(a+bx)}{4b^3}+\frac{2\cos(a+bx)\text{Ci}(a+bx)}{b^3}-\frac{x^2\cos(a+bx)\text{Ci}}{b}\\
&= -\frac{ax}{2b^2}+\frac{x^2}{4b}+\frac{\cos^2(a+bx)}{4b^3}+\frac{2\cos(a+bx)\text{Ci}(a+bx)}{b^3}-\frac{x^2\cos(a+bx)\text{Ci}}{b}\\
&= -\frac{ax}{2b^2}+\frac{x^2}{4b}+\frac{\cos^2(a+bx)}{4b^3}+\frac{\cos(2a+2bx)}{2b^3}+\frac{2\cos(a+bx)\text{Ci}(a+bx)}{b^3}-\end{aligned}$$

Mathematica [A]
time = 0.23, size = 134, normalized size = 0.61

$$\frac{-4abx+2b^2x^2+5\cos(2(a+bx))+4(-2+a^2)\,\text{CosIntegral}(2(a+bx))-8\log(a+bx)+4a^2\log(a+bx)-8\text{CosIntegral}(a+bx)\left((-2+b^2x^2)\cos(a+bx)-2bx\sin(a+bx)\right)-2a\sin(2(a+bx))+2bx\sin(2(a+bx))+8a\text{Si}(2(a+bx))}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*CosIntegral[a + b*x]*Sin[a + b*x],x]
```

```
[Out] (-4*a*b*x + 2*b^2*x^2 + 5*Cos[2*(a + b*x)] + 4*(-2 + a^2)*CosIntegral[2*(a
+ b*x)] - 8*Log[a + b*x] + 4*a^2*Log[a + b*x] - 8*CosIntegral[a + b*x]*((-2
 + b^2*x^2)*Cos[a + b*x] - 2*b*x*Sin[a + b*x]) - 2*a*Sin[2*(a + b*x)] + 2*b
*x*Sin[2*(a + b*x)] + 8*a*SinIntegral[2*(a + b*x)])/(8*b^3)
```

Maple [A]
time = 0.56, size = 217, normalized size = 0.99

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)\left(-a^2\cos(bx+a)-2a(\sin(bx+a)-(bx+a)\cos(bx+a))-(bx+a)^2\cos(bx+a)+2\cos(bx+a)+2(bx+a)\,\text{si}}{}$
default	$\frac{\text{cosineIntegral}(bx+a)\left(-a^2\cos(bx+a)-2a(\sin(bx+a)-(bx+a)\cos(bx+a))-(bx+a)^2\cos(bx+a)+2\cos(bx+a)+2(bx+a)\,\text{si}}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Ci(b*x+a)*(-a^2*cos(b*x+a)-2*a*(sin(b*x+a)-(b*x+a)*cos(b*x+a))-(b*x+
a)^2*cos(b*x+a)+2*cos(b*x+a)+2*(b*x+a)*sin(b*x+a))+1/2*a^2*ln(b*x+a)+1/2*a^
2*Ci(2*b*x+2*a)-cos(b*x+a)*sin(b*x+a)*a-a*(b*x+a)+(b*x+a)*(1/2*sin(b*x+a)*c
os(b*x+a)+1/2*b*x+1/2*a)-1/4*(b*x+a)^2-1/4*sin(b*x+a)^2+a*Si(2*b*x+2*a)+cos
(b*x+a)^2-ln(b*x+a)-Ci(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x^2*fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 414 vs. 2(204) = 408.
time = 0.43, size = 414, normalized size = 1.88

$$-\frac{2\left(\pi^2b^3x^2-2\pi^2b\right)\cos(bx+a)\,\mathrm{C}(bx+a)-\sqrt{b^2}\left(\left(\pi^2(a^2-2)+2\pi a+1\right)\cos\left(\frac{1}{2\pi}\right)-\left(\pi+2\pi^2a\right)\sin\left(\frac{1}{2\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\left(\pi^2(a^2-2)-2\pi a+1\right)\cos\left(\frac{1}{2\pi}\right)-\left(\pi-2\pi^2a\right)\sin\left(\frac{1}{2\pi}\right)\right)\mathrm{C}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\left(\pi+2\pi^2a\right)\cos\left(\frac{1}{2\pi}\right)+\left(\pi^2(a^2-2)+2\pi a+1\right)\sin\left(\frac{1}{2\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\left(\pi-2\pi^2a\right)\cos\left(\frac{1}{2\pi}\right)+\left(\pi^2(a^2-2)-2\pi a+1\right)\sin\left(\frac{1}{2\pi}\right)\right)\mathrm{S}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right)+2\left(2\pi b\sin(bx+a)-\left(\pi b^2x-\pi ab\right)\cos(bx+a)\right)\sin\left(\frac{1}{2}\pi b^2x^2+\pi abx+\frac{1}{2}\pi a^2\right)-2\left(2\pi^2b^2x\,\mathrm{C}(bx+a)-b\cos\left(\frac{1}{2}\pi b^2x^2+\pi abx+\frac{1}{2}\pi a^2\right)\right)\sin(bx+a)}{2\pi^2b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/2*(2*(pi^2*b^3*x^2 - 2*pi^2*b)*cos(b*x + a)*fresnel_cos(b*x + a) - sqrt(
b^2)*((pi^2*(a^2 - 2) + 2*pi*a + 1)*cos(1/2/pi) - (pi + 2*pi^2*a)*sin(1/2/p
```

```
i))*fresnel_cos((pi*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*((pi^2*(a
^2 - 2) - 2*pi*a + 1)*cos(1/2/pi) - (pi - 2*pi^2*a)*sin(1/2/pi))*fresnel_co
s((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*((pi + 2*pi^2*a)*cos(1/
2/pi) + (pi^2*(a^2 - 2) + 2*pi*a + 1)*sin(1/2/pi))*fresnel_sin((pi*b*x + pi
*a + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*((pi - 2*pi^2*a)*cos(1/2/pi) + (pi^2*
(a^2 - 2) - 2*pi*a + 1)*sin(1/2/pi))*fresnel_sin((pi*b*x + pi*a - 1)*sqrt(b
^2)/(pi*b)) + 2*(2*pi*b*sin(b*x + a) - (pi*b^2*x - pi*a*b)*cos(b*x + a))*si
n(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2) - 2*(2*pi^2*b^2*x*fresnel_cos(b*x
 + a) - b*cos(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2))*sin(b*x + a))/(pi^2*
b^4)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2 \sin(a+bx)\,\mathrm{Ci}\,(a+bx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x+a)*sin(b*x+a),x)
```

```
[Out] Integral(x**2*sin(a + b*x)*Ci(a + b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x^2*fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.00

$$\int x^2\,\mathrm{cosint}(a+b\,x)\,\sin(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(a + b*x)*sin(a + b*x),x)
```

```
[Out] int(x^2*cosint(a + b*x)*sin(a + b*x), x)
```

3.124 $\int x\textbf{CosIntegral}(a+bx)\sin(a+bx)\,dx$

Optimal. Leaf size=109

$$\frac{x}{2b}-\frac{x\cos(a+bx)\text{CosIntegral}(a+bx)}{b}-\frac{a\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{a\log(a+bx)}{2b^2}+\frac{\cos(a+bx)\sin(a+bx)}{2b^2}+\text{C}$$

```
[Out] 1/2*x/b-1/2*a*Ci(2*b*x+2*a)/b^2-x*Ci(b*x+a)*cos(b*x+a)/b-1/2*a*ln(b*x+a)/b^
2-1/2*Si(2*b*x+2*a)/b^2+Ci(b*x+a)*sin(b*x+a)/b^2+1/2*cos(b*x+a)*sin(b*x+a)/
b^2
```

Rubi [A]

time = 0.17, antiderivative size = 109, normalized size of antiderivative = 1.00, number of steps used = 12, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {6655, 6874, 2715, 8, 3393, 3383, 6647, 4491, 12, 3380}

$$-\frac{a\text{CosIntegral}(2a+2bx)}{2b^2}+\frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{b^2}-\frac{\text{Si}(2a+2bx)}{2b^2}-\frac{a\log(a+bx)}{2b^2}+\frac{\sin(a+bx)\cos(a+bx)}{2b^2}-\frac{x\text{CosIntegral}(a+bx)\cos(a+bx)}{b}+\frac{x}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[a + b*x]*Sin[a + b*x],x]
```

```
[Out] x/(2*b) - (x*Cos[a + b*x]*CosIntegral[a + b*x])/b - (a*CosIntegral[2*a + 2*
b*x])/(2*b^2) - (a*Log[a + b*x])/(2*b^2) + (Cos[a + b*x]*Sin[a + b*x])/(2*b
^2) + (CosIntegral[a + b*x]*Sin[a + b*x])/b^2 - SinIntegral[2*a + 2*b*x]/(2
*b^2)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\text{Ci}(a+bx)\sin(a+bx)\,dx = -\frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\int \cos(a+bx)\text{Ci}(a+bx)\,dx}{b} + \int \frac{x\cos^2(a+bx)}{a+bx}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\text{Ci}(a+bx)\sin(a+bx)}{b^2} - \frac{\int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx}{b}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\text{Ci}(a+bx)\sin(a+bx)}{b^2} + \frac{\int \cos^2(a+bx)\,dx}{b} -$$

$$= -\frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\cos(a+bx)\sin(a+bx)}{2b^2} + \frac{\text{Ci}(a+bx)\sin(a+b}{b^2}$$

$$= \frac{x}{2b} - \frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} - \frac{a\log(a+bx)}{2b^2} + \frac{\cos(a+bx)\sin(a+bx)}{2b^2} +$$

$$= \frac{x}{2b} - \frac{x\cos(a+bx)\text{Ci}(a+bx)}{b} - \frac{a\text{Ci}(2a+2bx)}{2b^2} - \frac{a\log(a+bx)}{2b^2} + \frac{\cos(a+b}{}$$

Mathematica [A]
time = 0.13, size = 76, normalized size = 0.70

$$\frac{2bx - 2a\text{CosIntegral}(2(a+bx)) - 2a\log(a+bx) + \text{CosIntegral}(a+bx)(-4bx\cos(a+bx) + 4\sin(a+bx)) + \sin(2(a+bx)) - 2\text{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[a + b*x]*Sin[a + b*x],x]
```

```
[Out] (2*b*x - 2*a*CosIntegral[2*(a + b*x)] - 2*a*Log[a + b*x] + CosIntegral[a +
b*x]*(-4*b*x*Cos[a + b*x] + 4*Sin[a + b*x]) + Sin[2*(a + b*x)] - 2*SinInteg
ral[2*(a + b*x)])/(4*b^2)
```

Maple [A]
time = 0.53, size = 94, normalized size = 0.86

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)(a\cos(bx+a)+\sin(bx+a)-(bx+a)\cos(bx+a)) - \frac{a\ln(bx+a)}{2} - \frac{a\,\text{cosineIntegral}(2bx+2a)}{2} - \frac{\text{sinIntegral}(2bx+}{2}}{b^2}$
default	$\frac{\text{cosineIntegral}(bx+a)(a\cos(bx+a)+\sin(bx+a)-(bx+a)\cos(bx+a)) - \frac{a\ln(bx+a)}{2} - \frac{a\,\text{cosineIntegral}(2bx+2a)}{2} - \frac{\text{sinIntegral}(2bx+}{2}}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x+a)*(a*cos(b*x+a)+sin(b*x+a)-(b*x+a)*cos(b*x+a))-1/2*a*ln(b*x+
a)-1/2*a*Ci(2*b*x+2*a)-1/2*Si(2*b*x+2*a)+1/2*sin(b*x+a)*cos(b*x+a)+1/2*b*x+
1/2*a)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 274 vs. 2(99) = 198.
time = 0.40, size = 274, normalized size = 2.51

$$-\frac{2\,\pi b^2 x\cos\left(bx+a\right)\mathrm{C}\left(bx+a\right)-2\,\pi b\,\mathrm{C}\left(bx+a\right)\sin\left(bx+a\right)-2\,b\cos\left(bx+a\right)\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)+\sqrt{b^2}\left(\left(\pi a+1\right)\cos\left(\frac{1}{2\,\pi}\right)-\pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\left(\left(\pi a-1\right)\cos\left(\frac{1}{2\,\pi}\right)+\pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\left(\pi a+1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)-\left(\pi a-1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^2}}{\pi b}\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/2*(2*pi*b^2*x*cos(b*x + a)*fresnel_cos(b*x + a) - 2*pi*b*fresnel_cos(b*x
 + a)*sin(b*x + a) - 2*b*cos(b*x + a)*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*p
i*a^2) + sqrt(b^2)*((pi*a + 1)*cos(1/2/pi) - pi*sin(1/2/pi))*fresnel_cos((p
i*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*((pi*a - 1)*cos(1/2/pi) + p
i*sin(1/2/pi))*fresnel_cos((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2
)*(pi*cos(1/2/pi) + (pi*a + 1)*sin(1/2/pi))*fresnel_sin((pi*b*x + pi*a + 1)
*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi) - (pi*a - 1)*sin(1/2/pi))*fr
esnel_sin((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)))/(pi*b^3)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\sin\left(a+bx\right)\mathrm{Ci}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x+a)*sin(b*x+a),x)
```

```
[Out] Integral(x*sin(a + b*x)*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x \operatorname{cosint}(a + b\,x)\,\sin\left(a + b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(a + b*x)*sin(a + b*x),x)
[Out] int(x*cosint(a + b*x)*sin(a + b*x), x)
```

3.125 $\int \textbf{CosIntegral}(a+bx)\sin(a+bx)\,dx$

Optimal. Leaf size=47

$$-\frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{b}+\frac{\text{CosIntegral}(2a+2bx)}{2b}+\frac{\log(a+bx)}{2b}$$

```
[Out] 1/2*Ci(2*b*x+2*a)/b-Ci(b*x+a)*cos(b*x+a)/b+1/2*ln(b*x+a)/b
```

Rubi [A]
time = 0.05, antiderivative size = 47, normalized size of antiderivative = 1.00, 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 = {6653, 3393, 3383}

$$\frac{\text{CosIntegral}(2a+2bx)}{2b}-\frac{\text{CosIntegral}(a+bx)\cos(a+bx)}{b}+\frac{\log(a+bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[a + b*x]*Sin[a + b*x],x]
```

```
[Out] -((Cos[a + b*x]*CosIntegral[a + b*x])/b) + CosIntegral[2*a + 2*b*x]/(2*b) +
 Log[a + b*x]/(2*b)
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\int \text{Ci}(a+bx)\sin(a+bx)\,dx = -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b} + \int \frac{\cos^2(a+bx)}{a+bx}\,dx$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b} + \int \left(\frac{1}{2(a+bx)} + \frac{\cos(2a+2bx)}{2(a+bx)}\right)dx$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\log(a+bx)}{2b} + \frac{1}{2}\int \frac{\cos(2a+2bx)}{a+bx}\,dx$$
$$= -\frac{\cos(a+bx)\text{Ci}(a+bx)}{b} + \frac{\text{Ci}(2a+2bx)}{2b} + \frac{\log(a+bx)}{2b}$$

Mathematica [A]
time = 0.02, size = 46, normalized size = 0.98

$$-\frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{b} + \frac{\text{CosIntegral}(2(a+bx))}{2b} + \frac{\log(a+bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[a + b*x]*Sin[a + b*x],x]
[Out] -((Cos[a + b*x]*CosIntegral[a + b*x])/b) + CosIntegral[2*(a + b*x)]/(2*b) +
 Log[a + b*x]/(2*b)
```

Maple [A]
time = 0.31, size = 39, normalized size = 0.83

method	result	size
derivativedivides	$\frac{-\text{cosineIntegral}(bx+a)\cos(bx+a)+\frac{\ln(bx+a)}{2}+\frac{\text{cosineIntegral}(2bx+2a)}{2}}{b}$	39
default	$\frac{-\text{cosineIntegral}(bx+a)\cos(bx+a)+\frac{\ln(bx+a)}{2}+\frac{\text{cosineIntegral}(2bx+2a)}{2}}{b}$	39

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)*sin(b*x+a),x,method=_RETURNVERBOSE)
[Out] 1/b*(-Ci(b*x+a)*cos(b*x+a)+1/2*ln(b*x+a)+1/2*Ci(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 161 vs. 2(43) = 86.
time = 0.36, size = 161, normalized size = 3.43

$$-\frac{2\,b\cos\left(bx+a\right)\mathrm{C}\left(bx+a\right)-\sqrt{b^2}\cos\left(\frac{1}{2\,\pi}\right)\mathrm{C}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\cos\left(\frac{1}{2\,\pi}\right)\mathrm{C}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)-\sqrt{b^2}\,\mathrm{S}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)}{2\,b^2}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/2*(2*b*cos(b*x + a)*fresnel_cos(b*x + a) - sqrt(b^2)*cos(1/2/pi)*fresnel
_cos((pi*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*cos(1/2/pi)*fresnel_
cos((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*fresnel_sin((pi*b*x +
 pi*a + 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi) - sqrt(b^2)*fresnel_sin((pi*b*x +
pi*a - 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \sin\left(a+bx\right)\mathrm{Ci}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)*sin(b*x+a),x)
```

```
[Out] Integral(sin(a + b*x)*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(b*x + a)*sin(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.02

$$\frac{\ln\left(a+b\,x\right)}{2\,b}+\frac{\mathrm{cosint}(2\,a+2\,b\,x)}{2\,b}-\frac{\mathrm{cosint}(a+b\,x)\,\cos\left(a+b\,x\right)}{b}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)*sin(a + b*x),x)
```

```
[Out] log(a + b*x)/(2*b) + cosint(2*a + 2*b*x)/(2*b) - (cosint(a + b*x)*cos(a + b
*x))/b
```

3.126 $\int \frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Ci(b*x+a)*sin(b*x+a)/x,x)
```

Rubi [A]
time = 0.11, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(CosIntegral[a + b*x]*Sin[a + b*x])/x,x]
[Out] Defer[Int][(CosIntegral[a + b*x]*Sin[a + b*x])/x, x]
```

Rubi steps

$$\int \frac{\text{Ci}(a+bx)\sin(a+bx)}{x}\,dx = \int \frac{\text{Ci}(a+bx)\sin(a+bx)}{x}\,dx$$

Mathematica [A]
time = 4.64, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(CosIntegral[a + b*x]*Sin[a + b*x])/x,x]
[Out] Integrate[(CosIntegral[a + b*x]*Sin[a + b*x])/x, x]
```

Maple [A]
time = 0.11, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx+a)\sin\,(bx+a)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)*sin(b*x+a)/x,x)
[Out] int(Ci(b*x+a)*sin(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a)/x,x, algorithm="maxima")
[Out] integrate(fresnel_cos(b*x + a)*sin(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a)/x,x, algorithm="fricas")
[Out] integral(fresnel_cos(b*x + a)*sin(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin(a+bx)\operatorname{Ci}(a+bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)*sin(b*x+a)/x,x)
[Out] Integral(sin(a + b*x)*Ci(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*sin(b*x+a)/x,x, algorithm="giac")
[Out] integrate(fresnel_cos(b*x + a)*sin(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\operatorname{cosint}(a+b\,x)\,\sin(a+b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(a + b*x)*sin(a + b*x))/x,x)
[Out] int((cosint(a + b*x)*sin(a + b*x))/x, x)
```

3.127 $\int x^2 \cos(a+bx)\textbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=185

$$-\frac{x}{b^2}-\frac{a\cos(2a+2bx)}{4b^3}+\frac{x\cos(2a+2bx)}{4b^2}+\frac{2x\cos(a+bx)\text{CosIntegral}(a+bx)}{b^2}+\frac{a\text{CosIntegral}(2a+2bx)}{b^3}+\frac{a\,\text{l}}{}$$

```
[Out] -x/b^2+a*Ci(2*b*x+2*a)/b^3+2*x*Ci(b*x+a)*cos(b*x+a)/b^2-1/4*a*cos(2*b*x+2*a
)/b^3+1/4*x*cos(2*b*x+2*a)/b^2+a*ln(b*x+a)/b^3+Si(2*b*x+2*a)/b^3-1/2*a^2*Si
(2*b*x+2*a)/b^3-2*Ci(b*x+a)*sin(b*x+a)/b^3+x^2*Ci(b*x+a)*sin(b*x+a)/b-cos(b
*x+a)*sin(b*x+a)/b^3-1/8*sin(2*b*x+2*a)/b^3
```

Rubi [A]
time = 0.50, antiderivative size = 185, normalized size of antiderivative = 1.00, number of steps used = 21, number of rules used = 16, integrand size = 16, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {6649, 4669, 6873, 6874, 2718, 3377, 2717, 3380, 6655, 2715, 8, 3393, 3383, 6647, 4491, 12}

$$-\frac{a^2\text{Si}(2a+2bx)}{2b^3}+\frac{a\text{CosIntegral}(2a+2bx)}{b^3}-\frac{2\text{CosIntegral}(a+bx)\sin(a+bx)}{b^3}+\frac{\text{Si}(2a+2bx)}{b^3}+\frac{a\log(a+bx)}{b^3}-\frac{\sin(2a+2bx)}{8b^3}-\frac{a\cos(2a+2bx)}{4b^3}-\frac{\sin(a+bx)\cos(a+bx)}{b^3}+\frac{2x\text{CosIntegral}(a+bx)\cos(a+bx)}{b^2}+\frac{x\cos(2a+2bx)}{4b^2}+\frac{x^2\text{CosIntegral}(a+bx)\sin(a+bx)}{b}-\frac{x}{b^2}$$

Antiderivative was successfully verified.

```
[In] Int[x^2*Cos[a + b*x]*CosIntegral[a + b*x],x]
```

```
[Out] -(x/b^2) - (a*Cos[2*a + 2*b*x])/(4*b^3) + (x*Cos[2*a + 2*b*x])/(4*b^2) + (2
*x*Cos[a + b*x]*CosIntegral[a + b*x])/b^2 + (a*CosIntegral[2*a + 2*b*x])/b^
3 + (a*Log[a + b*x])/b^3 - (Cos[a + b*x]*Sin[a + b*x])/b^3 - (2*CosIntegral
[a + b*x]*Sin[a + b*x])/b^3 + (x^2*CosIntegral[a + b*x]*Sin[a + b*x])/b - S
in[2*a + 2*b*x]/(8*b^3) + SinIntegral[2*a + 2*b*x]/b^3 - (a^2*SinIntegral[2
*a + 2*b*x])/(2*b^3)
```

Rule 8

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

Rule 12

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

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
```

```
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x^2\cos(a+bx)\text{Ci}(a+bx)\,dx = \frac{x^2\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{2\int x\text{Ci}(a+bx)\sin(a+bx)\,dx}{b} - \int \frac{x^2\cos(a+}{a}$$

$$= \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} + \frac{x^2\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{1}{2}\int \frac{x^2\sin(2(a+b}{a+bx}$$

$$= \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{2\text{Ci}(a+bx)\sin(a+bx)}{b^3} + \frac{x^2\text{Ci}(a+bx)\sin(a-}{b}$$

$$= \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{2\text{Ci}(a+bx)\sin(a+bx)}{b^3} + \frac{x^2\text{Ci}(a+bx)\sin(a-}{b}$$

$$= \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{\cos(a+bx)\sin(a+bx)}{b^3} - \frac{2\text{Ci}(a+bx)\sin(a+}{b^3}$$

$$= -\frac{x}{b^2} - \frac{a\cos(2a+2bx)}{4b^3} + \frac{x\cos(2a+2bx)}{4b^2} + \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} + \frac{a}{}$$

$$= -\frac{x}{b^2} - \frac{a\cos(2a+2bx)}{4b^3} + \frac{x\cos(2a+2bx)}{4b^2} + \frac{2x\cos(a+bx)\text{Ci}(a+bx)}{b^2} + \frac{a}{}$$

Mathematica [A]
time = 0.22, size = 123, normalized size = 0.66

$$\frac{-8bx - 2a\cos(2(a+bx)) + 2bx\cos(2(a+bx)) + 8a\text{CosIntegral}(2(a+bx)) + 8a\log(a+bx) + 8\text{CosIntegral}(a+bx)\,(2bx\cos(a+bx) + (-2+b^2x^2)\sin(a+bx)) - 5\sin(2(a+bx)) + 8\text{Si}(2(a+bx)) - 4a^2\text{Si}(2(a+bx))}{8b^3}$$

Antiderivative was successfully verified.

```
[In] Integrate[x^2*Cos[a + b*x]*CosIntegral[a + b*x],x]
```

```
[Out] (-8*b*x - 2*a*Cos[2*(a + b*x)] + 2*b*x*Cos[2*(a + b*x)] + 8*a*CosIntegral[2
*(a + b*x)] + 8*a*Log[a + b*x] + 8*CosIntegral[a + b*x]*(2*b*x*Cos[a + b*x]
 + (-2 + b^2*x^2)*Sin[a + b*x]) - 5*Sin[2*(a + b*x)] + 8*SinIntegral[2*(a +
 b*x)] - 4*a^2*SinIntegral[2*(a + b*x)])/(8*b^3)
```

Maple [A]
time = 0.62, size = 170, normalized size = 0.92

method	result
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)\left(a^2\sin(bx+a) - 2a(\cos(bx+a)+(bx+a)\sin(bx+a)) + (bx+a)^2\sin(bx+a) - 2\sin(bx+a) + 2(bx+a)\cos(\right.}{}$
default	$\frac{\text{cosineIntegral}(bx+a)\left(a^2\sin(bx+a) - 2a(\cos(bx+a)+(bx+a)\sin(bx+a)) + (bx+a)^2\sin(bx+a) - 2\sin(bx+a) + 2(bx+a)\cos(\right.}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*Ci(b*x+a)*cos(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^3*(Ci(b*x+a)*(a^2*sin(b*x+a)-2*a*(cos(b*x+a)+(b*x+a)*sin(b*x+a))+(b*x+a
)^2*sin(b*x+a)-2*sin(b*x+a)+2*(b*x+a)*cos(b*x+a))-1/2*a^2*Si(2*b*x+2*a)-cos
(b*x+a)^2*a+1/2*cos(b*x+a)^2*(b*x+a)-5/4*sin(b*x+a)*cos(b*x+a)-5/4*b*x-5/4*
a+a*ln(b*x+a)+a*Ci(2*b*x+2*a)+Si(2*b*x+2*a))
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x^2*cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 414 vs. $2(177) = 354$.
time = 0.42, size = 414, normalized size = 2.24

$$\frac{4\,\pi^2 b^2 x \cos\left(bx+a\right) \mathrm{C}\left(bx+a\right) - 2\,b \cos\left(\frac{1}{2}\,\pi b^2 x^2 + \pi abx + \frac{1}{2}\,\pi a^2\right) \cos\left(bx+a\right) + 2\,\left(\pi^2 b^3 x^2 - 2\,\pi^2 b\right) \mathrm{C}\left(bx+a\right) \sin\left(bx+a\right) + \sqrt{b^2}\,\left(\left(\pi + 2\,\pi^2 a\right) \cos\left(\frac{1}{2\pi}\right) + \left(\pi^2(a^2-2) + 2\,\pi a + 1\right) \sin\left(\frac{1}{2\pi}\right)\right) \mathrm{C}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right) - \sqrt{b^2}\,\left(\left(\pi - 2\,\pi^2 a\right) \cos\left(\frac{1}{2\pi}\right) + \left(\pi^2(a^2-2) - 2\,\pi a + 1\right) \sin\left(\frac{1}{2\pi}\right)\right) \mathrm{C}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right) - \sqrt{b^2}\,\left(\left(\pi^2(a^2-2) + 2\,\pi a + 1\right) \cos\left(\frac{1}{2\pi}\right) - \left(\pi + 2\,\pi^2 a\right) \sin\left(\frac{1}{2\pi}\right)\right) \mathrm{S}\left(\frac{(\pi bx+\pi a+1)\sqrt{b^2}}{\pi b}\right) + \sqrt{b^2}\,\left(\left(\pi^2(a^2-2) - 2\,\pi a + 1\right) \cos\left(\frac{1}{2\pi}\right) - \left(\pi - 2\,\pi^2 a\right) \sin\left(\frac{1}{2\pi}\right)\right) \mathrm{S}\left(\frac{(\pi bx+\pi a-1)\sqrt{b^2}}{\pi b}\right) - 2\,\left(2\,\pi b \cos\left(bx+a\right) + \left(\pi b^2 x - \pi ab\right) \sin\left(bx+a\right)\right) \sin\left(\frac{1}{2}\,\pi b^2 x^2 + \pi abx + \frac{1}{2}\,\pi a^2\right)}{2\,\pi^2 b^4}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/2*(4*pi^2*b^2*x*cos(b*x + a)*fresnel_cos(b*x + a) - 2*b*cos(1/2*pi*b^2*x^
2 + pi*a*b*x + 1/2*pi*a^2)*cos(b*x + a) + 2*(pi^2*b^3*x^2 - 2*pi^2*b)*fresn
el_cos(b*x + a)*sin(b*x + a) + sqrt(b^2)*((pi + 2*pi^2*a)*cos(1/2/pi) + (pi
^2*(a^2 - 2) + 2*pi*a + 1)*sin(1/2/pi))*fresnel_cos((pi*b*x + pi*a + 1)*sqr
t(b^2)/(pi*b)) - sqrt(b^2)*((pi - 2*pi^2*a)*cos(1/2/pi) + (pi^2*(a^2 - 2) -
 2*pi*a + 1)*sin(1/2/pi))*fresnel_cos((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b))
 - sqrt(b^2)*((pi^2*(a^2 - 2) + 2*pi*a + 1)*cos(1/2/pi) - (pi + 2*pi^2*a)*s
in(1/2/pi))*fresnel_sin((pi*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*(
(pi^2*(a^2 - 2) - 2*pi*a + 1)*cos(1/2/pi) - (pi - 2*pi^2*a)*sin(1/2/pi))*fr
esnel_sin((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) - 2*(2*pi*b*cos(b*x + a) +
(pi*b^2*x - pi*a*b)*sin(b*x + a))*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^
2))/(pi^2*b^4)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x^2 \cos\left(a + bx\right) \operatorname{Ci}\left(a + bx\right)\, dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x**2*Ci(b*x+a)*cos(b*x+a),x)
```

```
[Out] Integral(x**2*cos(a + b*x)*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x^2*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="giac")
[Out] integrate(x^2*cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int x^2\,\mathrm{cosint}(a+b\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x^2*cosint(a + b*x)*cos(a + b*x),x)
[Out] int(x^2*cosint(a + b*x)*cos(a + b*x), x)
```

3.128 $\int x\cos(a+bx)\,\mathbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=96

$$\frac{\cos(2a+2bx)}{4b^2}+\frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{b^2}-\frac{\text{CosIntegral}(2a+2bx)}{2b^2}-\frac{\log(a+bx)}{2b^2}+\frac{x\text{CosIntegral}(a+\hat{\ }}{b}$$

[Out] -1/2*Ci(2*b*x+2*a)/b^2+Ci(b*x+a)*cos(b*x+a)/b^2+1/4*cos(2*b*x+2*a)/b^2-1/2*ln(b*x+a)/b^2+1/2*a*Si(2*b*x+2*a)/b^2+x*Ci(b*x+a)*sin(b*x+a)/b

Rubi [A]
time = 0.19, antiderivative size = 96, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 9, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.643$, Rules used = {6649, 4669, 6873, 6874, 2718, 3380, 6653, 3393, 3383}

$$-\frac{\text{CosIntegral}(2a+2bx)}{2b^2}+\frac{\text{CosIntegral}(a+bx)\cos(a+bx)}{b^2}+\frac{a\text{Si}(2a+2bx)}{2b^2}-\frac{\log(a+bx)}{2b^2}+\frac{\cos(2a+2bx)}{4b^2}+\frac{x\text{CosIntegral}(a+bx)\sin(a+bx)}{b}$$

Antiderivative was successfully verified.

[In] Int[x*Cos[a + b*x]*CosIntegral[a + b*x],x]

[Out] Cos[2*a + 2*b*x]/(4*b^2) + (Cos[a + b*x]*CosIntegral[a + b*x])/b^2 - CosIntegral[2*a + 2*b*x]/(2*b^2) - Log[a + b*x]/(2*b^2) + (x*CosIntegral[a + b*x]*Sin[a + b*x])/b + (a*SinIntegral[2*a + 2*b*x])/(2*b^2)

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3393

```
Int[((c_.) + (d_.)*(x_))^(m_)*sin[(e_.) + (f_.)*(x_)]^(n_), x_Symbol] :> In
t[ExpandTrigReduce[(c + d*x)^m, Sin[e + f*x]^n, x], x] /; FreeQ[{c, d, e, f
, m}, x] && IGtQ[n, 1] && ( !RationalQ[m] || (GeQ[m, -1] && LtQ[m, 1]))
```

Rule 4669

```
Int[Cos[w_]^(p_.)*(u_.)*Sin[v_]^(p_.), x_Symbol] :> Dist[1/2^p, Int[u*Sin[2
*v]^p, x], x] /; EqQ[w, v] && IntegerQ[p]
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6873

```
Int[u_, x_Symbol] :> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v =!
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\cos(a+bx)\text{Ci}(a+bx)\,dx = \frac{x\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{\int \text{Ci}(a+bx)\sin(a+bx)\,dx}{b} - \int \frac{x\cos(a+bx)\,\text{si}}{a+bx}$$

$$= \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} + \frac{x\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{1}{2}\int \frac{x\sin(2(a+bx))}{a+bx}\,d$$

$$= \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} + \frac{x\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{1}{2}\int \frac{x\sin(2a+2bx)}{a+bx}\,dx$$

$$= \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{\log(a+bx)}{2b^2} + \frac{x\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{1}{2}\int \Bigg(\frac{\text{si}}{}$$

$$= \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{\text{Ci}(2a+2bx)}{2b^2} - \frac{\log(a+bx)}{2b^2} + \frac{x\text{Ci}(a+bx)\sin(a+}{b}$$

$$= \frac{\cos(2a+2bx)}{4b^2} + \frac{\cos(a+bx)\text{Ci}(a+bx)}{b^2} - \frac{\text{Ci}(2a+2bx)}{2b^2} - \frac{\log(a+bx)}{2b^2} + \frac{x}{}$$

Mathematica [A]
time = 0.11, size = 69, normalized size = 0.72

$$\frac{\cos(2(a+bx)) - 2\mathrm{CosIntegral}(2(a+bx)) - 2\log(a+bx) + 4\mathrm{CosIntegral}(a+bx)(\cos(a+bx) + bx\sin(a+bx)) + 2a\mathrm{Si}(2(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[a + b*x]*CosIntegral[a + b*x],x]
```

```
[Out] (Cos[2*(a + b*x)] - 2*CosIntegral[2*(a + b*x)] - 2*Log[a + b*x] + 4*CosInte
gral[a + b*x]*(Cos[a + b*x] + b*x*Sin[a + b*x]) + 2*a*SinIntegral[2*(a + b*
x)])/(4*b^2)
```

Maple [A]
time = 0.58, size = 82, normalized size = 0.85

method	result
derivativedivides	$\frac{\mathrm{cosineIntegral}(bx+a)(-a\sin(bx+a)+\cos(bx+a)+(bx+a)\sin(bx+a))+\frac{a\,\mathrm{sinIntegral}(2bx+2a)}{2}-\frac{\ln(bx+a)}{2}-\frac{\mathrm{cosineIntegral}(2ba}{2}}{b^2}$
default	$\frac{\mathrm{cosineIntegral}(bx+a)(-a\sin(bx+a)+\cos(bx+a)+(bx+a)\sin(bx+a))+\frac{a\,\mathrm{sinIntegral}(2bx+2a)}{2}-\frac{\ln(bx+a)}{2}-\frac{\mathrm{cosineIntegral}(2ba}{2}}{b^2}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(b*x+a)*cos(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2*(Ci(b*x+a)*(-a*sin(b*x+a)+cos(b*x+a)+(b*x+a)*sin(b*x+a))+1/2*a*Si(2*b
*x+2*a)-1/2*ln(b*x+a)-1/2*Ci(2*b*x+2*a)+1/2*cos(b*x+a)^2)
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 276 vs. 2(88) = 176.
time = 0.42, size = 276, normalized size = 2.88

$$\frac{2\,\pi b^2 x\,\mathrm{C}\left(bx+a\right)\sin\left(bx+a\right)+2\,\pi b\cos\left(bx+a\right)\mathrm{C}\left(bx+a\right)-2\,b\sin\left(\frac{1}{2}\,\pi b^2x^2+\pi abx+\frac{1}{2}\,\pi a^2\right)\sin\left(bx+a\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)+\left(\pi a+1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\pi\cos\left(\frac{1}{2\,\pi}\right)-\left(\pi a-1\right)\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{C}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^2}}{\pi b}\right)+\sqrt{b^2}\left(\left(\pi a+1\right)\cos\left(\frac{1}{2\,\pi}\right)-\pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^2}}{\pi b}\right)-\sqrt{b^2}\left(\left(\pi a-1\right)\cos\left(\frac{1}{2\,\pi}\right)+\pi\sin\left(\frac{1}{2\,\pi}\right)\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^2}}{\pi b}\right)}{2\,\pi b^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/2*(2*pi*b^2*x*fresnel_cos(b*x + a)*sin(b*x + a) + 2*pi*b*cos(b*x + a)*fre
snel_cos(b*x + a) - 2*b*sin(1/2*pi*b^2*x^2 + pi*a*b*x + 1/2*pi*a^2)*sin(b*x
 + a) - sqrt(b^2)*(pi*cos(1/2/pi) + (pi*a + 1)*sin(1/2/pi))*fresnel_cos((pi
*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) - sqrt(b^2)*(pi*cos(1/2/pi) - (pi*a - 1)
*sin(1/2/pi))*fresnel_cos((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)
*((pi*a + 1)*cos(1/2/pi) - pi*sin(1/2/pi))*fresnel_sin((pi*b*x + pi*a + 1)*
sqrt(b^2)/(pi*b)) - sqrt(b^2)*((pi*a - 1)*cos(1/2/pi) + pi*sin(1/2/pi))*fre
snel_sin((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)))/(pi*b^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos\left(a+bx\right)\operatorname{Ci}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(b*x+a)*cos(b*x+a),x)
```

```
[Out] Integral(x*cos(a + b*x)*Ci(a + b*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x*cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int x\,\mathrm{cosint}(a+b\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(a + b*x)*cos(a + b*x),x)
```

```
[Out] int(x*cosint(a + b*x)*cos(a + b*x), x)
```

3.129 $\int \cos(a+bx)\textbf{CosIntegral}(a+bx)\,dx$

Optimal. Leaf size=33

$$\frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{b}-\frac{\text{Si}(2a+2bx)}{2b}$$

```
[Out] -1/2*Si(2*b*x+2*a)/b+Ci(b*x+a)*sin(b*x+a)/b
```

Rubi [A]
time = 0.04, antiderivative size = 33, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.308, Rules used = {6647, 4491, 12, 3380}

$$\frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{b}-\frac{\text{Si}(2a+2bx)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[a + b*x]*CosIntegral[a + b*x],x]
```

```
[Out] (CosIntegral[a + b*x]*Sin[a + b*x])/b - SinIntegral[2*a + 2*b*x]/(2*b)
```

Rule 12

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

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 4491

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*((c_.) + (d_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(n_.), x_Symbol] :> Int[ExpandTrigReduce[(c + d*x)^m, Sin[a + b*x
]^n*Cos[a + b*x]^p, x], x] /; FreeQ[{a, b, c, d, m}, x] && IGtQ[n, 0] && IG
tQ[p, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$
\begin{aligned}
\int \cos(a+bx)\text{Ci}(a+bx)\,dx &= \frac{\text{Ci}(a+bx)\sin(a+bx)}{b} - \int \frac{\cos(a+bx)\sin(a+bx)}{a+bx}\,dx \\
&= \frac{\text{Ci}(a+bx)\sin(a+bx)}{b} - \int \frac{\sin(2a+2bx)}{2(a+bx)}\,dx \\
&= \frac{\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{1}{2}\int \frac{\sin(2a+2bx)}{a+bx}\,dx \\
&= \frac{\text{Ci}(a+bx)\sin(a+bx)}{b} - \frac{\text{Si}(2a+2bx)}{2b}
\end{aligned}
$$

Mathematica [**A**]
time = 0.01, size = 32, normalized size = 0.97

$$\frac{\text{CosIntegral}(a+bx)\sin(a+bx)}{b} - \frac{\text{Si}(2(a+bx))}{2b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[a + b*x]*CosIntegral[a + b*x],x]
[Out] (CosIntegral[a + b*x]*Sin[a + b*x])/b - SinIntegral[2*(a + b*x)]/(2*b)
```

Maple [**A**]
time = 0.26, size = 30, normalized size = 0.91

method	result	size
derivativedivides	$\frac{\text{cosineIntegral}(bx+a)\sin(bx+a)-\frac{\text{sinIntegral}(2bx+2a)}{2}}{b}$	30
default	$\frac{\text{cosineIntegral}(bx+a)\sin(bx+a)-\frac{\text{sinIntegral}(2bx+2a)}{2}}{b}$	30

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)*cos(b*x+a),x,method=_RETURNVERBOSE)
[Out] 1/b*(Ci(b*x+a)*sin(b*x+a)-1/2*Si(2*b*x+2*a))
```

Maxima [**F**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="maxima")
[Out] integrate(cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Fricas [B] Leaf count of result is larger than twice the leaf count of optimal. 159 vs. $2(31) = 62$.
time = 0.38, size = 159, normalized size = 4.82

$$\frac{2\,b\,\mathrm{C}\left(bx+a\right)\sin\left(bx+a\right)-\sqrt{b^{2}}\,\cos\left(\frac{1}{2\,\pi}\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^{2}}}{\pi b}\right)+\sqrt{b^{2}}\,\cos\left(\frac{1}{2\,\pi}\right)\mathrm{S}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^{2}}}{\pi b}\right)+\sqrt{b^{2}}\,\mathrm{C}\left(\frac{\left(\pi bx+\pi a+1\right)\sqrt{b^{2}}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)-\sqrt{b^{2}}\,\mathrm{C}\left(\frac{\left(\pi bx+\pi a-1\right)\sqrt{b^{2}}}{\pi b}\right)\sin\left(\frac{1}{2\,\pi}\right)}{2\,b^{2}}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/2*(2*b*fresnel_cos(b*x + a)*sin(b*x + a) - sqrt(b^2)*cos(1/2/pi)*fresnel_
sin((pi*b*x + pi*a + 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*cos(1/2/pi)*fresnel_s
in((pi*b*x + pi*a - 1)*sqrt(b^2)/(pi*b)) + sqrt(b^2)*fresnel_cos((pi*b*x +
pi*a + 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi) - sqrt(b^2)*fresnel_cos((pi*b*x + p
i*a - 1)*sqrt(b^2)/(pi*b))*sin(1/2/pi))/b^2
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \cos\left(a+bx\right)\mathrm{Ci}\left(a+bx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)*cos(b*x+a),x)
```

```
[Out] Integral(cos(a + b*x)*Ci(a + b*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(cos(b*x + a)*fresnel_cos(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.03

$$\int \mathrm{cosint}(a+b\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(a + b*x)*cos(a + b*x),x)
```

```
[Out] int(cosint(a + b*x)*cos(a + b*x), x)
```

3.130 $\int \frac{\cos(a+bx)\textbf{CosIntegral}(a+bx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Ci(b*x+a)*cos(b*x+a)/x,x)
```

Rubi [A]
time = 0.05, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[a + b*x]*CosIntegral[a + b*x])/x,x]
[Out] Defer[Int][(Cos[a + b*x]*CosIntegral[a + b*x])/x, x]
```

Rubi steps

$$\int \frac{\cos(a+bx)\text{Ci}(a+bx)}{x}\,dx = \int \frac{\cos(a+bx)\text{Ci}(a+bx)}{x}\,dx$$

Mathematica [A]
time = 2.27, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\text{CosIntegral}(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[a + b*x]*CosIntegral[a + b*x])/x,x]
[Out] Integrate[(Cos[a + b*x]*CosIntegral[a + b*x])/x, x]
```

Maple [A]
time = 0.22, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(bx+a)\cos\,(bx+a)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(b*x+a)*cos(b*x+a)/x,x)
[Out] int(Ci(b*x+a)*cos(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a)/x,x, algorithm="maxima")
[Out] integrate(cos(b*x + a)*fresnel_cos(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a)/x,x, algorithm="fricas")
[Out] integral(cos(b*x + a)*fresnel_cos(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\operatorname{Ci}(a+bx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(b*x+a)*cos(b*x+a)/x,x)
[Out] Integral(cos(a + b*x)*Ci(a + b*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(b*x+a)*cos(b*x+a)/x,x, algorithm="giac")
[Out] integrate(cos(b*x + a)*fresnel_cos(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\operatorname{cosint}(a+b\,x)\,\cos(a+b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(a + b*x)*cos(a + b*x))/x,x)
[Out] int((cosint(a + b*x)*cos(a + b*x))/x, x)
```

3.131 $\int x\textbf{CosIntegral}(c+dx)\sin(a+bx)\,dx$

Optimal. Leaf size=371

$$-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2bd}-\frac{x\cos(a+bx)\text{CosIntegral}(c+dx)}{b}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosInteg}}{2}$$

```
[Out] -1/2*c*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b/d-1/2*c*Ci(c*(b+d)/d+(b+d)*x)*c
os(a-b*c/d)/b/d-x*Ci(d*x+c)*cos(b*x+a)/b-1/2*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d
)*x)/b^2-1/2*cos(a-b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b^2-1/2*Ci(c*(b-d)/d+(b-d)*
x)*sin(a-b*c/d)/b^2-1/2*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b^2+1/2*c*Si(c*(
b-d)/d+(b-d)*x)*sin(a-b*c/d)/b/d+1/2*c*Si(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b
/d+Ci(d*x+c)*sin(b*x+a)/b^2+1/2*sin(a-c+(b-d)*x)/b/(b-d)+1/2*sin(a+c+(b+d)*
x)/b/(b+d)
```

Rubi [A]
time = 0.80, antiderivative size = 371, normalized size of antiderivative = 1.00, number of steps used = 24, number of rules used = 9, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.643$, Rules used = {6655, 4705, 6874, 2717, 3384, 3380, 3383, 6647, 4515}

$$-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b^2}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b^2}+\frac{\sin(a+bx)\text{CosIntegral}(c+dx)}{b^2}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b^2}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b^2}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2bd}-\frac{x\cos(a+bx)\text{CosIntegral}(c+dx)}{b}-\frac{c\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2bd}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2bd}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2bd}+\frac{\sin(a+x(b-d)-c)}{2b(b-d)}+\frac{\sin(a+x(b+d)+c)}{2b(b+d)}$$

Antiderivative was successfully verified.

```
[In] Int[x*CosIntegral[c + d*x]*Sin[a + b*x],x]
```

```
[Out] -1/2*(c*Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/(b*d) - (x
*Cos[a + b*x]*CosIntegral[c + d*x])/b - (c*Cos[a - (b*c)/d]*CosIntegral[(c*
(b + d))/d + (b + d)*x])/(2*b*d) - (CosIntegral[(c*(b - d))/d + (b - d)*x]*
Sin[a - (b*c)/d])/(2*b^2) - (CosIntegral[(c*(b + d))/d + (b + d)*x]*Sin[a -
 (b*c)/d])/(2*b^2) + (CosIntegral[c + d*x]*Sin[a + b*x])/b^2 + Sin[a - c +
(b - d)*x]/(2*b*(b - d)) + Sin[a + c + (b + d)*x]/(2*b*(b + d)) - (Cos[a -
(b*c)/d]*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b^2) + (c*Sin[a - (b*c)
/d]*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b*d) - (Cos[a - (b*c)/d]*Sin
Integral[(c*(b + d))/d + (b + d)*x])/(2*b^2) + (c*Sin[a - (b*c)/d]*SinInteg
ral[(c*(b + d))/d + (b + d)*x])/(2*b*d)
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] :> Simp[Sin[c + d*x]/d, x] /;
 FreeQ[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 4705

```
Int[Cos[(a_.) + (b_.)*(x_)]^(m_.)*Cos[(c_.) + (d_.)*(x_)]^(n_.)*(u_.), x_Sy
mbol] :> Int[ExpandTrigReduce[u, Cos[a + b*x]^m*Cos[c + d*x]^n, x], x] /; F
reeQ[{a, b, c, d}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6655

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) +
(b_.)*(x_)], x_Symbol] :> Simp[(-(e + f*x)^m)*Cos[a + b*x]*(CosIntegral[c +
 d*x]/b), x] + (Dist[d/b, Int[(e + f*x)^m*Cos[a + b*x]*(Cos[c + d*x]/(c + d
*x)), x], x] + Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Cos[a + b*x]*CosIntegral
[c + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\int x\text{Ci}(c+dx)\sin(a+bx)\,dx = -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} + \frac{\int \cos(a+bx)\text{Ci}(c+dx)\,dx}{b} + \frac{d\int \frac{x\cos(a+bx)\cos}{c+dx}}{b}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} + \frac{\text{Ci}(c+dx)\sin(a+bx)}{b^2} - \frac{d\int \frac{\cos(c+dx)\sin(a+bx)}{c+dx}}{b^2}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} + \frac{\text{Ci}(c+dx)\sin(a+bx)}{b^2} - \frac{d\int \left(\frac{\sin(a-c+(b-d)x)}{2(c+dx)}\right.}{b}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} + \frac{\text{Ci}(c+dx)\sin(a+bx)}{b^2} - \frac{d\int \frac{\sin(a-c+(b-d)x)}{c+dx}\,dx}{2b^2}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} + \frac{\text{Ci}(c+dx)\sin(a+bx)}{b^2} + \frac{\int \cos(a-c+(b-}{2b}$$

$$= -\frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} - \frac{\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b^2} - \frac{\text{Ci}\left(\frac{c(b+}{d}\right.}{}$$

$$= -\frac{c\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2bd} - \frac{x\cos(a+bx)\text{Ci}(c+dx)}{b} - \frac{c\cos(}{}$$

Mathematica [C] Result contains complex when optimal does not.
time = 4.05, size = 328, normalized size = 0.88

$$\frac{\frac{e^{-ia}\left(ibde^{-ic}\left(\frac{e^{-i(b+d)x}}{b+d}+\frac{e^{i(2c-bx+dx)}}{b-d}\right)-(bc+id)e^{\frac{ibc}{d}}\text{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)-(bc+id)e^{\frac{ibc}{d}}\text{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)\right)}{d}-\frac{e^{i(a-c)}\left(ibd\left(\frac{e^{i(b-d)x}}{b-d}+\frac{e^{i(2c+(b+d)x)}}{b+d}\right)+(bc-id)e^{-\frac{ic(b-d)}{d}}\text{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+(bc-id)e^{-\frac{ic(b-d)}{d}}\text{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)}{d}-4\text{CosIntegral}(c+dx)(bx\cos(a+bx)-\sin(a+bx))}{4b^2}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*CosIntegral[c + d*x]*Sin[a + b*x],x]
```

```
[Out] (((I*b*d*(1/((b + d)*E^(I*(b + d)*x)) + E^(I*(2*c - b*x + d*x))/(b - d)))/E
^(I*c) - (b*c + I*d)*E^((I*b*c)/d)*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d
] - (b*c + I*d)*E^((I*b*c)/d)*ExpIntegralEi[((-I)*(b + d)*(c + d*x))/d])/(d
*E^(I*a)) - (E^(I*(a - c))*(I*b*d*(E^(I*(b - d)*x)/(b - d) + E^(I*(2*c + (b
 + d)*x))/(b + d)) + ((b*c - I*d)*ExpIntegralEi[(I*(b - d)*(c + d*x))/d])/E
^((I*c*(b - d))/d) + ((b*c - I*d)*ExpIntegralEi[(I*(b + d)*(c + d*x))/d])/E
^((I*c*(b - d))/d)))/d - 4*CosIntegral[c + d*x]*(b*x*Cos[a + b*x] - Sin[a +
 b*x]))/(4*b^2)
```

Maple [B] Leaf count of result is larger than twice the leaf count of optimal. 1241 vs. $2(351) = 702$.
time = 1.44, size = 1242, normalized size = 3.35

method	result	size

default	Expression too large to display	1242

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(d*x+c)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (-Ci(d*x+c)/b*(-d/b*a*cos(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(sin(1/d*b*(d*x+
c)+(a*d-b*c)/d)-(1/d*b*(d*x+c)+(a*d-b*c)/d)*cos(1/d*b*(d*x+c)+(a*d-b*c)/d))
)+1/b*(-1/2*d^2*a/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin
((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c
)/d)/d)+1/2*d^2*c/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin
((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c
)/d)/d)+1/2*(a*d-b*c)*d/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/
d)*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a
*d+b*c)/d)/d)+1/2/(b-d)*d*sin((b-d)/d*(d*x+c)+(a*d-b*c)/d)-1/2*d^2*a/(b+d)*
(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d
)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)-1/2*d^2*c/(b+d)*
(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d
)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)+1/2*(a*d-b*c)*d/
(b+d)*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+C
i((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)+1/2/(b+d)*
d*sin((b+d)/d*(d*x+c)+(a*d-b*c)/d)-1/2/b*d^2*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c
)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+
b*c)/d)*sin((-a*d+b*c)/d)/d)-1/2/b*d^2*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-
a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d
)*sin((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*fresnel_cos(d*x + c)*sin(b*x + a), x)
```

Fricas [A]
time = 0.44, size = 451, normalized size = 1.22

$$-\frac{2\,\pi b d^3 x\cos\left(bx+a\right)\mathrm{C}\left(dx+c\right)-2\,\pi d^3\,\mathrm{C}\left(dx+c\right)\sin\left(bx+a\right)-2\,bd^2\cos\left(bx+a\right)\sin\left(\frac{1}{2}\,\pi d^2x^2+\pi cdx+\frac{1}{2}\,\pi c^2\right)+\left(\pi d^2\sin\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)+\left(\pi bcd+b^2\right)\cos\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)+\left(\pi d^2\sin\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)+\left(\pi bcd-b^2\right)\cos\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)+\left(\pi d^2\cos\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)-\left(\pi bcd+b^2\right)\sin\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)-\left(\pi d^2\cos\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)-\left(\pi bcd-b^2\right)\sin\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)}{2\,\pi b^2d^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/2*(2*pi*b*d^3*x*cos(b*x + a)*fresnel_cos(d*x + c) - 2*pi*d^3*fresnel_cos
(d*x + c)*sin(b*x + a) - 2*b*d^2*cos(b*x + a)*sin(1/2*pi*d^2*x^2 + pi*c*d*x
 + 1/2*pi*c^2) + (pi*d^2*sin(a - b*c/d - 1/2*b^2/(pi*d^2)) + (pi*b*c*d + b^
2)*cos(a - b*c/d - 1/2*b^2/(pi*d^2)))*sqrt(d^2)*fresnel_cos((pi*d^2*x + pi*
c*d + b)*sqrt(d^2)/(pi*d^2)) + (pi*d^2*sin(a - b*c/d + 1/2*b^2/(pi*d^2)) +
(pi*b*c*d - b^2)*cos(a - b*c/d + 1/2*b^2/(pi*d^2)))*sqrt(d^2)*fresnel_cos((
pi*d^2*x + pi*c*d - b)*sqrt(d^2)/(pi*d^2)) + (pi*d^2*cos(a - b*c/d - 1/2*b^
2/(pi*d^2)) - (pi*b*c*d + b^2)*sin(a - b*c/d - 1/2*b^2/(pi*d^2)))*sqrt(d^2)
*fresnel_sin((pi*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2)) - (pi*d^2*cos(a -
b*c/d + 1/2*b^2/(pi*d^2)) - (pi*b*c*d - b^2)*sin(a - b*c/d + 1/2*b^2/(pi*d^
2)))*sqrt(d^2)*fresnel_sin((pi*d^2*x + pi*c*d - b)*sqrt(d^2)/(pi*d^2)))/(pi
*b^2*d^3)
```

Sympy [**F**]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\sin(a+bx)\operatorname{Ci}(c+dx)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(d*x+c)*sin(b*x+a),x)
```

```
[Out] Integral(x*sin(a + b*x)*Ci(c + d*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x*fresnel_cos(d*x + c)*sin(b*x + a), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.00

$$\int x\,\mathrm{cosint}(c+d\,x)\,\sin(a+b\,x)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(c + d*x)*sin(a + b*x),x)
```

```
[Out] int(x*cosint(c + d*x)*sin(a + b*x), x)
```

3.132 $\int \text{CosIntegral}(c+dx)\sin(a+bx)\,dx$

Optimal. Leaf size=154

$$\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b}-\frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{b}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+}{d}\right.}{2b}$$

```
[Out] 1/2*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b+1/2*Ci(c*(b+d)/d+(b+d)*x)*cos(a-b*
c/d)/b-Ci(d*x+c)*cos(b*x+a)/b-1/2*Si(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)/b-1/2*
Si(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b
```

Rubi [A]

time = 0.16, antiderivative size = 154, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6653, 4514, 3384, 3380, 3383}

$$\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b}-\frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{b}+\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[CosIntegral[c + d*x]*Sin[a + b*x],x]
```

```
[Out] (Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/(2*b) - (Cos[a +
b*x]*CosIntegral[c + d*x])/b + (Cos[a - (b*c)/d]*CosIntegral[(c*(b + d))/d
+ (b + d)*x])/(2*b) - (Sin[a - (b*c)/d]*SinIntegral[(c*(b - d))/d + (b - d)
*x])/(2*b) - (Sin[a - (b*c)/d]*SinIntegral[(c*(b + d))/d + (b + d)*x])/(2*b
)
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4514

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f
_.)*(x_))^(m_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Cos[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \text{Ci}(c+dx)\sin(a+bx)\,dx &= -\frac{\cos(a+bx)\text{Ci}(c+dx)}{b}+\frac{d\int\frac{\cos(a+bx)\cos(c+dx)}{c+dx}\,dx}{b}\\ &= -\frac{\cos(a+bx)\text{Ci}(c+dx)}{b}+\frac{d\int\left(\frac{\cos(a-c+(b-d)x)}{2(c+dx)}+\frac{\cos(a+c+(b+d)x)}{2(c+dx)}\right)dx}{b}\\ &= -\frac{\cos(a+bx)\text{Ci}(c+dx)}{b}+\frac{d\int\frac{\cos(a-c+(b-d)x)}{c+dx}\,dx}{2b}+\frac{d\int\frac{\cos(a+c+(b+d)x)}{c+dx}\,dx}{2b}\\ &= -\frac{\cos(a+bx)\text{Ci}(c+dx)}{b}+\frac{\left(d\cos\left(a-\frac{bc}{d}\right)\right)\int\frac{\cos\left(\frac{c(b-d)}{d}+(b-d)x\right)}{c+dx}\,dx}{2b}+\frac{\left(d\cos\left(\right.\right.}{}\\ &= \frac{\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b}-\frac{\cos(a+bx)\text{Ci}(c+dx)}{b}+\frac{\cos\left(a-\frac{bc}{d}\right)}{}\end{aligned}$$

Mathematica [C] Result contains complex when optimal does not.
time = 0.81, size = 144, normalized size = 0.94

$$\frac{-4\cos(a+bx)\text{CosIntegral}(c+dx)+\left(\text{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)+\text{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)\right)\left(\cos\left(a-\frac{bc}{d}\right)-i\sin\left(a-\frac{bc}{d}\right)\right)+\left(\text{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+\text{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)\left(\cos\left(a-\frac{bc}{d}\right)+i\sin\left(a-\frac{bc}{d}\right)\right)}{4b}$$

Antiderivative was successfully verified.

```
[In] Integrate[CosIntegral[c + d*x]*Sin[a + b*x],x]
```

```
[Out] (-4*Cos[a + b*x]*CosIntegral[c + d*x] + (ExpIntegralEi[((-I)*(b - d)*(c + d
*x))/d] + ExpIntegralEi[((-I)*(b + d)*(c + d*x))/d])*(Cos[a - (b*c)/d] - I*
Sin[a - (b*c)/d]) + (ExpIntegralEi[(I*(b - d)*(c + d*x))/d] + ExpIntegralEi
[(I*(b + d)*(c + d*x))/d])*(Cos[a - (b*c)/d] + I*Sin[a - (b*c)/d]))/(4*b)
```

Maple [A]
time = 0.86, size = 288, normalized size = 1.87

method	result
default	$-\frac{\text{cosineIntegral}(dx+c)d\cos\left(\frac{b(dx+c)}{d}+\frac{ad-cb}{d}\right)}{b}+\frac{d\left(\frac{d\left(-\frac{\text{sinIntegral}\left(-\frac{(b-d)(dx+c)}{d}-\frac{ad-cb}{d}-\frac{-ad+cb}{d}\right)\sin\left(\frac{-ad+cb}{d}\right)}{d}+\frac{\text{cosineIntegral}\left(\frac{(b-d)(dx}{d}\right.}{}\right.}{2}\right.}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*x+c)*sin(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (-Ci(d*x+c)/b*d*cos(1/d*b*(d*x+c)+(a*d-b*c)/d)+1/b*d*(1/2*d*(-Si(-(b-d)/d*(
d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*
d-b*c)/d+(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)+1/2*d*(-Si(-(b+d)/d*(d*x+c)-(a*
d-b*c)/d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(
-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(fresnel_cos(d*x + c)*sin(b*x + a), x)
```

Fricas [A]
time = 0.41, size = 239, normalized size = 1.55

$$-\frac{2\,d\cos\left(bx+a\right)\mathrm{C}\left(dx+c\right)-\sqrt{d^{2}}\cos\left(a-\frac{bc}{d}-\frac{b^{2}}{2\,\pi d^{2}}\right)\mathrm{C}\left(\frac{(\pi d^{2}x+\pi cd+b)\sqrt{d^{2}}}{\pi d^{2}}\right)-\sqrt{d^{2}}\cos\left(a-\frac{bc}{d}+\frac{b^{2}}{2\,\pi d^{2}}\right)\mathrm{C}\left(\frac{(\pi d^{2}x+\pi cd-b)\sqrt{d^{2}}}{\pi d^{2}}\right)-\sqrt{d^{2}}\,\mathrm{S}\left(\frac{(\pi d^{2}x+\pi cd-b)\sqrt{d^{2}}}{\pi d^{2}}\right)\sin\left(a-\frac{bc}{d}+\frac{b^{2}}{2\,\pi d^{2}}\right)+\sqrt{d^{2}}\,\mathrm{S}\left(\frac{(\pi d^{2}x+\pi cd+b)\sqrt{d^{2}}}{\pi d^{2}}\right)\sin\left(a-\frac{bc}{d}-\frac{b^{2}}{2\,\pi d^{2}}\right)}{2\,bd}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="fricas")
```

```
[Out] -1/2*(2*d*cos(b*x + a)*fresnel_cos(d*x + c) - sqrt(d^2)*cos(a - b*c/d - 1/2
*b^2/(pi*d^2))*fresnel_cos((pi*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2)) - sq
rt(d^2)*cos(a - b*c/d + 1/2*b^2/(pi*d^2))*fresnel_cos((pi*d^2*x + pi*c*d -
b)*sqrt(d^2)/(pi*d^2)) - sqrt(d^2)*fresnel_sin((pi*d^2*x + pi*c*d - b)*sqrt
(d^2)/(pi*d^2))*sin(a - b*c/d + 1/2*b^2/(pi*d^2)) + sqrt(d^2)*fresnel_sin((
pi*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2))*sin(a - b*c/d - 1/2*b^2/(pi*d^2)
))/(b*d)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int\sin\left(a+bx\right)\mathrm{Ci}\left(c+dx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*x+c)*sin(b*x+a),x)
```

```
[Out] Integral(sin(a + b*x)*Ci(c + d*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(fresnel_cos(d*x + c)*sin(b*x + a), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{cosint}(c+d\,x)\,\sin\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(c + d*x)*sin(a + b*x),x)
```

```
[Out] int(cosint(c + d*x)*sin(a + b*x), x)
```

3.133 $\int \frac{\text{CosIntegral}(c+dx)\sin(a+bx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\text{CosIntegral}(c+dx)\sin(a+bx)}{x},x\right)$$

```
[Out] CannotIntegrate(Ci(d*x+c)*sin(b*x+a)/x,x)
```

Rubi [A]
time = 0.11, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\text{CosIntegral}(c+dx)\sin(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(CosIntegral[c + d*x]*Sin[a + b*x])/x,x]
[Out] Defer[Int][(CosIntegral[c + d*x]*Sin[a + b*x])/x, x]
```

Rubi steps

$$\int \frac{\text{Ci}(c+dx)\sin(a+bx)}{x}\,dx = \int \frac{\text{Ci}(c+dx)\sin(a+bx)}{x}\,dx$$

Mathematica [A]
time = 21.64, size = 0, normalized size = 0.00

$$\int \frac{\text{CosIntegral}(c+dx)\sin(a+bx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(CosIntegral[c + d*x]*Sin[a + b*x])/x,x]
[Out] Integrate[(CosIntegral[c + d*x]*Sin[a + b*x])/x, x]
```

Maple [A]
time = 0.12, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\,(dx+c)\sin\,(bx+a)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*x+c)*sin(b*x+a)/x,x)
[Out] int(Ci(d*x+c)*sin(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a)/x,x, algorithm="maxima")
[Out] integrate(fresnel_cos(d*x + c)*sin(b*x + a)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a)/x,x, algorithm="fricas")
[Out] integral(fresnel_cos(d*x + c)*sin(b*x + a)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\sin(a+bx)\operatorname{Ci}(c+dx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*x+c)*sin(b*x+a)/x,x)
[Out] Integral(sin(a + b*x)*Ci(c + d*x)/x, x)
```

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*sin(b*x+a)/x,x, algorithm="giac")
[Out] integrate(fresnel_cos(d*x + c)*sin(b*x + a)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\operatorname{cosint}(c+d\,x)\,\sin(a+b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(c + d*x)*sin(a + b*x))/x,x)
```

```
[Out] int((cosint(c + d*x)*sin(a + b*x))/x, x)
```

3.134 $\int x\cos(a+bx)\,\mathbf{CosIntegral}(c+dx)\,dx$

Optimal. Leaf size=370

$$\frac{\cos(a-c+(b-d)x)}{2b(b-d)}+\frac{\cos(a+c+(b+d)x)}{2b(b+d)}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)}{2b^2}+\frac{\cos(a+bx)\text{Co}}{}$$

```
[Out] -1/2*Ci(c*(b-d)/d+(b-d)*x)*cos(a-b*c/d)/b^2-1/2*Ci(c*(b+d)/d+(b+d)*x)*cos(a
-b*c/d)/b^2+Ci(d*x+c)*cos(b*x+a)/b^2+1/2*cos(a-c+(b-d)*x)/b/(b-d)+1/2*cos(a
+c+(b+d)*x)/b/(b+d)+1/2*c*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d)*x)/b/d+1/2*c*cos(
a-b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b/d+1/2*c*Ci(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)
/b/d+1/2*c*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b/d+1/2*Si(c*(b-d)/d+(b-d)*x)
*sin(a-b*c/d)/b^2+1/2*Si(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b^2+x*Ci(d*x+c)*si
n(b*x+a)/b
```

Rubi [A]

time = 0.59, antiderivative size = 370, normalized size of antiderivative = 1.00, number of steps used = 24, number of rules used = 10, integrand size = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.714$, Rules used = {6649, 6874, 4670, 2718, 4515, 3384, 3380, 3383, 6653, 4514}

$$-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b^2}+\frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{b^2}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b^2}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b^2}+\frac{\sin\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b^2}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2bd}+\frac{c\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2bd}+\frac{x\sin(a+bx)\text{CosIntegral}(c+dx)}{b}+\frac{c\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2bd}+\frac{c\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2bd}+\frac{\cos(a+x(b-d)-c)}{2b(b-d)}+\frac{\cos(a+x(b+d)+c)}{2b(b+d)}$$

Antiderivative was successfully verified.

```
[In] Int[x*Cos[a + b*x]*CosIntegral[c + d*x],x]
```

```
[Out] Cos[a - c + (b - d)*x]/(2*b*(b - d)) + Cos[a + c + (b + d)*x]/(2*b*(b + d))
 - (Cos[a - (b*c)/d]*CosIntegral[(c*(b - d))/d + (b - d)*x])/(2*b^2) + (Cos
[a + b*x]*CosIntegral[c + d*x])/b^2 - (Cos[a - (b*c)/d]*CosIntegral[(c*(b +
 d))/d + (b + d)*x])/(2*b^2) + (c*CosIntegral[(c*(b - d))/d + (b - d)*x]*Si
n[a - (b*c)/d])/(2*b*d) + (c*CosIntegral[(c*(b + d))/d + (b + d)*x]*Sin[a -
 (b*c)/d])/(2*b*d) + (x*CosIntegral[c + d*x]*Sin[a + b*x])/b + (c*Cos[a - (
b*c)/d]*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b*d) + (Sin[a - (b*c)/d]
*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b^2) + (c*Cos[a - (b*c)/d]*SinI
ntegral[(c*(b + d))/d + (b + d)*x])/(2*b*d) + (Sin[a - (b*c)/d]*SinIntegral
[(c*(b + d))/d + (b + d)*x])/(2*b^2)
```

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*
e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f
)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] &&
 NeQ[d*e - c*f, 0]
```

Rule 4514

```
Int[Cos[(a_.) + (b_.)*(x_)]^(p_.)*Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f
_.)*(x_))^(m_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Cos[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] &&
 IGtQ[q, 0] && IntegerQ[m]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 4670

```
Int[Cos[w_]^(q_.)*Sin[v_]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[Sin[v]^p
*Cos[w]^q, x], x] /; IGtQ[p, 0] && IGtQ[q, 0] && ((PolynomialQ[v, x] && Pol
ynomialQ[w, x]) || (BinomialQ[{v, w}, x] && IndependentQ[Cancel[v/w], x]))
```

Rule 6649

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*
(x_))^(m_.), x_Symbol] :> Simp[(e + f*x)^m*Sin[a + b*x]*(CosIntegral[c + d*
x]/b), x] + (-Dist[d/b, Int[(e + f*x)^m*Sin[a + b*x]*(Cos[c + d*x]/(c + d*x
)), x], x] - Dist[f*(m/b), Int[(e + f*x)^(m - 1)*Sin[a + b*x]*CosIntegral[c
 + d*x], x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[m, 0]
```

Rule 6653

```
Int[CosIntegral[(c_.) + (d_.)*(x_)]*Sin[(a_.) + (b_.)*(x_)], x_Symbol] :> S
imp[(-Cos[a + b*x])*(CosIntegral[c + d*x]/b), x] + Dist[d/b, Int[Cos[a + b*
x]*(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rule 6874

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
\int x\cos(a+bx)\text{Ci}(c+dx)\,dx &= \frac{x\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{\int \text{Ci}(c+dx)\sin(a+bx)\,dx}{b} - \frac{d\int \frac{x\cos(c+dx)\sin(a \ldots}{c+dx}}{b} \\
&= \frac{\cos(a+bx)\text{Ci}(c+dx)}{b^2} + \frac{x\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{d\int \frac{\cos(a+bx)\cos(c+dx)}{c+dx}\,d \ldots}{b^2} \\
&= \frac{\cos(a+bx)\text{Ci}(c+dx)}{b^2} + \frac{x\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{\int \cos(c+dx)\sin(a+ \ldots}{b} \\
&= \frac{\cos(a+bx)\text{Ci}(c+dx)}{b^2} + \frac{x\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{\int \left(\frac{1}{2}\sin(a-c+(b- \ldots\right.}{} \\
&= \frac{\cos(a+bx)\text{Ci}(c+dx)}{b^2} + \frac{x\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{\int \sin(a-c+(b-d)x \ldots}{2b} \\
&= \frac{\cos(a-c+(b-d)x)}{2b(b-d)} + \frac{\cos(a+c+(b+d)x)}{2b(b+d)} - \frac{\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b-d)}{d} + \ldots\right.}{2b^2} \\
&= \frac{\cos(a-c+(b-d)x)}{2b(b-d)} + \frac{\cos(a+c+(b+d)x)}{2b(b+d)} - \frac{\cos\left(a-\frac{bc}{d}\right)\text{Ci}\left(\frac{c(b-d)}{d} + \ldots\right.}{2b^2}
\end{aligned}$$

Mathematica [C] Result contains complex when optimal does not.
time = 2.79, size = 433, normalized size = 1.17

$$\frac{-ie^{-\frac{i(b(c+dx)+d(a+c+dx))}{d}}\left((bc-id)\left(b^2-d^2\right)e^{i(2a+c+(b+d)x)}\text{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)+e^{\frac{ibc}{d}}\left(ibd\left(d\left(-1+e^{2i(a+bx)}\right)+b\left(1+e^{2i(a+bx)}\right)\right)-(bc+id)\left(b^2-d^2\right)e^{\frac{i(b+d)(c+dx)}{d}}\text{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)\right)\right)-ie^{-\frac{i(d(a-dx)+b(c+dx))}{d}}\left(ibde^{\frac{ic(b+d)}{d}}\left(b+d+be^{2i(a+bx)}-de^{2i(a+bx)}\right)-(bc+id)\left(b^2-d^2\right)e^{-idx+ib\left(\frac{2c}{d}+x\right)}\text{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)+(bc-id)\left(b^2-d^2\right)e^{i(2a+(b-d)x)}\text{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)+4(b-d)d(b+d)\text{CosIntegral}(c+dx)(\cos(a+bx)+bx\sin(a+bx))}{4b^2(b-d)d(b+d)}$$

Antiderivative was successfully verified.

```
[In] Integrate[x*Cos[a + b*x]*CosIntegral[c + d*x],x]
```

```
[Out] (((-I)*((b*c - I*d)*(b^2 - d^2)*E^(I*(2*a + c + (b + d)*x))*ExpIntegralEi[(
I*(b - d)*(c + d*x))/d] + E^((I*b*c)/d)*(I*b*d*(d*(-1 + E^((2*I)*(a + b*x))
) + b*(1 + E^((2*I)*(a + b*x)))) - (b*c + I*d)*(b^2 - d^2)*E^((I*(b + d)*(c
 + d*x))/d)*ExpIntegralEi[((-I)*(b + d)*(c + d*x))/d])))/E^((I*(b*(c + d*x)
 + d*(a + c + d*x)))/d) - (I*(I*b*d*E^((I*c*(b + d))/d)*(b + d + b*E^((2*I)
*(a + b*x)) - d*E^((2*I)*(a + b*x))) - (b*c + I*d)*(b^2 - d^2)*E^((-I)*d*x
+ I*b*((2*c)/d + x))*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d] + (b*c - I*d
)*(b^2 - d^2)*E^(I*(2*a + (b - d)*x))*ExpIntegralEi[(I*(b + d)*(c + d*x))/d
```

```
]))/E^((I*(d*(a - d*x) + b*(c + d*x)))/d) + 4*(b - d)*d*(b + d)*CosIntegral
[c + d*x]*(Cos[a + b*x] + b*x*Sin[a + b*x]))/(4*b^2*(b - d)*d*(b + d))
```

Maple [**B**] Leaf count of result is larger than twice the leaf count of optimal. 1243 vs. $2(350) = 700$.
time = 1.61, size = 1244, normalized size = 3.36

method	result	size
default	Expression too large to display	1244

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*Ci(d*x+c)*cos(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (-Ci(d*x+c)/b*(d/b*a*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(cos(1/d*b*(d*x+c
)+(a*d-b*c)/d)+(1/d*b*(d*x+c)+(a*d-b*c)/d)*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)))
+1/b*(1/2/(b-d)*d^2*a*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((
-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/
d)/d)-1/2*d^2*c/(b-d)*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((
-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/
d)/d)-1/2*(a*d-b*c)/(b-d)*d*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)
*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d
+b*c)/d)/d)+1/2/(b-d)*d*cos((b-d)/d*(d*x+c)+(a*d-b*c)/d)+1/2*a*d^2/(b+d)*(-
Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/
d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)+1/2*c*d^2/(b+d)*(-
Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/
d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)-1/2*(a*d-b*c)*d/(b
+d)*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci(
(b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)+1/2/(b+d)*d*
cos((b+d)/d*(d*x+c)+(a*d-b*c)/d)-1/2/b*d^2*(-Si(-(b-d)/d*(d*x+c)-(a*d-b*c)/
d-(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b-d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*
c)/d)*cos((-a*d+b*c)/d)/d)-1/2/b*d^2*(-Si(-(b+d)/d*(d*x+c)-(a*d-b*c)/d-(-a*
d+b*c)/d)*sin((-a*d+b*c)/d)/d+Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-a*d+b*c)/d)*
cos((-a*d+b*c)/d)/d)))/d
```

Maxima [**F**]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(x*cos(b*x + a)*fresnel_cos(d*x + c), x)
```

Fricas [**A**]
time = 0.44, size = 453, normalized size = 1.22

$$\frac{2\,\pi b d^3 x\,\mathrm{C}\left(dx+c\right)\sin\left(bx+a\right)+2\,\pi d^3\cos\left(bx+a\right)\mathrm{C}\left(dx+c\right)-2\,bd^2\sin\left(\frac{1}{2}\,\pi d^2x^2+\pi cdx+\frac{1}{2}\,\pi c^2\right)\sin\left(bx+a\right)-\left(\pi d^2\cos\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)-\left(\pi bcd+b^2\right)\sin\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)-\left(\pi d^2\cos\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)-\left(\pi bcd-b^2\right)\sin\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)+\left(\pi d^2\sin\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)+\left(\pi bcd+b^2\right)\cos\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)-\left(\pi d^2\sin\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)+\left(\pi bcd-b^2\right)\cos\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)\right)\sqrt{d^2}\,\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)}{2\,\pi b^2d^3}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/2*(2*pi*b*d^3*x*fresnel_cos(d*x + c)*sin(b*x + a) + 2*pi*d^3*cos(b*x + a)
*fresnel_cos(d*x + c) - 2*b*d^2*sin(1/2*pi*d^2*x^2 + pi*c*d*x + 1/2*pi*c^2)
*sin(b*x + a) - (pi*d^2*cos(a - b*c/d - 1/2*b^2/(pi*d^2)) - (pi*b*c*d + b^2
)*sin(a - b*c/d - 1/2*b^2/(pi*d^2)))*sqrt(d^2)*fresnel_cos((pi*d^2*x + pi*c
*d + b)*sqrt(d^2)/(pi*d^2)) - (pi*d^2*cos(a - b*c/d + 1/2*b^2/(pi*d^2)) - (
pi*b*c*d - b^2)*sin(a - b*c/d + 1/2*b^2/(pi*d^2)))*sqrt(d^2)*fresnel_cos((p
i*d^2*x + pi*c*d - b)*sqrt(d^2)/(pi*d^2)) + (pi*d^2*sin(a - b*c/d - 1/2*b^2
/(pi*d^2)) + (pi*b*c*d + b^2)*cos(a - b*c/d - 1/2*b^2/(pi*d^2)))*sqrt(d^2)*
fresnel_sin((pi*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2)) - (pi*d^2*sin(a - b
*c/d + 1/2*b^2/(pi*d^2)) + (pi*b*c*d - b^2)*cos(a - b*c/d + 1/2*b^2/(pi*d^2
)))*sqrt(d^2)*fresnel_sin((pi*d^2*x + pi*c*d - b)*sqrt(d^2)/(pi*d^2)))/(pi*
b^2*d^3)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int x\cos\left(a+bx\right)\operatorname{Ci}\left(c+dx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*Ci(d*x+c)*cos(b*x+a),x)
```

```
[Out] Integral(x*cos(a + b*x)*Ci(c + d*x), x)
```

Giac [F]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(x*fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(x*cos(b*x + a)*fresnel_cos(d*x + c), x)
```

Mupad [F]
time = 0.00, size = -1, normalized size = -0.00

$$\int x\,\mathrm{cosint}(c+d\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(x*cosint(c + d*x)*cos(a + b*x),x)
```

```
[Out] int(x*cosint(c + d*x)*cos(a + b*x), x)
```

3.135 $\int \cos(a+bx)\textbf{CosIntegral}(c+dx)\,dx$

Optimal. Leaf size=153

$$-\frac{\text{CosIntegral}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}-\frac{\text{CosIntegral}\left(\frac{c(b+d)}{d}+(b+d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b}+\frac{\text{CosIntegral}(c-$$

```
[Out] -1/2*cos(a-b*c/d)*Si(c*(b-d)/d+(b-d)*x)/b-1/2*cos(a-b*c/d)*Si(c*(b+d)/d+(b+d)*x)/b-1/2*Ci(c*(b-d)/d+(b-d)*x)*sin(a-b*c/d)/b-1/2*Ci(c*(b+d)/d+(b+d)*x)*sin(a-b*c/d)/b+Ci(d*x+c)*sin(b*x+a)/b
```

Rubi [A]
time = 0.16, antiderivative size = 153, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 5, integrand size = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.385$, Rules used = {6647, 4515, 3384, 3380, 3383}

$$-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b-d)}{d}+x(b-d)\right)}{2b}-\frac{\sin\left(a-\frac{bc}{d}\right)\text{CosIntegral}\left(\frac{c(b+d)}{d}+x(b+d)\right)}{2b}+\frac{\sin(a+bx)\text{CosIntegral}(c+dx)}{b}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b-d)+\frac{c(b-d)}{d}\right)}{2b}-\frac{\cos\left(a-\frac{bc}{d}\right)\text{Si}\left(x(b+d)+\frac{c(b+d)}{d}\right)}{2b}$$

Antiderivative was successfully verified.

```
[In] Int[Cos[a + b*x]*CosIntegral[c + d*x],x]
```

```
[Out] -1/2*(CosIntegral[(c*(b - d))/d + (b - d)*x]*Sin[a - (b*c)/d])/b - (CosIntegral[(c*(b + d))/d + (b + d)*x]*Sin[a - (b*c)/d])/(2*b) + (CosIntegral[c + d*x]*Sin[a + b*x])/b - (Cos[a - (b*c)/d]*SinIntegral[(c*(b - d))/d + (b - d)*x])/(2*b) - (Cos[a - (b*c)/d]*SinIntegral[(c*(b + d))/d + (b + d)*x])/(2*b)
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinIntegral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[CosIntegral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) - c*f, 0]
```

Rule 3384

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Dist[Cos[(d*e - c*f)/d], Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Dist[Sin[(d*e - c*f)/d], Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x] && NeQ[d*e - c*f, 0]
```

Rule 4515

```
Int[Cos[(c_.) + (d_.)*(x_)]^(q_.)*((e_.) + (f_.)*(x_))^(m_.)*Sin[(a_.) + (b
_.)*(x_)]^(p_.), x_Symbol] :> Int[ExpandTrigReduce[(e + f*x)^m, Sin[a + b*x
]^p*Cos[c + d*x]^q, x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[p, 0]
 && IGtQ[q, 0]
```

Rule 6647

```
Int[Cos[(a_.) + (b_.)*(x_)]*CosIntegral[(c_.) + (d_.)*(x_)], x_Symbol] :> S
imp[Sin[a + b*x]*(CosIntegral[c + d*x]/b), x] - Dist[d/b, Int[Sin[a + b*x]*
(Cos[c + d*x]/(c + d*x)), x], x] /; FreeQ[{a, b, c, d}, x]
```

Rubi steps

$$\begin{aligned}\int \cos(a+bx)\text{Ci}(c+dx)\,dx &= \frac{\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{d\int \frac{\cos(c+dx)\sin(a+bx)}{c+dx}\,dx}{b} \\ &= \frac{\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{d\int \left(\frac{\sin(a-c+(b-d)x)}{2(c+dx)} + \frac{\sin(a+c+(b+d)x)}{2(c+dx)}\right)dx}{b} \\ &= \frac{\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{d\int \frac{\sin(a-c+(b-d)x)}{c+dx}\,dx}{2b} - \frac{d\int \frac{\sin(a+c+(b+d)x)}{c+dx}\,dx}{2b} \\ &= \frac{\text{Ci}(c+dx)\sin(a+bx)}{b} - \frac{\left(d\cos\left(a-\frac{bc}{d}\right)\right)\int \frac{\sin\left(\frac{c(b-d)}{d}+(b-d)x\right)}{c+dx}\,dx}{2b} - \frac{(d\cos(a\ \end{aligned}$$

$$= -\frac{\text{Ci}\left(\frac{c(b-d)}{d}+(b-d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b} - \frac{\text{Ci}\left(\frac{c(b+d)}{d}+(b+d)x\right)\sin\left(a-\frac{bc}{d}\right)}{2b} +$$

Mathematica [C] Result contains complex when optimal does not.
time = 0.91, size = 153, normalized size = 1.00

$$\frac{ie^{-\frac{i(bc+ad)}{d}}\left(-e^{\frac{2ibc}{d}}\text{Ei}\left(-\frac{i(b-d)(c+dx)}{d}\right)+e^{2ia}\text{Ei}\left(\frac{i(b-d)(c+dx)}{d}\right)-e^{\frac{2ibc}{d}}\text{Ei}\left(-\frac{i(b+d)(c+dx)}{d}\right)+e^{2ia}\text{Ei}\left(\frac{i(b+d)(c+dx)}{d}\right)\right)+4\text{CosIntegral}(c+dx)\sin(a+bx)}{4b}$$

Antiderivative was successfully verified.

```
[In] Integrate[Cos[a + b*x]*CosIntegral[c + d*x],x]
```

```
[Out] ((I*(-(E^(((2*I)*b*c)/d)*ExpIntegralEi[((-I)*(b - d)*(c + d*x))/d]) + E^((2
*I)*a)*ExpIntegralEi[(I*(b - d)*(c + d*x))/d] - E^(((2*I)*b*c)/d)*ExpIntegr
alEi[((-I)*(b + d)*(c + d*x))/d] + E^((2*I)*a)*ExpIntegralEi[(I*(b + d)*(c
+ d*x))/d]))/E^((I*(b*c + a*d))/d) + 4*CosIntegral[c + d*x]*Sin[a + b*x])/(
4*b)
```

Maple [A]
time = 0.91, size = 290, normalized size = 1.90

method	result
default	$\frac{\frac{\text{cosineIntegral}(dx+c)d\sin\left(\frac{b(dx+c)}{d}+\frac{ad-cb}{d}\right)}{b}-\frac{d\left(\frac{d\left(-\frac{\text{sinIntegral}\left(-\frac{(b-d)(dx+c)}{d}-\frac{ad-cb}{d}-\frac{-ad+cb}{d}\right)\cos\left(\frac{-ad+cb}{d}\right)}{d}-\frac{\text{cosineIntegral}\left(\frac{(b-d)(dx+}{d}\right.}{}\right.}{2}\right.}{}}{}$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*x+c)*cos(b*x+a),x,method=_RETURNVERBOSE)
```

```
[Out] (Ci(d*x+c)/b*d*sin(1/d*b*(d*x+c)+(a*d-b*c)/d)-1/b*d*(1/2*d*(-Si(-(b-d)/d*(d
*x+c)-(a*d-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b-d)/d*(d*x+c)+(a*d
-b*c)/d+(-a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)+1/2*d*(-Si(-(b+d)/d*(d*x+c)-(a*d
-b*c)/d-(-a*d+b*c)/d)*cos((-a*d+b*c)/d)/d-Ci((b+d)/d*(d*x+c)+(a*d-b*c)/d+(-
a*d+b*c)/d)*sin((-a*d+b*c)/d)/d)))/d
```

Maxima [F]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="maxima")
```

```
[Out] integrate(cos(b*x + a)*fresnel_cos(d*x + c), x)
```

Fricas [A]
time = 0.39, size = 239, normalized size = 1.56

$$\frac{2\,d\,\mathrm{C}\left(dx+c\right)\sin\left(bx+a\right)-\sqrt{d^2}\,\cos\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)+\sqrt{d^2}\,\cos\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)\mathrm{S}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)-\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd-b\right)\sqrt{d^2}}{\pi d^2}\right)\sin\left(a-\frac{bc}{d}+\frac{b^2}{2\,\pi d^2}\right)-\sqrt{d^2}\,\mathrm{C}\left(\frac{\left(\pi d^2x+\pi cd+b\right)\sqrt{d^2}}{\pi d^2}\right)\sin\left(a-\frac{bc}{d}-\frac{b^2}{2\,\pi d^2}\right)}{2\,bd}$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="fricas")
```

```
[Out] 1/2*(2*d*fresnel_cos(d*x + c)*sin(b*x + a) - sqrt(d^2)*cos(a - b*c/d - 1/2*
b^2/(pi*d^2))*fresnel_sin((pi*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2)) + sqr
t(d^2)*cos(a - b*c/d + 1/2*b^2/(pi*d^2))*fresnel_sin((pi*d^2*x + pi*c*d - b
)*sqrt(d^2)/(pi*d^2)) - sqrt(d^2)*fresnel_cos((pi*d^2*x + pi*c*d - b)*sqrt(
d^2)/(pi*d^2))*sin(a - b*c/d + 1/2*b^2/(pi*d^2)) - sqrt(d^2)*fresnel_cos((p
i*d^2*x + pi*c*d + b)*sqrt(d^2)/(pi*d^2))*sin(a - b*c/d - 1/2*b^2/(pi*d^2))
)/(b*d)
```

Sympy [F]
time = 0.00, size = 0, normalized size = 0.00

$$\int \cos\left(a+bx\right)\mathrm{Ci}\left(c+dx\right)dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(Ci(d*x+c)*cos(b*x+a),x)
```

```
[Out] Integral(cos(a + b*x)*Ci(c + d*x), x)
```

Giac [**F**]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

```
[In] integrate(fresnel_cos(d*x+c)*cos(b*x+a),x, algorithm="giac")
```

```
[Out] integrate(cos(b*x + a)*fresnel_cos(d*x + c), x)
```

Mupad [**F**]
time = 0.00, size = -1, normalized size = -0.01

$$\int \mathrm{cosint}(c+d\,x)\,\cos\left(a+b\,x\right)\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(cosint(c + d*x)*cos(a + b*x),x)
```

```
[Out] int(cosint(c + d*x)*cos(a + b*x), x)
```

3.136 $\int \frac{\cos(a+bx)\textbf{CosIntegral}(c+dx)}{x}\,dx$

Optimal. Leaf size=19

$$\text{Int}\left(\frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{x},x\right)$$

```
[Out] CannotIntegrate(Ci(d*x+c)*cos(b*x+a)/x,x)
```

Rubi [A]
time = 0.07, antiderivative size = 0, normalized size of antiderivative = 0.00, number of steps used = 0, number of rules used = 0, integrand size = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Int[(Cos[a + b*x]*CosIntegral[c + d*x])/x,x]
[Out] Defer[Int][(Cos[a + b*x]*CosIntegral[c + d*x])/x, x]
```

Rubi steps

$$\int \frac{\cos(a+bx)\text{Ci}(c+dx)}{x}\,dx = \int \frac{\cos(a+bx)\text{Ci}(c+dx)}{x}\,dx$$

Mathematica [A]
time = 12.95, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\text{CosIntegral}(c+dx)}{x}\,dx$$

Verification is not applicable to the result.

```
[In] Integrate[(Cos[a + b*x]*CosIntegral[c + d*x])/x,x]
[Out] Integrate[(Cos[a + b*x]*CosIntegral[c + d*x])/x, x]
```

Maple [A]
time = 0.33, size = 0, normalized size = 0.00

$$\int \frac{\text{cosineIntegral}\left(dx+c\right)\cos\left(bx+a\right)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int(Ci(d*x+c)*cos(b*x+a)/x,x)
```

```
[Out] int(Ci(d*x+c)*cos(b*x+a)/x,x)
```

Maxima [A]
time = 0.00, size = 0, normalized size = 0.00

Failed to integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(cos(b*x + a)*fresnel_cos(d*x + c)/x, x)
```

Fricas [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integral(cos(b*x + a)*fresnel_cos(d*x + c)/x, x)
```

Sympy [A]
time = 0.00, size = 0, normalized size = 0.00

$$\int \frac{\cos(a+bx)\operatorname{Ci}(c+dx)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

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

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

Giac [A]
time = 0.00, size = 0, normalized size = 0.00

could not integrate

Verification of antiderivative is not currently implemented for this CAS.

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

```
[Out] integrate(cos(b*x + a)*fresnel_cos(d*x + c)/x, x)
```

Mupad [A]
time = 0.00, size = -1, normalized size = -0.05

$$\int \frac{\mathrm{cosint}(c+d\,x)\,\cos(a+b\,x)}{x}\,dx$$

Verification of antiderivative is not currently implemented for this CAS.

```
[In] int((cosint(c + d*x)*cos(a + b*x))/x,x)
```

```
[Out] int((cosint(c + d*x)*cos(a + b*x))/x, x)
```

Chapter 4

Appendix

Local contents

4.1 Download section 576
4.2 Listing of Grading functions 576

4.1 Download section

The following zip files contain the raw integrals used in this test.

Mathematica format Mathematica_syntax.zip

Maple and Mupad format Maple_syntax.zip

Sympy format SYMPY_syntax.zip

Sage math format SAGE_syntax.zip

4.2 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.

4.2.1 Mathematica and Rubi grading function

```
(* Original version thanks to Albert Rich emailed on 03/21/2017 *)
(* ::Package:: *)

(* Nasser: April 7,2022. add second output which gives reason for the grade *)
(*                       Small rewrite of logic in main function to make it*)
(*                       match Maple's logic. No change in functionality otherwise*)

(* ::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_] := Module[{expnResult,expnOptimal,leafCountResult,leafC
    expnResult  = ExpnType[result];
    expnOptimal = ExpnType[optimal];
    leafCountResult = LeafCount[result];
    leafCountOptimal = LeafCount[optimal];

    (*Print["expnResult=",expnResult," expnOptimal=",expnOptimal];*)
    If[expnResult<=expnOptimal,
        If[Not[FreeQ[result,Complex]], (*result contains complex*)
            If[Not[FreeQ[optimal,Complex]], (*optimal contains complex*)
                If[leafCountResult<=2*leafCountOptimal,
                    finalresult={"A","none"}
                    ,(*ELSE*)
                    finalresult={"B","Both result and optimal contain complex but leaf count
                ]
            ,(*ELSE*)
                finalresult={"C","Result contains complex when optimal does not."}
            ]
        ,(*ELSE*)(*result does not contains complex*)
            If[leafCountResult<=2*leafCountOptimal,
               finalresult={"A","none"}
            ,(*ELSE*)
               finalresult={"B","Leaf count is larger than twice the leaf count of optimal. $
              ]
        ]
    ,(*ELSE*) (*expnResult>expnOptimal*)
        If[FreeQ[result,Integrate] && FreeQ[result,Int],
            finalresult={"C","Result contains higher order function than in optimal. Order "<
            ,
            finalresult={"F","Contains unresolved integral."}
        ]
    ];

    finalresult
]

(* ::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]
```

4.2.2 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
#Nasser 4/07/2022   add second output which gives reason for the grade

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","result has leaf size over 500,000. Avoiding possible recursion issues
        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","Result contains unresolved integral";
    fi;


    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;
                if leaf_count_result<=2*leaf_count_optimal then
                    return "A","";
                else
                   return "B",cat("Both result and optimal contain complex but leaf count of re
                                  convert(leaf_count_result,string)," vs. $2 (",
                                  convert(leaf_count_optimal,string)," ) = ",convert(2*leaf_co
                end if
            else #result contains complex but optimal is not
                if debug then
                        print("result contains complex but optimal is not");
                fi;
                return "C","Result contains complex when optimal does not.";
            fi;
        else # result do not contain complex
```

```
             # this assumes optimal do not as well. No check is needed here.
            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",cat("Leaf count of result is larger than twice the leaf count of o
                               convert(leaf_count_result,string),"$ vs. $2(",
                               convert(leaf_count_optimal,string),")=",convert(2*leaf_cou
            fi;
        fi;
    else #ExpnType(result) > ExpnType(optimal)
        if debug then
            print("ExpnType(result) > ExpnType(optimal)");
        fi;
        return "C",cat("Result contains higher order function than in optimal. Order ",
                       convert(ExpnType_result,string)," vs. order ",
                       convert(ExpnType_optimal,string),".");
    fi;

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:
```

4.2.3 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)),ExpnT
    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):

    #print ("Enter grade_antiderivative for sagemath")
    #print("Enter grade_antiderivative, result=",result," optimal=",optimal)

    leaf_count_result  = leaf_count(result)
    leaf_count_optimal = leaf_count(optimal)

    #print("leaf_count_result=",leaf_count_result)
    #print("leaf_count_optimal=",leaf_count_optimal)

    expnType_result  = expnType(result)
    expnType_optimal = expnType(optimal)

    if str(result).find("Integral") != -1:
        grade = "F"
        grade_annotation =""
    else:
        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:
                        grade = "A"
                        grade_annotation =""
                    else:
                        grade = "B"
                        grade_annotation ="Both result and optimal contain complex but leaf count of result is larger
                else: #result contains complex but optimal is not
                    grade = "C"
                    grade_annotation ="Result contains complex when optimal does not."
            else: # result do not contain complex, this assumes optimal do not as well
                if leaf_count_result <= 2*leaf_count_optimal:
                    grade = "A"
                    grade_annotation =""
                else:
                    grade = "B"
                    grade_annotation ="Leaf count of result is larger than twice the leaf count of optimal. "+str(lea
        else:
            grade = "C"
            grade_annotation ="Result contains higher order function than in optimal. Order "+str(ExpnType_re
```

```
    #print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

    return grade, grade_annotation
```

4.2.4 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'
#June 4, 2022  Made default grade_annotation "none" instead of "" due
#              issue later when reading the file.
#July 14, 2022. Added ellipticF. This is until they fix sagemath, then remove it.

from sage.all import *
from sage.symbolic.operators import add_vararg, mul_vararg

debug=False;

def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    #print("Enter tree_size, expr is ",expr)

    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)

def is_sqrt(expr):
    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','ellipticF',
           '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):

   #debug=False
   if debug:
       print ("Enter is_atom, expn=",expn)

   if not hasattr(expn, 'parent'):
      return False


   #thanks to answer at https://ask.sagemath.org/question/49179/what-is-sagemath-equivalent-to-atomic-
   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:
      print("Exception,AttributeError in  is_atom")
      print ("cought exception" , type(error).__name__ )
      return False


def expnType(expn):

   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.op
   elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #isinstance(expn,Add) or isinstan
      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):


   if debug:
      print ("Enter grade_antiderivative for sagemath")
      print("Enter grade_antiderivative, result=",result)
      print("Enter grade_antiderivative, optimal=",optimal)
      print("type(anti)=",type(result))
      print("type(optimal)=",type(optimal))

   leaf_count_result  = tree_size(result) #leaf_count(result)
   leaf_count_optimal = tree_size(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:
                grade = "A"
                grade_annotation ="none"
            else:
                grade = "B"
                grade_annotation ="Both result and optimal contain complex but leaf count of result is larger t
        else: #result contains complex but optimal is not
            grade = "C"
            grade_annotation ="Result contains complex when optimal does not."
    else: # result do not contain complex, this assumes optimal do not as well
        if leaf_count_result <= 2*leaf_count_optimal:
            grade = "A"
            grade_annotation ="none"
        else:
            grade = "B"
            grade_annotation ="Leaf count of result is larger than twice the leaf count of optimal. "+str(leaf_
else:
    grade = "C"
    grade_annotation ="Result contains higher order function than in optimal. Order "+str(expnType_resu


print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation
```