Computer Algebra Independent Integration Tests

Summer 2023 edition

2-Exponentials/53-2.1-u-F^-c-a+b-x-^n

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Contents

CHAPTER 1

INTRODUCTION

This report gives the result of running the computer algebra independent integration test.The download section in on the main webpage contains links to download the problems in plain text format used for all CAS systems. The number of integrals in this report is [98]. This is test number [53].

1.1 Listing of CAS systems tested

The following are the CAS systems tested:

1. Mathematica 13.3.1 (August 16, 2023) on windows 10.
2. Rubi 4.16.1 (Dec 19, 2018) on Mathematica 13.3 on windows 10
3. Maple 2023.1 (July, 12, 2023) on windows 10.
4. Maxima 5.47 (June 1, 2023) using Lisp SBCL 2.3.0 on Linux via sagemath 10.1 (Aug 20, 2023).
5. FriCAS 1.3.9 (July 8, 2023) based on sbcl 2.3.0 on Linux via sagemath 10.1 (Aug 20, 2023).
6. Giac/Xcas 1.9.0-57 (June 26, 2023) on Linux via sagemath 10.1 (Aug 20, 2023).
7. Sympy 1.12 (May 10, 2023) Using Python 3.11.3 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 run directly in Python not via sagemath.

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 (98)	0.00 (0)
Mathematica	100.00 (98)	0.00 (0)
Fricas	94.90 (93)	5.10 (5)
Maple	79.59 (78)	20.41 (20)
Maxima	65.31 (64)	34.69 (34)
Mupad	59.18 (58)	40.82 (40)
Giac	57.14 (56)	42.86 (42)
Sympy	38.78 (38)	61.22 (60)

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.

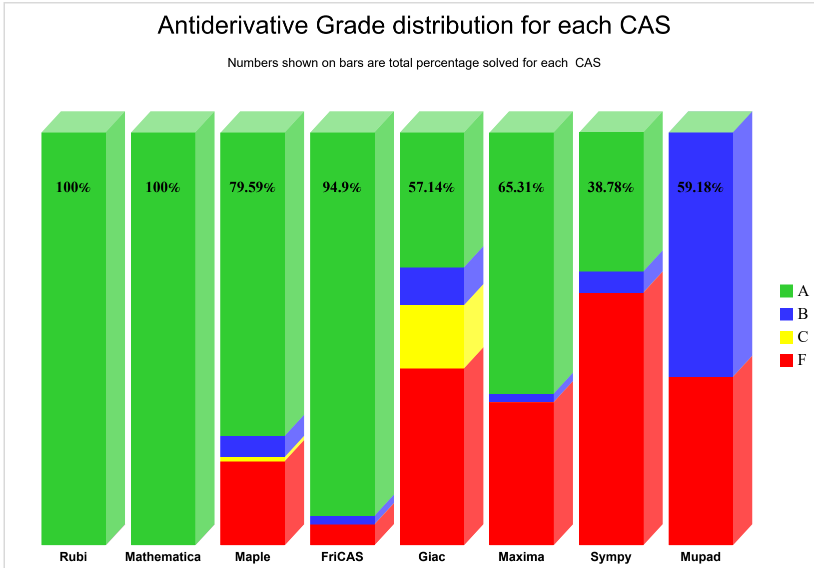
Table 1.2: Description of grading applied to integration result

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

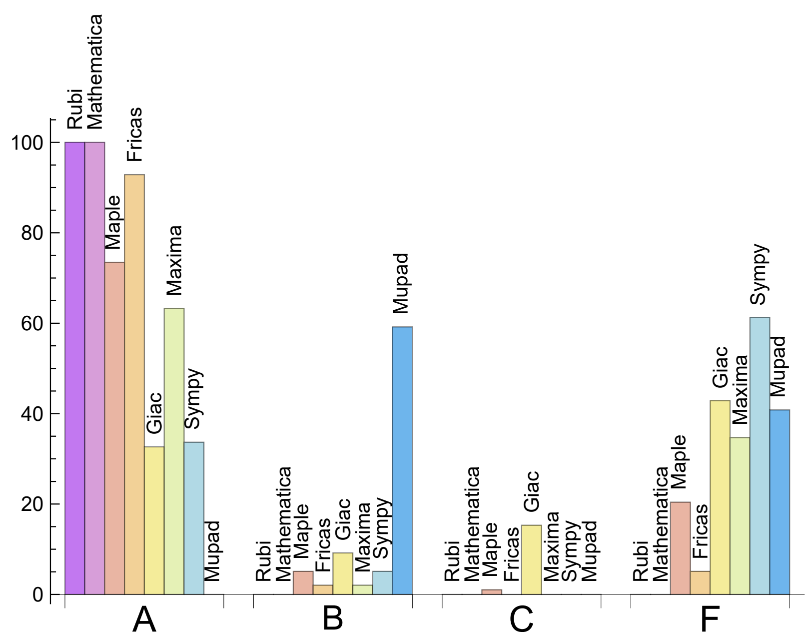
System	% A grade	% B grade	% C grade	% F grade
Rubi	100.000	0.000	0.000	0.000
Mathematica	100.000	0.000	0.000	0.000
Fricas	92.857	2.041	0.000	5.102
Maple	73.469	5.102	1.020	20.408
Maxima	63.265	2.041	0.000	34.694
Sympy	33.673	5.102	0.000	61.224
Giac	32.653	9.184	15.306	42.857
Mupad	0.000	59.184	0.000	40.816

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 grades of the CAS systems.



The following table shows the distribution of the different types of failures for each CAS. There are 3 types failures. The first is when CAS returns the input within the time limit, which means it could not solve it. This is the typical failure and given as **F**.

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

The third is due to an exception generated, indicated as **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 the CAS itself. This type of error requires more investigation 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	0	0.00	0.00	0.00
Fricas	5	100.00	0.00	0.00
Maple	20	100.00	0.00	0.00
Maxima	34	100.00	0.00	0.00
Mupad	40	0.00	100.00	0.00
Giac	42	88.10	0.00	11.90
Sympy	60	91.67	6.67	1.67

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)
Rubi	0.11
Mupad	0.16
Maxima	0.22
Fricas	0.25
Mathematica	0.33
Giac	0.37
Sympy	3.87
Maple	5.65

Table 1.5: Time performance for each CAS

System	Mean size	Normalized mean	Median size	Normalized median
Mathematica	86.02	0.72	65.50	0.71
Maxima	113.80	0.94	62.00	0.80
Mupad	114.10	0.88	80.00	0.82
Fricas	131.90	0.96	83.00	0.88
Rubi	134.81	1.00	95.50	1.00
Maple	159.51	1.18	99.00	1.11
Sympy	195.47	1.13	133.00	0.89
Giac	1814.00	9.71	186.00	1.15

Table 1.6: Leaf size performance for each CAS

1.4 Performance based on number of rules Rubi used

This section shows how each CAS performed based on the number of rules Rubi needed to solve the same integral. One diagram is given for each CAS.

On the y axis is the percentage solved which Rubi itself needed the number of rules given the x axis. These plots show that as more rules are needed then most CAS system percentage of solving decreases which indicates the integral is becoming more complicated to solve.

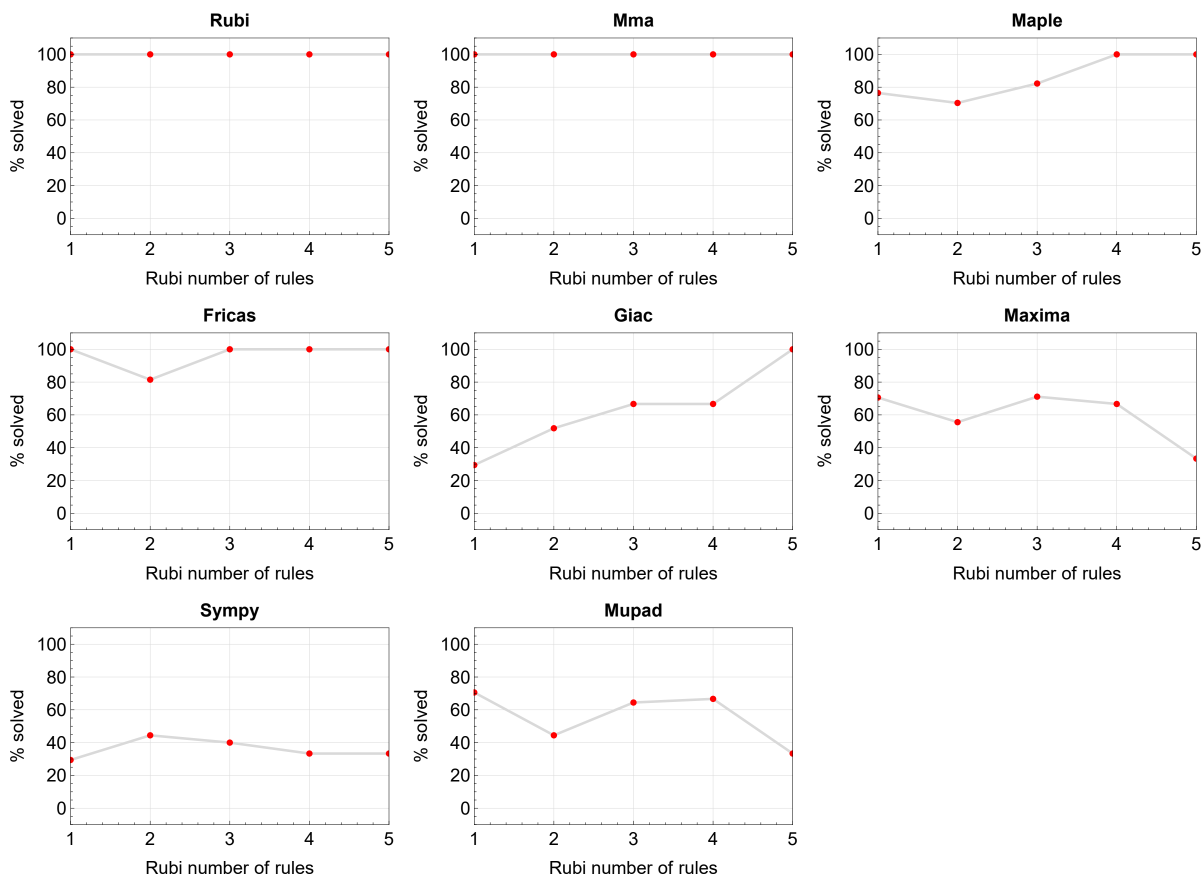


Figure 1.1: Solving statistics per number of Rubi rules used

1.5 Performance based on number of steps Rubi used

This section shows how each CAS performed based on the number of steps Rubi needed to solve the same integral. Note that the number of steps Rubi needed can be much higher than the number of rules, as the same rule could be used more than once.

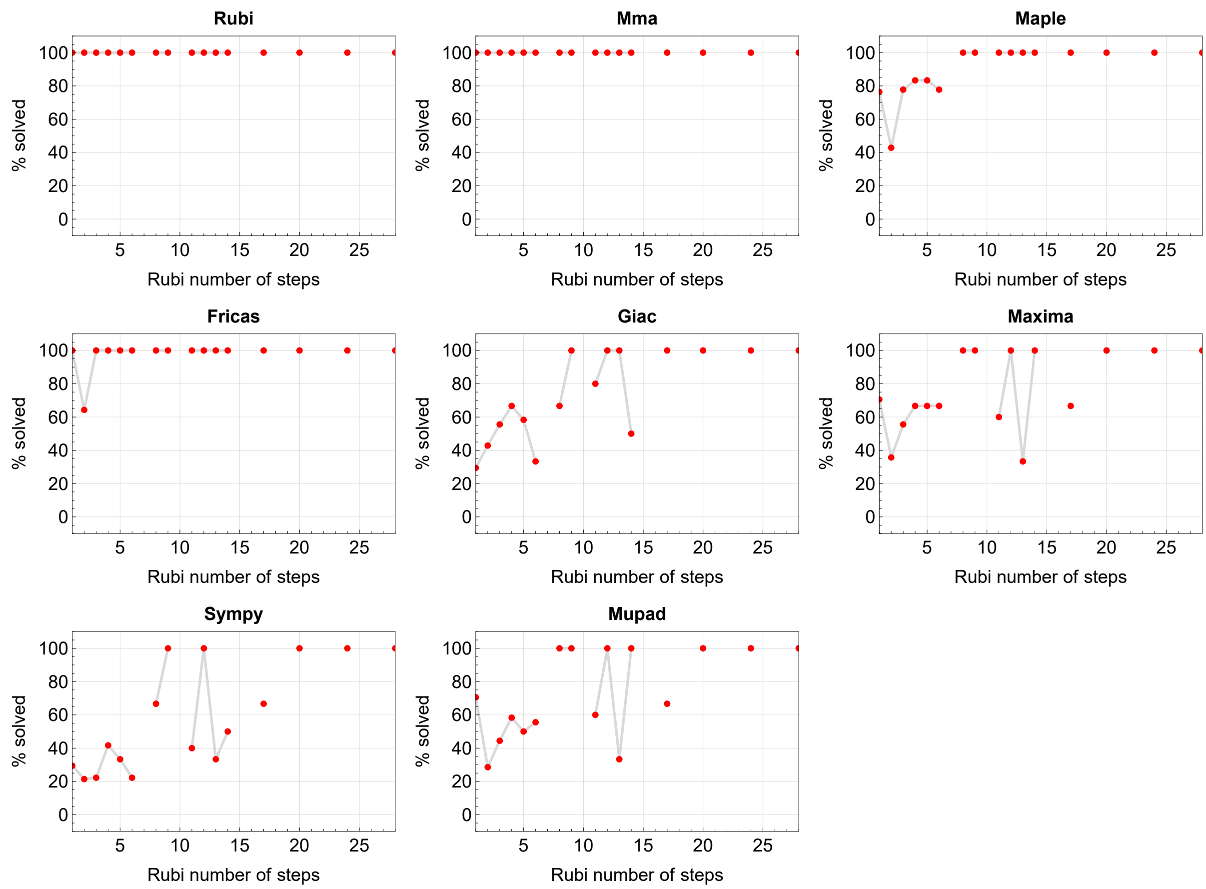


Figure 1.2: Solving statistics per number of Rubi steps used

The above diagram show that the precentage of solved intergals decreases for most CAS systems as the number of steps increases. As expected, for integrals that required less steps by Rubi, CAS systems had more success which indicates the integral was not as hard to solve. As Rubi needed more steps to solve the integral, the solved percentage decreased for most CAS systems which indicates the integral is becoming harder to solve.

1.6 Solved integrals histogram based on leaf size of result

The following shows the distribution of solved integrals for each CAS system based on leaf size of the antiderivatives produced by each CAS. It shows that most integrals solved produced leaf size less than about 100 to 150. The bin size used is 40.

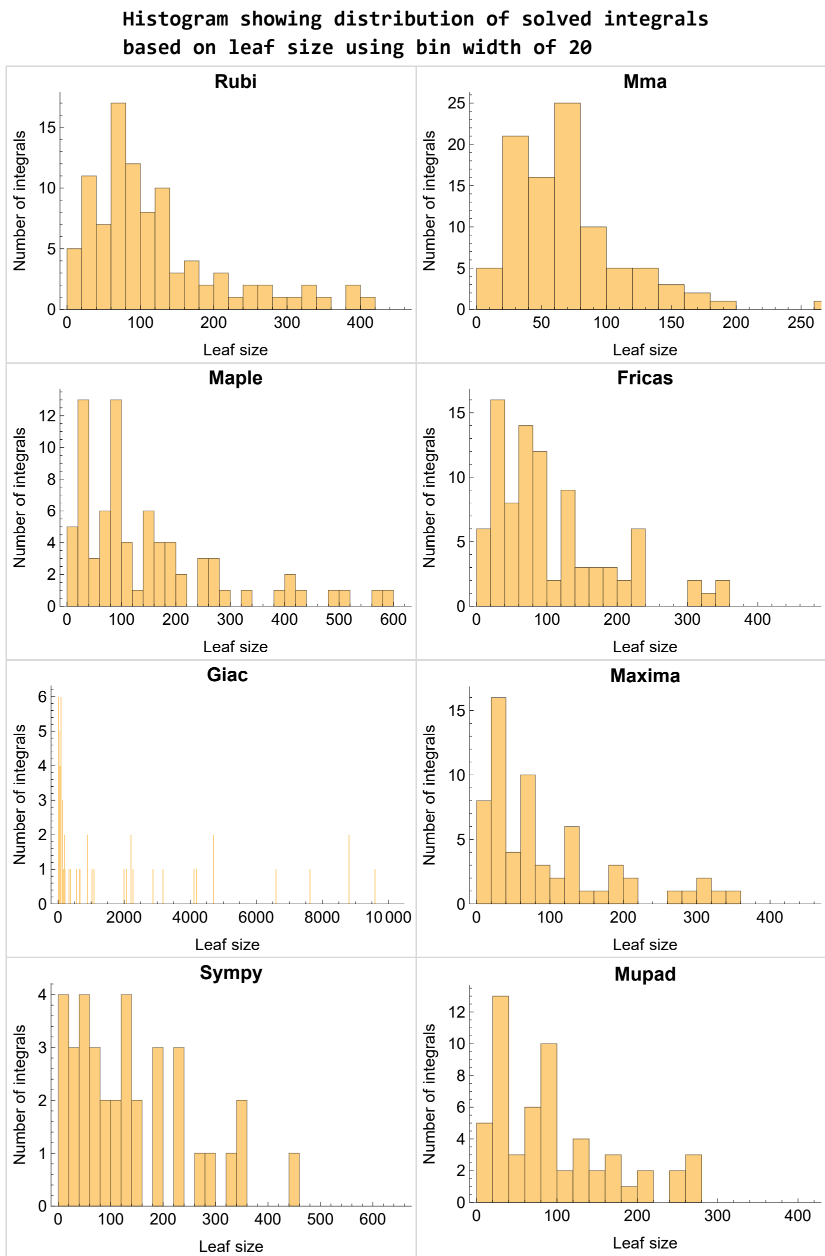


Figure 1.3: Solved integrals based on leaf size distribution

1.7 Solved integrals histogram based on CPU time used

The following shows the distribution of solved integrals for each CAS system based on CPU time used in seconds. The bin size used is 0.1 second.

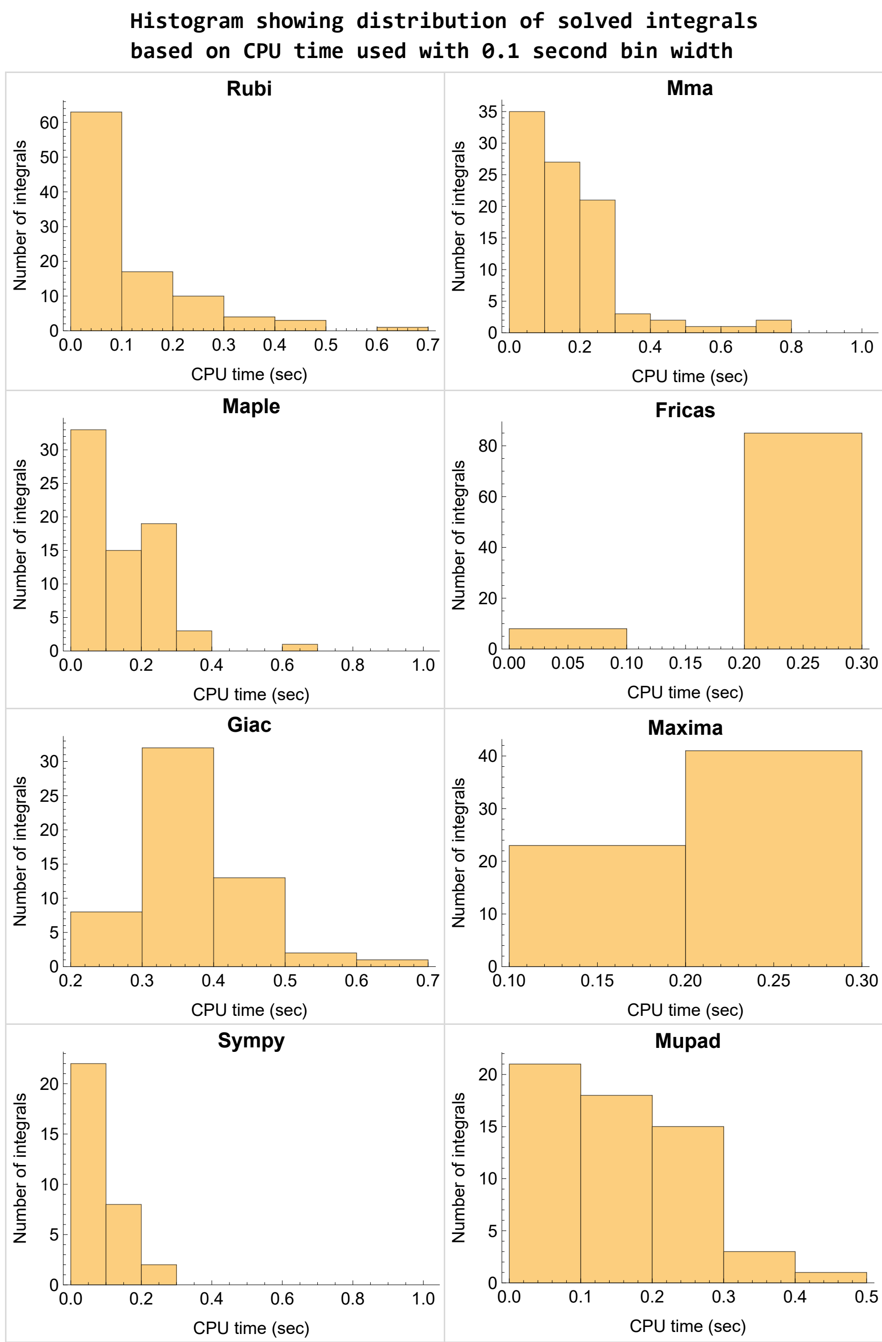


Figure 1.4: Solved integrals histogram based on CPU time used

1.8 Leaf size vs. CPU time used

The following shows the relation between the CPU time used to solve an integral and the leaf size of the antiderivative.

The result for Fricas, Maxima and Giac is shifted more to the right than the other CAS system due to the use of sagemath to call them, which causes an initial slight delay in the timing to start the integration due to overhead of starting a new process each time. This should also be taken into account when looking at the timing of these three CAS systems. Direct calls not using sagemath would result in faster timings, but current implementation uses sagemath as this makes testing much easier to do.

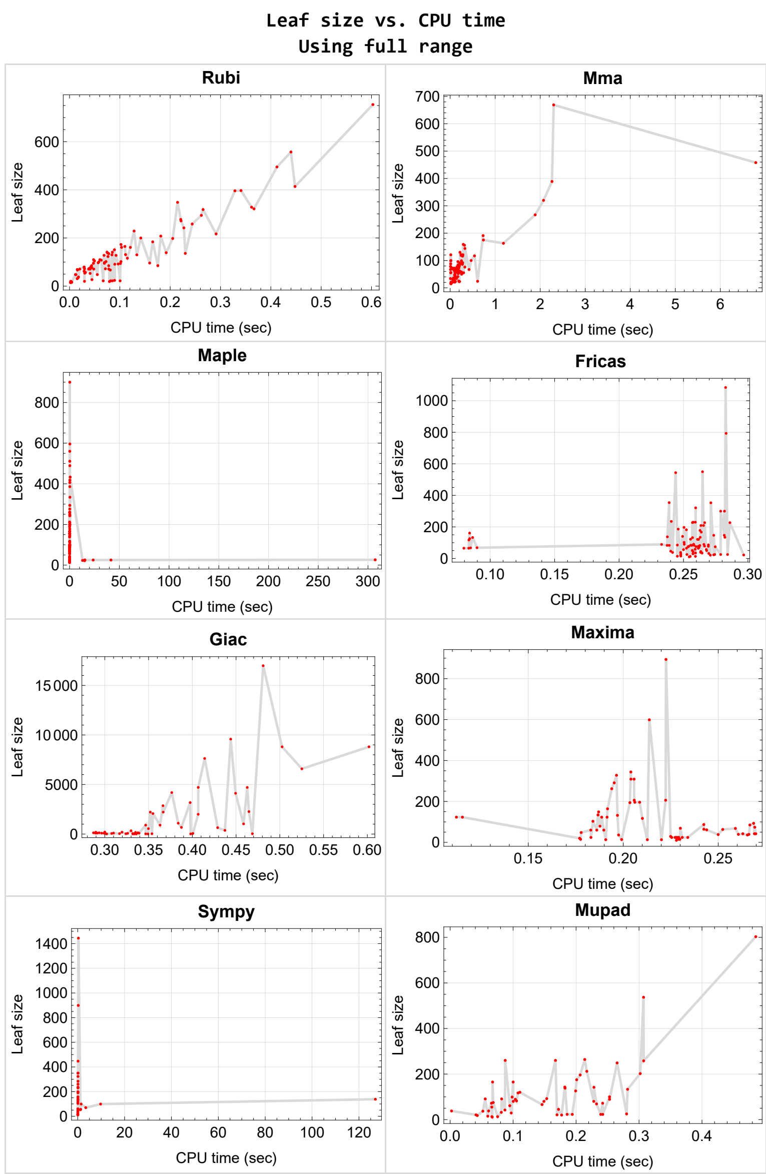


Figure 1.5: Leaf size vs. CPU time. Full range

1.9 list of integrals with no known antiderivative

{}

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

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {}

Sympy {}

Giac {}

Mupad {}

1.11 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 necessarily mean 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 possible to do further investigation to determine why the result could not be verified.

Rubi {}

Mathematica {}

Maple {}

Maxima Verification phase not currently implemented.

Fricas Verification phase not currently implemented.

Sympy Verification phase not currently implemented.

Giac Verification phase not currently implemented.

Mupad Verification phase not currently implemented.

1.12 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.

1.13 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.

1.14 Important notes about some of the results

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.

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.

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
```

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.

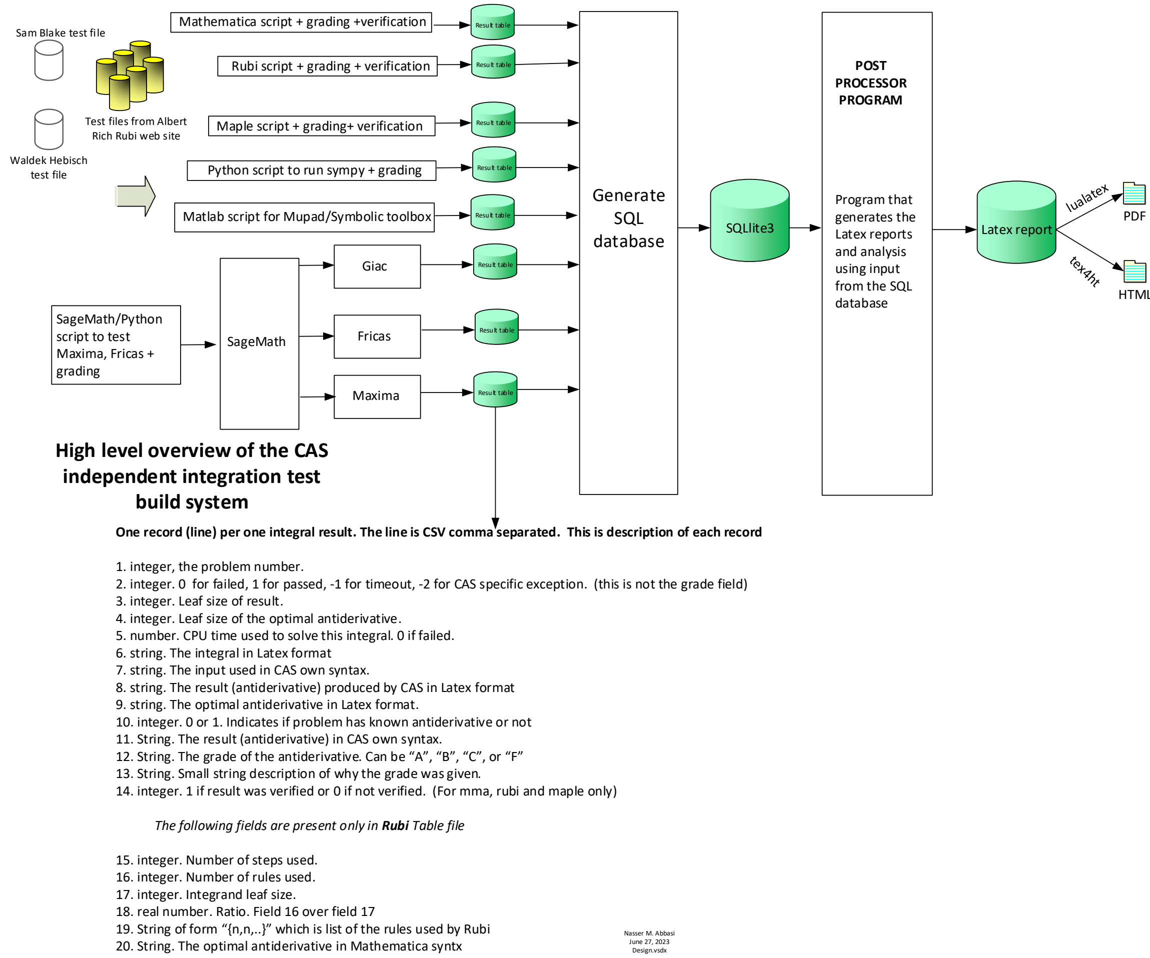
The following is an example of using Matlab's symbolic toolbox (Mupad) to solve an integral

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

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

1.15 Design of the test system

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



CHAPTER 2

DETAILED SUMMARY TABLES OF RESULTS

2.1 List of integrals sorted by grade for each CAS

Rubi

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade { }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

Mma

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade { }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

Maple

A grade { 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 48, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94 }

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

C grade { 55 }

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

F(-1) timedout fail { }

F(-2) exception fail { }

Fricas

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 23, 24, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade { 81, 82 }

C grade { }

F normal fail { 20, 21, 22, 25, 26 }

F(-1) timedout fail { }

F(-2) exception fail { }

Maxima

A grade { 3, 4, 5, 6, 13, 14, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 48, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98 }

B grade { 2, 12 }

C grade { }

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

F(-1) timedout fail { }

F(-2) exception fail { }

Giac

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

B grade { 39, 40, 41, 42, 78, 79, 80, 81, 82 }

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

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

F(-1) timedout fail { }

F(-2) exception fail { 84, 85, 86, 87, 88 }

Mupad

A grade { }

B grade { 2, 3, 4, 5, 6, 12, 13, 14, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 48, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94 }

C grade { }

F normal fail { }

F(-1) timedout fail { 1, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 55, 64, 78, 79, 80, 81, 82, 95, 96, 97, 98 }

F(-2) exception fail { }

Sympy

A grade { 4, 5, 6, 14, 27, 28, 29, 48, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 75, 76, 77, 90, 91, 92, 93, 94 }

B grade { 2, 3, 12, 13, 74 }

C grade { }

F normal fail { 1, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 49, 64, 69, 70, 71, 72, 73, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 89, 95, 96, 97, 98 }

F(-1) timedout fail { 39, 47, 50, 83 }

F(-2) exception fail { 25 }

2.2 Detailed conclusion table per each integral for all CAS systems

Detailed conclusion table per each integral is given by the 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 as **F**.

In this table, the column `N.S.` means **normalized size** and is defined as $\frac{\text{antiderivative leaf size}}{\text{optimal antiderivative leaf size}}$. To make the table fit the page, the name **`Mathematica`** was abbreviated to **`MMA`**.

Problem 1	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	67	67	67	0	0	65	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.97	0.00	0.00	0.00
time (sec)	N/A	0.081	0.419	0.000	0.000	0.083	0.000	0.000	0.000

Problem 2	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	B	A	B	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	141	141	100	260	309	227	350	8802	260
N.S.	1	1.00	0.71	1.84	2.19	1.61	2.48	62.43	1.84
time (sec)	N/A	0.074	0.465	0.164	0.204	0.286	0.113	0.503	0.167

Problem 3	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	110	110	78	165	206	147	231	4706	165
N.S.	1	1.00	0.71	1.50	1.87	1.34	2.10	42.78	1.50
time (sec)	N/A	0.048	0.156	0.108	0.222	0.282	0.098	0.463	0.100

Problem 4	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	79	79	56	91	123	84	133	2214	91
N.S.	1	1.00	0.71	1.15	1.56	1.06	1.68	28.03	1.15
time (sec)	N/A	0.029	0.244	0.126	0.189	0.258	0.092	0.352	0.082

Problem 5	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	34	38	60	38	60	898	38
N.S.	1	1.00	0.71	0.79	1.25	0.79	1.25	18.71	0.79
time (sec)	N/A	0.012	0.142	0.016	0.183	0.264	0.071	0.363	0.061

Problem 6	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	20	20	21	21	20	21	20	21	21
N.S.	1	1.00	1.05	1.05	1.00	1.05	1.00	1.05	1.05
time (sec)	N/A	0.002	0.022	0.012	0.177	0.271	0.049	0.332	0.041

Problem 7	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	31	31	31	56	0	39	0	0	0
N.S.	1	1.00	1.00	1.81	0.00	1.26	0.00	0.00	0.00
time (sec)	N/A	0.015	0.089	0.112	0.000	0.263	0.000	0.000	0.000

Problem 8	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	57	57	55	99	0	77	0	0	0
N.S.	1	1.00	0.96	1.74	0.00	1.35	0.00	0.00	0.00
time (sec)	N/A	0.032	0.298	0.094	0.000	0.262	0.000	0.000	0.000

Problem 9	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	95	95	88	155	0	134	0	0	0
N.S.	1	1.00	0.93	1.63	0.00	1.41	0.00	0.00	0.00
time (sec)	N/A	0.048	0.237	0.159	0.000	0.263	0.000	0.000	0.000

Problem 10	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	128	128	99	199	0	209	0	0	0
N.S.	1	1.00	0.77	1.55	0.00	1.63	0.00	0.00	0.00
time (sec)	N/A	0.069	0.250	0.347	0.000	0.264	0.000	0.000	0.000

Problem 11	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	161	161	121	243	0	300	0	0	0
N.S.	1	1.00	0.75	1.51	0.00	1.86	0.00	0.00	0.00
time (sec)	N/A	0.103	0.240	0.306	0.000	0.282	0.000	0.000	0.000

Problem 12	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	B	A	B	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	141	141	100	260	309	227	350	8802	260
N.S.	1	1.00	0.71	1.84	2.19	1.61	2.48	62.43	1.84
time (sec)	N/A	0.085	0.017	0.059	0.206	0.266	0.109	0.602	0.087

Problem 13	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	110	110	78	165	206	147	231	4706	165
N.S.	1	1.00	0.71	1.50	1.87	1.34	2.10	42.78	1.50
time (sec)	N/A	0.060	0.008	0.037	0.206	0.273	0.101	0.407	0.067

Problem 14	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	79	79	56	91	123	84	133	2214	91
N.S.	1	1.00	0.71	1.15	1.56	1.06	1.68	28.03	1.15
time (sec)	N/A	0.029	0.016	0.023	0.191	0.256	0.087	0.367	0.056

Problem 15	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	57	57	55	99	0	77	0	0	0
N.S.	1	1.00	0.96	1.74	0.00	1.35	0.00	0.00	0.00
time (sec)	N/A	0.031	0.011	0.246	0.000	0.269	0.000	0.000	0.000

Problem 16	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	95	95	88	155	0	134	0	0	0
N.S.	1	1.00	0.93	1.63	0.00	1.41	0.00	0.00	0.00
time (sec)	N/A	0.069	0.011	0.083	0.000	0.282	0.000	0.000	0.000

Problem 17	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	128	128	99	199	0	209	0	0	0
N.S.	1	1.00	0.77	1.55	0.00	1.63	0.00	0.00	0.00
time (sec)	N/A	0.092	0.013	0.123	0.000	0.266	0.000	0.000	0.000

Problem 18	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	161	161	121	243	0	300	0	0	0
N.S.	1	1.00	0.75	1.51	0.00	1.86	0.00	0.00	0.00
time (sec)	N/A	0.121	0.014	0.191	0.000	0.279	0.000	0.000	0.000

Problem 19	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	72	72	72	0	0	68	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.94	0.00	0.00	0.00
time (sec)	N/A	0.041	0.086	0.000	0.000	0.090	0.000	0.000	0.000

Problem 20	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.048	0.078	0.000	0.000	0.000	0.000	0.000	0.000

Problem 21	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.038	0.073	0.000	0.000	0.000	0.000	0.000	0.000

Problem 22	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	71	71	71	0	0	0	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.041	0.042	0.000	0.000	0.000	0.000	0.000	0.000

Problem 23	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	67	67	67	0	0	65	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.97	0.00	0.00	0.00
time (sec)	N/A	0.016	0.008	0.000	0.000	0.080	0.000	0.000	0.000

Problem 24	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	69	69	69	0	0	67	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.97	0.00	0.00	0.00
time (sec)	N/A	0.015	0.046	0.000	0.000	0.085	0.000	0.000	0.000

Problem 25	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F(-2)	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	73	73	73	0	0	0	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.040	0.036	0.000	0.000	0.000	0.000	0.000	0.000

Problem 26	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	73	73	73	0	0	0	0	0	0
N.S.	1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.039	0.036	0.000	0.000	0.000	0.000	0.000	0.000

Problem 27	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	15	15	15	14	13	13	14	13	13
N.S.	1	1.00	1.00	0.93	0.87	0.87	0.93	0.87	0.87
time (sec)	N/A	0.002	0.020	0.013	0.213	0.259	0.042	0.334	0.075

Problem 28	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	15	15	15	16	15	15	15	15	15
N.S.	1	1.00	1.00	1.07	1.00	1.00	1.00	1.00	1.00
time (sec)	N/A	0.002	0.015	0.013	0.178	0.248	0.040	0.398	0.060

Problem 29	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	19	19	19	12	13	13	10	13	11
N.S.	1	1.00	1.00	0.63	0.68	0.68	0.53	0.68	0.58
time (sec)	N/A	0.004	0.018	0.028	0.191	0.255	0.048	0.302	0.067

Problem 30	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	131	131	36	99	24	89	0	94	82
N.S.	1	1.00	0.27	0.76	0.18	0.68	0.00	0.72	0.63
time (sec)	N/A	0.111	0.087	0.022	0.228	0.266	0.000	0.310	0.105

Problem 31	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	108	108	36	87	24	77	0	82	72
N.S.	1	1.00	0.33	0.81	0.22	0.71	0.00	0.76	0.67
time (sec)	N/A	0.063	0.072	0.011	0.229	0.254	0.000	0.339	0.066

Problem 32	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	36	75	24	65	0	70	75
N.S.	1	1.00	0.42	0.88	0.28	0.76	0.00	0.82	0.88
time (sec)	N/A	0.044	0.096	0.008	0.226	0.252	0.000	0.326	0.068

Problem 33	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	62	62	30	66	24	51	0	58	55
N.S.	1	1.00	0.48	1.06	0.39	0.82	0.00	0.94	0.89
time (sec)	N/A	0.029	0.058	0.008	0.228	0.257	0.000	0.308	0.066

Problem 34	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	38	38	30	27	29	34	0	28	32
N.S.	1	1.00	0.79	0.71	0.76	0.89	0.00	0.74	0.84
time (sec)	N/A	0.018	0.070	0.010	0.225	0.264	0.000	0.469	0.081

Problem 35	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	54	54	38	64	24	44	0	0	42
N.S.	1	1.00	0.70	1.19	0.44	0.81	0.00	0.00	0.78
time (sec)	N/A	0.030	0.116	0.010	0.234	0.263	0.000	0.000	0.087

Problem 36	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	77	77	49	72	24	58	0	0	61
N.S.	1	1.00	0.64	0.94	0.31	0.75	0.00	0.00	0.79
time (sec)	N/A	0.044	0.106	0.010	0.227	0.259	0.000	0.000	0.095

Problem 37	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	100	100	61	84	24	74	0	0	80
N.S.	1	1.00	0.61	0.84	0.24	0.74	0.00	0.00	0.80
time (sec)	N/A	0.058	0.125	0.011	0.231	0.254	0.000	0.000	0.100

Problem 38	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	123	123	73	96	24	86	0	0	99
N.S.	1	1.00	0.59	0.78	0.20	0.70	0.00	0.00	0.80
time (sec)	N/A	0.076	0.148	0.010	0.229	0.269	0.000	0.000	0.098

Problem 39	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F(-1)	B	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	208	208	72	0	0	230	0	1023	0
N.S.	1	1.00	0.35	0.00	0.00	1.11	0.00	4.92	0.00
time (sec)	N/A	0.181	0.193	0.000	0.000	0.259	0.000	0.459	0.000

Problem 40	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	173	173	72	0	0	167	0	643	0
N.S.	1	1.00	0.42	0.00	0.00	0.97	0.00	3.72	0.00
time (sec)	N/A	0.102	0.126	0.000	0.000	0.264	0.000	0.429	0.000

Problem 41	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	138	138	63	0	0	121	0	372	0
N.S.	1	1.00	0.46	0.00	0.00	0.88	0.00	2.70	0.00
time (sec)	N/A	0.076	0.153	0.000	0.000	0.261	0.000	0.437	0.000

Problem 42	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	105	105	63	0	0	90	0	189	0
N.S.	1	1.00	0.60	0.00	0.00	0.86	0.00	1.80	0.00
time (sec)	N/A	0.050	0.093	0.000	0.000	0.258	0.000	0.320	0.000

Problem 43	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	A	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	72	72	63	0	0	64	0	56	0
N.S.	1	1.00	0.88	0.00	0.00	0.89	0.00	0.78	0.00
time (sec)	N/A	0.030	0.094	0.000	0.000	0.261	0.000	0.300	0.000

Problem 44	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	97	97	75	0	0	90	0	0	0
N.S.	1	1.00	0.77	0.00	0.00	0.93	0.00	0.00	0.00
time (sec)	N/A	0.057	0.176	0.000	0.000	0.251	0.000	0.000	0.000

Problem 45	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	130	130	92	0	0	140	0	0	0
N.S.	1	1.00	0.71	0.00	0.00	1.08	0.00	0.00	0.00
time (sec)	N/A	0.084	0.277	0.000	0.000	0.249	0.000	0.000	0.000

Problem 46	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	165	165	118	0	0	230	0	0	0
N.S.	1	1.00	0.72	0.00	0.00	1.39	0.00	0.00	0.00
time (sec)	N/A	0.110	0.246	0.000	0.000	0.258	0.000	0.000	0.000

Problem 47	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	200	200	144	0	0	321	0	0	0
N.S.	1	1.00	0.72	0.00	0.00	1.60	0.00	0.00	0.00
time (sec)	N/A	0.142	0.328	0.000	0.000	0.259	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	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	151	151	24	78	79	82	138	80	89
N.S.	1	1.00	0.16	0.52	0.52	0.54	0.91	0.53	0.59
time (sec)	N/A	0.089	0.609	0.096	0.188	0.263	127.004	0.299	0.104

Problem 49	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	71	71	63	0	0	117	0	0	0
N.S.	1	1.00	0.89	0.00	0.00	1.65	0.00	0.00	0.00
time (sec)	N/A	0.020	0.184	0.000	0.000	0.083	0.000	0.000	0.000

Problem 50	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	98	98	78	0	0	133	0	0	0
N.S.	1	1.00	0.80	0.00	0.00	1.36	0.00	0.00	0.00
time (sec)	N/A	0.069	0.200	0.000	0.000	0.086	0.000	0.000	0.000

Problem 51	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	34	38	60	38	60	898	38
N.S.	1	1.00	0.71	0.79	1.25	0.79	1.25	18.71	0.79
time (sec)	N/A	0.013	0.007	0.000	0.190	0.242	0.061	0.347	0.002

Problem 52	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	135	135	56	80	117	74	116	2068	80
N.S.	1	1.00	0.41	0.59	0.87	0.55	0.86	15.32	0.59
time (sec)	N/A	0.078	0.118	0.020	0.210	0.275	0.075	0.355	0.149

Problem 53	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	229	229	84	138	194	122	190	4188	138
N.S.	1	1.00	0.37	0.60	0.85	0.53	0.83	18.29	0.60
time (sec)	N/A	0.128	0.176	0.027	0.204	0.255	0.088	0.377	0.183

Problem 54	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	348	348	117	212	291	182	284	7630	212
N.S.	1	1.00	0.34	0.61	0.84	0.52	0.82	21.93	0.61
time (sec)	N/A	0.215	0.540	0.033	0.195	0.252	0.120	0.414	0.217

Problem 55	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	C	A	A	A	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	116	116	61	334	123	126	99	0	0
N.S.	1	1.00	0.53	2.88	1.06	1.09	0.85	0.00	0.00
time (sec)	N/A	0.115	0.218	0.342	0.112	0.084	9.756	0.000	0.000

Problem 56	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	397	397	121	178	196	121	236	202	175
N.S.	1	1.00	0.30	0.45	0.49	0.30	0.59	0.51	0.44
time (sec)	N/A	0.341	0.283	0.210	0.206	0.262	0.102	0.300	0.201

Problem 57	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	318	318	130	143	164	102	196	163	126
N.S.	1	1.00	0.41	0.45	0.52	0.32	0.62	0.51	0.40
time (sec)	N/A	0.265	0.218	0.161	0.192	0.250	0.096	0.335	0.199

Problem 58	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	184	184	96	102	132	78	148	123	117
N.S.	1	1.00	0.52	0.55	0.72	0.42	0.80	0.67	0.64
time (sec)	N/A	0.165	0.172	0.197	0.197	0.266	0.087	0.294	0.108

Problem 59	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	80	80	41	68	103	57	104	87	66
N.S.	1	1.00	0.51	0.85	1.29	0.71	1.30	1.09	0.82
time (sec)	N/A	0.042	0.170	0.164	0.184	0.268	0.077	0.297	0.146

Problem 60	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	102	102	52	96	69	50	70	95	69
N.S.	1	1.00	0.51	0.94	0.68	0.49	0.69	0.93	0.68
time (sec)	N/A	0.102	0.177	0.210	0.230	0.268	3.432	0.291	0.233

Problem 61	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	94	94	54	88	61	56	99	92	72
N.S.	1	1.00	0.57	0.94	0.65	0.60	1.05	0.98	0.77
time (sec)	N/A	0.101	0.188	0.205	0.244	0.250	1.465	0.289	0.242

Problem 62	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	130	130	68	112	64	70	56	125	100
N.S.	1	1.00	0.52	0.86	0.49	0.54	0.43	0.96	0.77
time (sec)	N/A	0.134	0.167	0.225	0.242	0.262	1.264	0.287	0.253

Problem 63	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	198	198	81	167	63	83	53	183	142
N.S.	1	1.00	0.41	0.84	0.32	0.42	0.27	0.92	0.72
time (sec)	N/A	0.205	0.203	0.211	0.252	0.257	1.168	0.290	0.228

Problem 64	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	A	A	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	139	139	86	433	123	161	0	0	0
N.S.	1	1.00	0.62	3.12	0.88	1.16	0.00	0.00	0.00
time (sec)	N/A	0.192	0.271	0.600	0.115	0.084	0.000	0.000	0.000

Problem 65	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	414	414	159	250	328	228	323	9584	249
N.S.	1	1.00	0.38	0.60	0.79	0.55	0.78	23.15	0.60
time (sec)	N/A	0.448	0.291	0.220	0.196	0.257	0.116	0.444	0.265

Problem 66	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	328	328	121	197	262	178	260	6582	196
N.S.	1	1.00	0.37	0.60	0.80	0.54	0.79	20.07	0.60
time (sec)	N/A	0.362	0.256	0.178	0.194	0.263	0.106	0.525	0.207

Problem 67	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	242	242	91	144	196	132	199	4114	143
N.S.	1	1.00	0.38	0.60	0.81	0.55	0.82	17.00	0.59
time (sec)	N/A	0.227	0.214	0.207	0.209	0.257	0.091	0.449	0.182

Problem 68	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	C	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	58	93	134	85	134	2264	92
N.S.	1	1.00	0.68	1.09	1.58	1.00	1.58	26.64	1.08
time (sec)	N/A	0.078	0.166	0.203	0.187	0.245	0.098	0.465	0.153

Problem 69	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	96	96	54	118	87	75	0	0	80
N.S.	1	1.00	0.56	1.23	0.91	0.78	0.00	0.00	0.83
time (sec)	N/A	0.159	0.270	0.211	0.242	0.260	0.000	0.000	0.228

Problem 70	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	85	85	58	153	68	83	0	0	89
N.S.	1	1.00	0.68	1.80	0.80	0.98	0.00	0.00	1.05
time (sec)	N/A	0.175	0.250	0.230	0.259	0.239	0.000	0.000	0.253

Problem 71	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	136	136	76	208	74	89	0	0	133
N.S.	1	1.00	0.56	1.53	0.54	0.65	0.00	0.00	0.98
time (sec)	N/A	0.230	0.326	0.234	0.269	0.233	0.000	0.000	0.282

Problem 72	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	217	217	116	294	85	137	0	0	202
N.S.	1	1.00	0.53	1.35	0.39	0.63	0.00	0.00	0.93
time (sec)	N/A	0.291	0.277	0.200	0.267	0.237	0.000	0.000	0.302

Problem 73	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	321	321	156	386	93	186	0	0	258
N.S.	1	1.00	0.49	1.20	0.29	0.58	0.00	0.00	0.80
time (sec)	N/A	0.367	0.318	0.239	0.269	0.246	0.000	0.000	0.307

Problem 74	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	754	754	458	900	894	544	1445	1096	803
N.S.	1	1.00	0.61	1.19	1.19	0.72	1.92	1.45	1.06
time (sec)	N/A	0.603	6.787	0.188	0.223	0.244	0.292	0.384	0.485

Problem 75	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	495	495	320	560	599	354	899	674	537
N.S.	1	1.00	0.65	1.13	1.21	0.72	1.82	1.36	1.08
time (sec)	N/A	0.412	2.074	0.219	0.214	0.239	0.229	0.388	0.307

Problem 76	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	271	271	191	276	344	197	447	331	264
N.S.	1	1.00	0.70	1.02	1.27	0.73	1.65	1.22	0.97
time (sec)	N/A	0.222	0.731	0.159	0.204	0.250	0.138	0.330	0.214

Problem 77	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	102	102	50	99	149	83	158	132	120
N.S.	1	1.00	0.49	0.97	1.46	0.81	1.55	1.29	1.18
time (sec)	N/A	0.072	0.255	0.154	0.187	0.237	0.099	0.338	0.111

Problem 78	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	277	277	175	489	0	235	0	546	0
N.S.	1	1.00	0.63	1.77	0.00	0.85	0.00	1.97	0.00
time (sec)	N/A	0.221	0.738	0.263	0.000	0.241	0.000	0.350	0.000

Problem 79	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	258	258	163	406	0	353	0	2861	0
N.S.	1	1.00	0.63	1.57	0.00	1.37	0.00	11.09	0.00
time (sec)	N/A	0.244	1.184	0.196	0.000	0.271	0.000	0.366	0.000

Problem 80	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	294	294	267	418	0	550	0	1995	0
N.S.	1	1.00	0.91	1.42	0.00	1.87	0.00	6.79	0.00
time (sec)	N/A	0.262	1.888	0.248	0.000	0.265	0.000	0.407	0.000

Problem 81	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	B	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	396	396	389	511	0	793	0	3178	0
N.S.	1	1.00	0.98	1.29	0.00	2.00	0.00	8.03	0.00
time (sec)	N/A	0.329	2.262	0.204	0.000	0.283	0.000	0.398	0.000

Problem 82	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F	B	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	557	557	669	596	0	1084	0	16988	0
N.S.	1	1.00	1.20	1.07	0.00	1.95	0.00	30.50	0.00
time (sec)	N/A	0.440	2.299	0.269	0.000	0.283	0.000	0.481	0.000

Problem 83	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F(-1)	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	24	24	25	26	42	32	0	0	25
N.S.	1	1.00	1.04	1.08	1.75	1.33	0.00	0.00	1.04
time (sec)	N/A	0.089	0.192	307.214	0.263	0.270	0.000	0.000	0.280

Problem 84	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F(-2)	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	25	42	25	0	0	23
N.S.	1	1.00	1.05	1.14	1.91	1.14	0.00	0.00	1.05
time (sec)	N/A	0.082	0.116	41.589	0.270	0.253	0.000	0.000	0.194

Problem 85	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F(-2)	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	25	42	25	0	0	23
N.S.	1	1.00	1.05	1.14	1.91	1.14	0.00	0.00	1.05
time (sec)	N/A	0.067	0.106	23.717	0.269	0.274	0.000	0.000	0.186

Problem 86	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F(-2)	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	20	20	21	23	38	23	0	0	21
N.S.	1	1.00	1.05	1.15	1.90	1.15	0.00	0.00	1.05
time (sec)	N/A	0.030	0.103	13.035	0.250	0.273	0.000	0.000	0.170

Problem 87	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F(-2)	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	19	19	19	22	36	22	0	0	20
N.S.	1	1.00	1.00	1.16	1.89	1.16	0.00	0.00	1.05
time (sec)	N/A	0.079	0.024	15.115	0.265	0.297	0.000	0.000	0.177

Problem 88	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F(-2)	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	25	39	25	0	0	23
N.S.	1	1.00	1.05	1.14	1.77	1.14	0.00	0.00	1.05
time (sec)	N/A	0.100	0.197	15.318	0.261	0.284	0.000	0.000	0.242

Problem 89	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	F	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	22	22	23	25	39	25	0	0	23
N.S.	1	1.00	1.05	1.14	1.77	1.14	0.00	0.00	1.05
time (sec)	N/A	0.085	0.209	15.315	0.266	0.279	0.000	0.000	0.239

Problem 90	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	91	91	45	43	60	43	51	43	45
N.S.	1	1.00	0.49	0.47	0.66	0.47	0.56	0.47	0.49
time (sec)	N/A	0.090	0.109	0.043	0.186	0.257	0.071	0.317	0.172

Problem 91	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	72	72	37	35	48	35	42	35	37
N.S.	1	1.00	0.51	0.49	0.67	0.49	0.58	0.49	0.51
time (sec)	N/A	0.071	0.093	0.020	0.178	0.259	0.071	0.332	0.052

Problem 92	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	53	53	29	27	36	27	34	27	29
N.S.	1	1.00	0.55	0.51	0.68	0.51	0.64	0.51	0.55
time (sec)	N/A	0.041	0.086	0.017	0.198	0.248	0.053	0.324	0.097

Problem 93	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	34	34	21	19	24	19	26	19	18
N.S.	1	1.00	0.62	0.56	0.71	0.56	0.76	0.56	0.53
time (sec)	N/A	0.017	0.062	0.020	0.183	0.248	0.054	0.347	0.043

Problem 94	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	16	16	16	14	14	14	14	14	13
N.S.	1	1.00	1.00	0.88	0.88	0.88	0.88	0.88	0.81
time (sec)	N/A	0.004	0.021	0.016	0.199	0.245	0.039	0.349	0.066

Problem 95	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	A	A	F	A	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	27	27	27	57	10	10	0	10	0
N.S.	1	1.00	1.00	2.11	0.37	0.37	0.00	0.37	0.00
time (sec)	N/A	0.045	0.078	0.014	0.228	0.254	0.000	0.336	0.000

Problem 96	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	A	A	F	A	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	48	48	47	116	13	29	0	29	0
N.S.	1	1.00	0.98	2.42	0.27	0.60	0.00	0.60	0.00
time (sec)	N/A	0.055	0.097	0.020	0.220	0.257	0.000	0.354	0.000

Problem 97	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	A	A	F	A	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	71	71	56	155	15	38	0	46	0
N.S.	1	1.00	0.79	2.18	0.21	0.54	0.00	0.65	0.00
time (sec)	N/A	0.078	0.106	0.023	0.230	0.248	0.000	0.332	0.000

Problem 98	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	A	A	F	A	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	92	92	64	189	15	46	0	63	0
N.S.	1	1.00	0.70	2.05	0.16	0.50	0.00	0.68	0.00
time (sec)	N/A	0.097	0.115	0.033	0.229	0.240	0.000	0.401	0.000

2.3 Detailed conclusion table specific for Rubi results

The following table is specific to Rubi only. 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 also given. The larger this ratio is, the harder the integral is to solve. In this test file, problem number [48] had the largest ratio of [.2500000000000000000]

Table 2.1: Rubi specific breakdown of results for each integral

#	grade	number of steps used	number of unique rules	normalized antiderivative leaf size	integrand leaf size	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
1	A	1	1	1.00	17	0.059
2	A	5	2	1.00	17	0.118
3	A	4	2	1.00	17	0.118
4	A	3	2	1.00	17	0.118
5	A	2	2	1.00	15	0.133
6	A	1	1	1.00	9	0.111
7	A	1	1	1.00	17	0.059
8	A	2	2	1.00	17	0.118
9	A	3	2	1.00	17	0.118
10	A	4	2	1.00	17	0.118
11	A	5	2	1.00	17	0.118
12	A	6	3	1.00	48	0.062
13	A	5	3	1.00	37	0.081
14	A	4	3	1.00	26	0.115
15	A	3	3	1.00	28	0.107
16	A	4	3	1.00	39	0.077
17	A	5	3	1.00	50	0.060
18	A	6	3	1.00	61	0.049
19	A	2	2	1.00	19	0.105
20	A	2	2	1.00	50	0.040
21	A	2	2	1.00	39	0.051
22	A	2	2	1.00	28	0.071
23	A	1	1	1.00	17	0.059
24	A	1	1	1.00	19	0.053

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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
25	A	2	2	1.00	30	0.067
26	A	2	2	1.00	41	0.049
27	A	1	1	1.00	7	0.143
28	A	1	1	1.00	7	0.143
29	A	1	1	1.00	7	0.143
30	A	6	3	1.00	13	0.231
31	A	5	3	1.00	13	0.231
32	A	4	3	1.00	13	0.231
33	A	3	3	1.00	13	0.231
34	A	2	2	1.00	13	0.154
35	A	3	3	1.00	13	0.231
36	A	4	3	1.00	13	0.231
37	A	5	3	1.00	13	0.231
38	A	6	3	1.00	13	0.231
39	A	6	3	1.00	19	0.158
40	A	5	3	1.00	19	0.158
41	A	4	3	1.00	19	0.158
42	A	3	3	1.00	19	0.158
43	A	2	2	1.00	19	0.105
44	A	3	3	1.00	19	0.158
45	A	4	3	1.00	19	0.158
46	A	5	3	1.00	19	0.158
47	A	6	3	1.00	19	0.158
48	A	9	3	1.00	12	0.250
49	A	1	1	1.00	19	0.053
50	A	2	2	1.00	21	0.095
51	A	2	2	1.00	15	0.133
52	A	8	3	1.00	20	0.150
53	A	12	3	1.00	25	0.120
54	A	17	3	1.00	30	0.100
55	A	6	2	1.00	21	0.095
56	A	24	3	1.00	21	0.143
57	A	20	3	1.00	21	0.143
58	A	11	3	1.00	19	0.158
59	A	4	2	1.00	18	0.111

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
60	A	9	4	1.00	21	0.190
61	A	8	5	1.00	21	0.238
62	A	9	4	1.00	21	0.190
63	A	12	3	1.00	21	0.143
64	A	5	2	1.00	22	0.091
65	A	17	3	1.00	22	0.136
66	A	14	3	1.00	22	0.136
67	A	11	3	1.00	20	0.150
68	A	4	3	1.00	19	0.158
69	A	6	4	1.00	22	0.182
70	A	6	4	1.00	22	0.182
71	A	8	3	1.00	22	0.136
72	A	11	3	1.00	22	0.136
73	A	14	3	1.00	22	0.136
74	A	28	3	1.00	25	0.120
75	A	20	3	1.00	25	0.120
76	A	13	3	1.00	23	0.130
77	A	5	2	1.00	18	0.111
78	A	13	4	1.00	25	0.160
79	A	11	5	1.00	25	0.200
80	A	11	5	1.00	25	0.200
81	A	13	4	1.00	25	0.160
82	A	17	3	1.00	25	0.120
83	A	1	1	1.00	39	0.026
84	A	1	1	1.00	38	0.026
85	A	1	1	1.00	36	0.028
86	A	1	1	1.00	35	0.029
87	A	1	1	1.00	35	0.029
88	A	1	1	1.00	38	0.026
89	A	1	1	1.00	38	0.026
90	A	5	2	1.00	15	0.133
91	A	4	2	1.00	15	0.133
92	A	3	2	1.00	15	0.133
93	A	2	2	1.00	13	0.154
94	A	1	1	1.00	11	0.091

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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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
95	A	2	2	1.00	15	0.133
96	A	3	3	1.00	15	0.200
97	A	4	3	1.00	15	0.200
98	A	5	3	1.00	15	0.200

CHAPTER 3

LISTING OF INTEGRALS

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

Optimal result

Integrand size = 17, antiderivative size = 67

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

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

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 67, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2212}

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

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

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

Rule 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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.42 (sec) , antiderivative size = 67, normalized size of antiderivative = 1.00

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

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

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 65, normalized size of antiderivative = 0.97

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

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="fricas")
[Out] e^(-(e*m*log(-b*c*log(F)/e) + (b*c*d - a*c*e)*log(F))/e)*gamma(m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 141

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

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

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 141, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2207, 2225}

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

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

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.47 (sec) , antiderivative size = 100, normalized size of antiderivative = 0.71

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

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

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

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 260, normalized size of antiderivative = 1.84

method	result
gosper	$\frac{\left(e^4x^4c^4b^4\ln(F)^4+4\ln(F)^4b^4c^4d\,e^3x^3+6\ln(F)^4b^4c^4d^2e^2x^2+4\ln(F)^4b^4c^4d^3ex+\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3e^4x^3-12\ln(F)^3\right.}{}$
risch	$\frac{\left(e^4x^4c^4b^4\ln(F)^4+4\ln(F)^4b^4c^4d\,e^3x^3+6\ln(F)^4b^4c^4d^2e^2x^2+4\ln(F)^4b^4c^4d^3ex+\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3e^4x^3-12\ln(F)^3\right.}{}$
norman	$\frac{\left(\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3d^3e+12c^2b^2\ln(F)^2d^2e^2-24d\,e^3cb\ln(F)+24e^4\right)e^{c(bx+a)\ln(F)}}{c^5b^5\ln(F)^5}+\frac{e^4x^4e^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{4e\left(c^3b\right.}{}$
meijerg	$-\frac{F^{ca}e^4\left(24-\frac{\left(5b^4c^4x^4\ln(F)^4-20b^3c^3x^3\ln(F)^3+60b^2c^2x^2\ln(F)^2-120bcx\ln(F)+120\right)e^{bcx\ln(F)}}{5}\right)}{c^5b^5\ln(F)^5}+\frac{4F^{ca}e^3d\left(6-\frac{\left(-4b^3c^3x^3\ln(F\right.}{}\right.}{}$
parallelrisch	$\frac{x^4F^{c(bx+a)}e^4c^4b^4\ln(F)^4+4\ln(F)^4x^3F^{c(bx+a)}b^4c^4d\,e^3+6\ln(F)^4x^2F^{c(bx+a)}b^4c^4d^2e^2+4\ln(F)^4x\,F^{c(bx+a)}b^4c^4d^3e+\ln(F)^4F}{}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 227, normalized size of antiderivative = 1.61

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

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

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

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 350 vs. 2(139) = 278.

Time = 0.11 (sec) , antiderivative size = 350, normalized size of antiderivative = 2.48

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

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

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

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 309 vs. 2(141) = 282.

Time = 0.20 (sec) , antiderivative size = 309, normalized size of antiderivative = 2.19

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.50 (sec) , antiderivative size = 8802, normalized size of antiderivative = 62.43

$$\int F^{c(a+bx)}(d+ex)^4\,dx = \text{Too large to display}$$

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

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

```
b^3*c^3*e^4*x^3*sgn(F) + pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) + 3*pi*b^3*c^3
*e^4*x^3*log(abs(F))^2*sgn(F) - pi*b^4*c^4*d^4*log(abs(F))^3*sgn(F) + pi^3*
b^3*c^3*e^4*x^3 - pi^3*b^4*c^4*d^4*log(abs(F)) - 3*pi*b^3*c^3*e^4*x^3*log(a
bs(F))^2 + pi*b^4*c^4*d^4*log(abs(F))^3 - 3*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) +
 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*d*e^3*x^2 - 9
*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 - 3*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 9*p
i*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*d^2*e^2*x - 9*pi*
b^3*c^3*d^2*e^2*x*log(abs(F))^2 - pi^3*b^3*c^3*d^3*e*sgn(F) + 3*pi*b^3*c^3*
d^3*e*log(abs(F))^2*sgn(F) + pi^3*b^3*c^3*d^3*e - 3*pi*b^3*c^3*d^3*e*log(ab
s(F))^2 - 6*pi*b^2*c^2*e^4*x^2*log(abs(F))*sgn(F) + 6*pi*b^2*c^2*e^4*x^2*lo
g(abs(F)) - 12*pi*b^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 12*pi*b^2*c^2*d*e^3*
x*log(abs(F)) - 6*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 6*pi*b^2*c^2*d^2*
e^2*log(abs(F)) + 6*pi*b*c*e^4*x*sgn(F) - 6*pi*b*c*e^4*x + 6*pi*b*c*d*e^3*s
gn(F) - 6*pi*b*c*d*e^3)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^
2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c
^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*p
i^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5
*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 +
(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) -
 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log
(abs(F))^5)^2) - (pi^4*b^4*c^4*e^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*e^4*x^4*log(
abs(F))^2*sgn(F) - pi^4*b^4*c^4*e^4*x^4 + 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F)
)^2 - 2*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*pi^4*b^4*c^4*d*e^3*x^3*sgn(F) - 2
4*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d*e^3*x^3 +
24*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 - 8*b^4*c^4*d*e^3*x^3*log(abs(F))^4
 + 6*pi^4*b^4*c^4*d^2*e^2*x^2*sgn(F) - 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(
F))^2*sgn(F) - 6*pi^4*b^4*c^4*d^2*e^2*x^2 + 36*pi^2*b^4*c^4*d^2*e^2*x^2*log
(abs(F))^2 - 12*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*pi^4*b^4*c^4*d^3*e*x*
sgn(F) - 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d^3*
e*x + 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 - 8*b^4*c^4*d^3*e*x*log(abs(F))
^4 + pi^4*b^4*c^4*d^4*sgn(F) + 12*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) -
 6*pi^2*b^4*c^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*d^4 - 12*pi^2*b^3*c
^3*e^4*x^3*log(abs(F)) + 6*pi^2*b^4*c^4*d^4*log(abs(F))^2 + 8*b^3*c^3*e^4*x
^3*log(abs(F))^3 - 2*b^4*c^4*d^4*log(abs(F))^4 + 36*pi^2*b^3*c^3*d*e^3*x^2*
log(abs(F))*sgn(F) - 36*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) + 24*b^3*c^3*d*e
^3*x^2*log(abs(F))^3 + 36*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*sgn(F) - 36*pi
^2*b^3*c^3*d^2*e^2*x*log(abs(F)) + 24*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 12*
pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) - 12*pi^2*b^3*c^3*d^3*e*log(abs(F)) +
 8*b^3*c^3*d^3*e*log(abs(F))^3 - 12*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 12*pi^2*b
^2*c^2*e^4*x^2 - 24*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*pi^2*b^2*c^2*d*e^3*x
*sgn(F) + 24*pi^2*b^2*c^2*d*e^3*x - 48*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*p
i^2*b^2*c^2*d^2*e^2*sgn(F) + 12*pi^2*b^2*c^2*d^2*e^2 - 24*b^2*c^2*d^2*e^2*l
og(abs(F))^2 + 48*b*c*e^4*x*log(abs(F)) + 48*b*c*d*e^3*log(abs(F)) - 48*e^4
)*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F)
 - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*l
```

og(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^4*b^4*c^4*e^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*e^4*x^4 + 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 - 2*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*pi^4*b^4*c^4*d*e^3*x^3*sgn(F) - 24*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d*e^3*x^3 + 24*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 - 8*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*pi^4*b^4*c^4*d^2*e^2*x^2*sgn(F) - 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) - 6*pi^4*b^4*c^4*d^2*e^2*x^2 + 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 - 12*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*pi^4*b^4*c^4*d^3*e*x*sgn(F) - 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d^3*e*x + 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 - 8*b^4*c^4*d^3*e*x*log(abs(F))^4 + pi^4*b^4*c^4*d^4*sgn(F) + 12*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*d^4 - 12*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*pi^2*b^4*c^4*d^4*log(abs(F))^2 + 8*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*b^4*c^4*d^4*log(abs(F))^4 + 36*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F))*sgn(F) - 36*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) + 24*b^3*c^3*d*e^3*x^2*log(abs(F))^3 + 36*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*sgn(F) - 36*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)) + 24*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 12*pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) - 12*pi^2*b^3*c^3*d^3*e*log(abs(F)) + 8*b^3*c^3*d^3*e*log(abs(F))^3 - 12*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 12*pi^2*b^2*c^2*e^4*x^2 - 24*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*pi^2*b^2*c^2*d*e^3*x*sgn(F) + 24*pi^2*b^2*c^2*d*e^3*x - 48*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*pi^2*b^2*c^2*d^2*e^2*sgn(F) + 12*pi^2*b^2*c^2*d^2*e^2 - 24*b^2*c^2*d^2*e^2*log(abs(F))^2 + 48*b*c*e^4*x*log(abs(F)) + 48*b*c*d*e^3*log(abs(F)) - 48*e^4)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2) + 4*(pi^3*b^4*c^4*e^4*x^4*log(abs(F))*sgn(F) - pi*b^4*c^4*e^4*x^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*e^4*x^4*log(abs(F)) + pi*b^4*c^4*e^4*x^4*log(abs(F))^3 + 4*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*d*e^3*x^3*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F)) + 4*pi*b^4*c^4*d*e^3*x^3*log(abs(F))^3 + 6*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^3*sgn(F) - 6*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F)) + 6*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^3 + 4*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*d^3*e*x*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*d^3*e*x*log(abs(F)) + 4*pi*b^4*c^4*d^3*e*x*log(abs(F))^3 - pi^3*b^3*c^3*e^4*x^3*sgn(F) + pi^3*b^4*c^4*d^

```
4*log(abs(F))*sgn(F) + 3*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) - pi*b^4*c
^4*d^4*log(abs(F))^3*sgn(F) + pi^3*b^3*c^3*e^4*x^3 - pi^3*b^4*c^4*d^4*log(a
bs(F)) - 3*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 + pi*b^4*c^4*d^4*log(abs(F))^3
- 3*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sg
n(F) + 3*pi^3*b^3*c^3*d*e^3*x^2 - 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 - 3*
pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 9*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F)
 + 3*pi^3*b^3*c^3*d^2*e^2*x - 9*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2 - pi^3*b
^3*c^3*d^3*e*sgn(F) + 3*pi*b^3*c^3*d^3*e*log(abs(F))^2*sgn(F) + pi^3*b^3*c^
3*d^3*e - 3*pi*b^3*c^3*d^3*e*log(abs(F))^2 - 6*pi*b^2*c^2*e^4*x^2*log(abs(F
))*sgn(F) + 6*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 12*pi*b^2*c^2*d*e^3*x*log(ab
s(F))*sgn(F) + 12*pi*b^2*c^2*d*e^3*x*log(abs(F)) - 6*pi*b^2*c^2*d^2*e^2*log
(abs(F))*sgn(F) + 6*pi*b^2*c^2*d^2*e^2*log(abs(F)) + 6*pi*b*c*e^4*x*sgn(F)
- 6*pi*b*c*e^4*x + 6*pi*b*c*d*e^3*sgn(F) - 6*pi*b*c*d*e^3)*(5*pi^4*b^5*c^5*
log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*
log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)/((pi
^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log
(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5
*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^
5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(a
bs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b
*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(
F))) - 8*I*((I*pi^4*b^4*c^4*e^4*x^4*sgn(F) - 4*pi^3*b^4*c^4*e^4*x^4*log(abs
(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*
e^4*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e^4*x^4 + 4*pi^3*b^4*c^4*e^4*
x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 - 4*pi*b^4*c^4*e^4
*x^4*log(abs(F))^3 - 2*I*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*I*pi^4*b^4*c^4*d
*e^3*x^3*sgn(F) - 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F))*sgn(F) - 24*I*pi^2*
b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) + 16*pi*b^4*c^4*d*e^3*x^3*log(abs(F)
)^3*sgn(F) - 4*I*pi^4*b^4*c^4*d*e^3*x^3 + 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs
(F)) + 24*I*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 - 16*pi*b^4*c^4*d*e^3*x^3*
log(abs(F))^3 - 8*I*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*I*pi^4*b^4*c^4*d^2*
e^2*x^2*sgn(F) - 24*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 36*I*pi^2
*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) + 24*pi*b^4*c^4*d^2*e^2*x^2*log(a
bs(F))^3*sgn(F) - 6*I*pi^4*b^4*c^4*d^2*e^2*x^2 + 24*pi^3*b^4*c^4*d^2*e^2*x^
2*log(abs(F)) + 36*I*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 - 24*pi*b^4*c^4
*d^2*e^2*x^2*log(abs(F))^3 - 12*I*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*I*p
i^4*b^4*c^4*d^3*e*x*sgn(F) - 16*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) - 2
4*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) + 16*pi*b^4*c^4*d^3*e*x*log(a
bs(F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d^3*e*x + 16*pi^3*b^4*c^4*d^3*e*x*log(ab
s(F)) + 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 - 16*pi*b^4*c^4*d^3*e*x*log
(abs(F))^3 - 8*I*b^4*c^4*d^3*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d^4*sgn(F)
+ 4*pi^3*b^3*c^3*e^4*x^3*sgn(F) - 4*pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) + 1
2*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d^4*log(abs(
F))^2*sgn(F) - 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*d^
4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*d^4 - 4*pi^3*b^3*c^3*e^4*x^3 + 4*pi
```

^3*b^4*c^4*d^4*log(abs(F)) - 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*I*pi
^2*b^4*c^4*d^4*log(abs(F))^2 + 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 - 4*pi*b
^4*c^4*d^4*log(abs(F))^3 + 8*I*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*I*b^4*c^4*
d^4*log(abs(F))^4 + 12*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 36*I*pi^2*b^3*c^3*d*
e^3*x^2*log(abs(F))*sgn(F) - 36*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F) -
12*pi^3*b^3*c^3*d*e^3*x^2 - 36*I*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) + 36*p
i*b^3*c^3*d*e^3*x^2*log(abs(F))^2 + 24*I*b^3*c^3*d*e^3*x^2*log(abs(F))^3 +
12*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*
sgn(F) - 36*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) - 12*pi^3*b^3*c^3*d^2
*e^2*x - 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)) + 36*pi*b^3*c^3*d^2*e^2*x*
log(abs(F))^2 + 24*I*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 4*pi^3*b^3*c^3*d^3*e
*sgn(F) + 12*I*pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) - 12*pi*b^3*c^3*d^3*e*
log(abs(F))^2*sgn(F) - 4*pi^3*b^3*c^3*d^3*e - 12*I*pi^2*b^3*c^3*d^3*e*log(a
bs(F)) + 12*pi*b^3*c^3*d^3*e*log(abs(F))^2 + 8*I*b^3*c^3*d^3*e*log(abs(F))^
3 - 12*I*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 24*pi*b^2*c^2*e^4*x^2*log(abs(F))*sg
n(F) + 12*I*pi^2*b^2*c^2*e^4*x^2 - 24*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 24*I
*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*I*pi^2*b^2*c^2*d*e^3*x*sgn(F) + 48*pi*b
^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*d*e^3*x - 48*pi*b^2*c
^2*d*e^3*x*log(abs(F)) - 48*I*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*I*pi^2*b^2
*c^2*d^2*e^2*sgn(F) + 24*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 12*I*pi^2*
b^2*c^2*d^2*e^2 - 24*pi*b^2*c^2*d^2*e^2*log(abs(F)) - 24*I*b^2*c^2*d^2*e^2*
log(abs(F))^2 - 24*pi*b*c*e^4*x*sgn(F) + 24*pi*b*c*e^4*x + 48*I*b*c*e^4*x*l
og(abs(F)) - 24*pi*b*c*d*e^3*sgn(F) + 24*pi*b*c*d*e^3 + 48*I*b*c*d*e^3*log(
abs(F)) - 48*I*e^4)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*
c*sgn(F) - 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(ab
s(F))*sgn(F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*l
og(abs(F))^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*
c^5 + 80*pi^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*
pi^2*b^5*c^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log
(abs(F))^5) - (I*pi^4*b^4*c^4*e^4*x^4*sgn(F) + 4*pi^3*b^4*c^4*e^4*x^4*log(a
bs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^
4*e^4*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e^4*x^4 - 4*pi^3*b^4*c^4*e^
4*x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 + 4*pi*b^4*c^4*e
^4*x^4*log(abs(F))^3 - 2*I*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*I*pi^4*b^4*c^4
*d*e^3*x^3*sgn(F) + 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F))*sgn(F) - 24*I*pi^
2*b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) - 16*pi*b^4*c^4*d*e^3*x^3*log(abs(
F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d*e^3*x^3 - 16*pi^3*b^4*c^4*d*e^3*x^3*log(a
bs(F)) + 24*I*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 + 16*pi*b^4*c^4*d*e^3*x^
3*log(abs(F))^3 - 8*I*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*I*pi^4*b^4*c^4*d^
2*e^2*x^2*sgn(F) + 24*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 36*I*pi
^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) - 24*pi*b^4*c^4*d^2*e^2*x^2*log
(abs(F))^3*sgn(F) - 6*I*pi^4*b^4*c^4*d^2*e^2*x^2 - 24*pi^3*b^4*c^4*d^2*e^2*
x^2*log(abs(F)) + 36*I*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 + 24*pi*b^4*c
^4*d^2*e^2*x^2*log(abs(F))^3 - 12*I*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*I
*pi^4*b^4*c^4*d^3*e*x*sgn(F) + 16*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) -

```
 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) - 16*pi*b^4*c^4*d^3*e*x*log
(abs(F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d^3*e*x - 16*pi^3*b^4*c^4*d^3*e*x*log(
abs(F)) + 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 + 16*pi*b^4*c^4*d^3*e*x*l
og(abs(F))^3 - 8*I*b^4*c^4*d^3*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d^4*sgn(F
) - 4*pi^3*b^3*c^3*e^4*x^3*sgn(F) + 4*pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) +
 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d^4*log(ab
s(F))^2*sgn(F) + 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*
d^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*d^4 + 4*pi^3*b^3*c^3*e^4*x^3 - 4*
pi^3*b^4*c^4*d^4*log(abs(F)) - 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*I*
pi^2*b^4*c^4*d^4*log(abs(F))^2 - 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 + 4*pi
*b^4*c^4*d^4*log(abs(F))^3 + 8*I*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*I*b^4*c^
4*d^4*log(abs(F))^4 - 12*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 36*I*pi^2*b^3*c^3*
d*e^3*x^2*log(abs(F))*sgn(F) + 36*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F)
 + 12*pi^3*b^3*c^3*d*e^3*x^2 - 36*I*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) - 36
*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 + 24*I*b^3*c^3*d*e^3*x^2*log(abs(F))^3
- 12*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)
)*sgn(F) + 36*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) + 12*pi^3*b^3*c^3*d
^2*e^2*x - 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)) - 36*pi*b^3*c^3*d^2*e^2*
x*log(abs(F))^2 + 24*I*b^3*c^3*d^2*e^2*x*log(abs(F))^3 - 4*pi^3*b^3*c^3*d^3
*e*sgn(F) + 12*I*pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) + 12*pi*b^3*c^3*d^3*
e*log(abs(F))^2*sgn(F) + 4*pi^3*b^3*c^3*d^3*e - 12*I*pi^2*b^3*c^3*d^3*e*log
(abs(F)) - 12*pi*b^3*c^3*d^3*e*log(abs(F))^2 + 8*I*b^3*c^3*d^3*e*log(abs(F)
)^3 - 12*I*pi^2*b^2*c^2*e^4*x^2*sgn(F) - 24*pi*b^2*c^2*e^4*x^2*log(abs(F))*
sgn(F) + 12*I*pi^2*b^2*c^2*e^4*x^2 + 24*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 24
*I*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*I*pi^2*b^2*c^2*d*e^3*x*sgn(F) - 48*pi
*b^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*d*e^3*x + 48*pi*b^2
*c^2*d*e^3*x*log(abs(F)) - 48*I*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*I*pi^2*b
^2*c^2*d^2*e^2*sgn(F) - 24*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 12*I*pi^
2*b^2*c^2*d^2*e^2 + 24*pi*b^2*c^2*d^2*e^2*log(abs(F)) - 24*I*b^2*c^2*d^2*e^
2*log(abs(F))^2 + 24*pi*b*c*e^4*x*sgn(F) - 24*pi*b*c*e^4*x + 48*I*b*c*e^4*x
*log(abs(F)) + 24*pi*b*c*d*e^3*sgn(F) - 24*pi*b*c*d*e^3 + 48*I*b*c*d*e^3*lo
g(abs(F)) - 48*I*e^4)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi
*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*lo
g(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c
^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) + 16*I*pi^5*
b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160*I*pi^3*b^5*c^5*log(abs(F))^2 -
160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5
*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 260, normalized size of antiderivative = 1.84

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

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 110

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

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

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 110, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2207, 2225}

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

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

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.16 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.11 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.50

method	result
gosper	$\frac{\left(e^{3}x^{3}c^{3}b^{3}\ln(F)^{3}+3\ln(F)^{3}b^{3}c^{3}d\,e^{2}x^{2}+3\ln(F)^{3}b^{3}c^{3}d^{2}ex+c^{3}b^{3}\ln(F)^{3}d^{3}-3\ln(F)^{2}b^{2}c^{2}e^{3}x^{2}-6\ln(F)^{2}b^{2}c^{2}d\,e^{2}x-3\ln(F)^{2}b^{2}c^{2}c}{c^{4}b^{4}\ln(F)^{4}}$
risch	$\frac{\left(e^{3}x^{3}c^{3}b^{3}\ln(F)^{3}+3\ln(F)^{3}b^{3}c^{3}d\,e^{2}x^{2}+3\ln(F)^{3}b^{3}c^{3}d^{2}ex+c^{3}b^{3}\ln(F)^{3}d^{3}-3\ln(F)^{2}b^{2}c^{2}e^{3}x^{2}-6\ln(F)^{2}b^{2}c^{2}d\,e^{2}x-3\ln(F)^{2}b^{2}c^{2}c}{c^{4}b^{4}\ln(F)^{4}}$
norman	$\frac{\left(c^{3}b^{3}\ln(F)^{3}d^{3}-3\ln(F)^{2}b^{2}c^{2}d^{2}e+6\ln(F)bcd\,e^{2}-6e^{3}\right)e^{c(bx+a)\ln(F)}}{c^{4}b^{4}\ln(F)^{4}}+\frac{e^{3}x^{3}e^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{3e\left(\ln(F)^{2}b^{2}c^{2}d^{2}-2\ln(F)bced-\right.}{c^{3}b^{3}\ln(F)^{3}}$
meijerg	$\frac{F^{ca}e^{3}\left(6-\frac{\left(-4b^{3}c^{3}x^{3}\ln(F)^{3}+12b^{2}c^{2}x^{2}\ln(F)^{2}-24bcx\ln(F)+24\right)e^{bcx\ln(F)}}{4}\right)}{c^{4}b^{4}\ln(F)^{4}}-\frac{3F^{ca}e^{2}d\left(2-\frac{\left(3b^{2}c^{2}x^{2}\ln(F)^{2}-6bcx\ln(F)+6\right)e^{bcx\ln(}}{3}\right.}{c^{3}b^{3}\ln(F)^{3}}$
parallelrisch	$\frac{x^{3}F^{c(bx+a)}e^{3}c^{3}b^{3}\ln(F)^{3}+3\ln(F)^{3}x^{2}F^{c(bx+a)}b^{3}c^{3}d\,e^{2}+3\ln(F)^{3}x\,F^{c(bx+a)}b^{3}c^{3}d^{2}e+\ln(F)^{3}F^{c(bx+a)}b^{3}c^{3}d^{3}-3\ln(F)^{2}x^{2}F^{c(bx}}{c^{4}b^{4}}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 147, normalized size of antiderivative = 1.34

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

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

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

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 231 vs. $2(107) = 214$.

Time = 0.10 (sec) , antiderivative size = 231, normalized size of antiderivative = 2.10

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

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

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

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 206, normalized size of antiderivative = 1.87

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.46 (sec) , antiderivative size = 4706, normalized size of antiderivative = 42.78

$$\int F^{c(a+bx)}(d+ex)^3\,dx = \text{Too large to display}$$

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

```
[Out] -(((3*pi^2*b^3*c^3*e^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e^3*x^3*log(
abs(F)) + 2*b^3*c^3*e^3*x^3*log(abs(F))^3 + 9*pi^2*b^3*c^3*d*e^2*x^2*log(ab
s(F))*sgn(F) - 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)) + 6*b^3*c^3*d*e^2*x^2*l
og(abs(F))^3 + 9*pi^2*b^3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*d
^2*e*x*log(abs(F)) + 6*b^3*c^3*d^2*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*d^3*l
og(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*d^3*log(abs(F)) + 2*b^3*c^3*d^3*log(abs(
F))^3 - 3*pi^2*b^2*c^2*e^3*x^2*sgn(F) + 3*pi^2*b^2*c^2*e^3*x^2 - 6*b^2*c^2*
e^3*x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 6*pi^2*b^2*c^2*d*e^
2*x - 12*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*pi^2*b^2*c^2*d^2*e*sgn(F) + 3*pi
^2*b^2*c^2*d^2*e - 6*b^2*c^2*d^2*e*log(abs(F))^2 + 12*b*c*e^3*x*log(abs(F))
 + 12*b*c*d*e^2*log(abs(F)) - 12*e^3)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4
*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4
*c^4*log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sg
n(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^
4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F
) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*c
^3*e^3*x^3*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^
3*e^3*x^3 + 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2 + 3*pi^3*b^3*c^3*d*e^2*x^2*s
gn(F) - 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*
x^2 + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F)
- 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d^2*e*x + 9*pi
*b^3*c^3*d^2*e*x*log(abs(F))^2 + pi^3*b^3*c^3*d^3*sgn(F) - 3*pi*b^3*c^3*d^3
*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 +
 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*e^3*x^2*log(abs(F))
 + 12*pi*b^2*c^2*d*e^2*x*log(abs(F))*sgn(F) - 12*pi*b^2*c^2*d*e^2*x*log(abs
(F)) + 6*pi*b^2*c^2*d^2*e*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*d^2*e*log(abs(F
)) - 6*pi*b*c*e^3*x*sgn(F) + 6*pi*b*c*e^3*x - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*
b*c*d*e^2)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(
F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sg
n(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*
log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*s
gn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4
*c^4*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*
c*sgn(F) + 1/2*pi*a*c) - ((pi^3*b^3*c^3*e^3*x^3*sgn(F) - 3*pi*b^3*c^3*e^3*x
^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e^3*x^3 + 3*pi*b^3*c^3*e^3*x^3*log(a
```

```
bs(F))^2 + 3*pi^3*b^3*c^3*d*e^2*x^2*sgn(F) - 9*pi*b^3*c^3*d*e^2*x^2*log(abs
(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F
))^2 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*s
gn(F) - 3*pi^3*b^3*c^3*d^2*e*x + 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2 + pi^3*
b^3*c^3*d^3*sgn(F) - 3*pi*b^3*c^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d
^3 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(
F) - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) + 12*pi*b^2*c^2*d*e^2*x*log(abs(F))*s
gn(F) - 12*pi*b^2*c^2*d*e^2*x*log(abs(F)) + 6*pi*b^2*c^2*d^2*e*log(abs(F))*
sgn(F) - 6*pi*b^2*c^2*d^2*e*log(abs(F)) - 6*pi*b*c*e^3*x*sgn(F) + 6*pi*b*c*
e^3*x - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*b*c*d*e^2)*(pi^4*b^4*c^4*sgn(F) - 6*pi
^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))
^2 - 2*b^4*c^4*log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(ab
s(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*lo
g(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F
))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(
3*pi^2*b^3*c^3*e^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e^3*x^3*log(abs(
F)) + 2*b^3*c^3*e^3*x^3*log(abs(F))^3 + 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)
)*sgn(F) - 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)) + 6*b^3*c^3*d*e^2*x^2*log(a
bs(F))^3 + 9*pi^2*b^3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*d^2*e
*x*log(abs(F)) + 6*b^3*c^3*d^2*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*d^3*log(a
bs(F))*sgn(F) - 3*pi^2*b^3*c^3*d^3*log(abs(F)) + 2*b^3*c^3*d^3*log(abs(F))^
3 - 3*pi^2*b^2*c^2*e^3*x^2*sgn(F) + 3*pi^2*b^2*c^2*e^3*x^2 - 6*b^2*c^2*e^3*
x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 6*pi^2*b^2*c^2*d*e^2*x
- 12*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*pi^2*b^2*c^2*d^2*e*sgn(F) + 3*pi^2*b
^2*c^2*d^2*e - 6*b^2*c^2*d^2*e*log(abs(F))^2 + 12*b*c*e^3*x*log(abs(F)) + 1
2*b*c*d*e^2*log(abs(F)) - 12*e^3)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4
*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F
))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^
4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^
3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c
^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1
/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*l
og(abs(F))) - 1/2*I*((pi^3*b^3*c^3*e^3*x^3*sgn(F) + 3*I*pi^2*b^3*c^3*e^3*x^
3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3
*c^3*e^3*x^3 - 3*I*pi^2*b^3*c^3*e^3*x^3*log(abs(F)) + 3*pi*b^3*c^3*e^3*x^3*
log(abs(F))^2 + 2*I*b^3*c^3*e^3*x^3*log(abs(F))^3 + 3*pi^3*b^3*c^3*d*e^2*x^
2*sgn(F) + 9*I*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d*e
^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 - 9*I*pi^2*b^3*c^3*d
*e^2*x^2*log(abs(F)) + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 + 6*I*b^3*c^3*d
*e^2*x^2*log(abs(F))^3 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) + 9*I*pi^2*b^3*c^3*d
^2*e*x*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F) - 3*p
i^3*b^3*c^3*d^2*e*x - 9*I*pi^2*b^3*c^3*d^2*e*x*log(abs(F)) + 9*pi*b^3*c^3*d
^2*e*x*log(abs(F))^2 + 6*I*b^3*c^3*d^2*e*x*log(abs(F))^3 + pi^3*b^3*c^3*d^3
*sgn(F) + 3*I*pi^2*b^3*c^3*d^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*d^3*log(ab
s(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 - 3*I*pi^2*b^3*c^3*d^3*log(abs(F)) + 3*pi
```

```
*b^3*c^3*d^3*log(abs(F))^2 + 2*I*b^3*c^3*d^3*log(abs(F))^3 - 3*I*pi^2*b^2*c
^2*e^3*x^2*sgn(F) + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) + 3*I*pi^2*b^2*
c^2*e^3*x^2 - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) - 6*I*b^2*c^2*e^3*x^2*log(ab
s(F))^2 - 6*I*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 12*pi*b^2*c^2*d*e^2*x*log(abs(F
))*sgn(F) + 6*I*pi^2*b^2*c^2*d*e^2*x - 12*pi*b^2*c^2*d*e^2*x*log(abs(F)) -
12*I*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*I*pi^2*b^2*c^2*d^2*e*sgn(F) + 6*pi*b
^2*c^2*d^2*e*log(abs(F))*sgn(F) + 3*I*pi^2*b^2*c^2*d^2*e - 6*pi*b^2*c^2*d^2
*e*log(abs(F)) - 6*I*b^2*c^2*d^2*e*log(abs(F))^2 - 6*pi*b*c*e^3*x*sgn(F) +
6*pi*b*c*e^3*x + 12*I*b*c*e^3*x*log(abs(F)) - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*
b*c*d*e^2 + 12*I*b*c*d*e^2*log(abs(F)) - 12*I*e^3)*e^(1/2*I*pi*b*c*x*sgn(F)
 - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(pi^4*b^4*c^4*sgn(F
) + 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(
F) - 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 - 4*I*pi^3*b^4*c^4*
log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 + 4*I*pi*b^4*c^4*log(abs(F))^3 -
 2*b^4*c^4*log(abs(F))^4) + (pi^3*b^3*c^3*e^3*x^3*sgn(F) - 3*I*pi^2*b^3*c^3
*e^3*x^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - p
i^3*b^3*c^3*e^3*x^3 + 3*I*pi^2*b^3*c^3*e^3*x^3*log(abs(F)) + 3*pi*b^3*c^3*e
^3*x^3*log(abs(F))^2 - 2*I*b^3*c^3*e^3*x^3*log(abs(F))^3 + 3*pi^3*b^3*c^3*d
*e^2*x^2*sgn(F) - 9*I*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F))*sgn(F) - 9*pi*b^3*
c^3*d*e^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 + 9*I*pi^2*b^
3*c^3*d*e^2*x^2*log(abs(F)) + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 - 6*I*b^
3*c^3*d*e^2*x^2*log(abs(F))^3 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) - 9*I*pi^2*b^
3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F
) - 3*pi^3*b^3*c^3*d^2*e*x + 9*I*pi^2*b^3*c^3*d^2*e*x*log(abs(F)) + 9*pi*b^
3*c^3*d^2*e*x*log(abs(F))^2 - 6*I*b^3*c^3*d^2*e*x*log(abs(F))^3 + pi^3*b^3*
c^3*d^3*sgn(F) - 3*I*pi^2*b^3*c^3*d^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*d^3
*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 + 3*I*pi^2*b^3*c^3*d^3*log(abs(F))
 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 - 2*I*b^3*c^3*d^3*log(abs(F))^3 + 3*I*pi^
2*b^2*c^2*e^3*x^2*sgn(F) + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) - 3*I*pi
^2*b^2*c^2*e^3*x^2 - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) + 6*I*b^2*c^2*e^3*x^2
*log(abs(F))^2 + 6*I*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 12*pi*b^2*c^2*d*e^2*x*lo
g(abs(F))*sgn(F) - 6*I*pi^2*b^2*c^2*d*e^2*x - 12*pi*b^2*c^2*d*e^2*x*log(abs
(F)) + 12*I*b^2*c^2*d*e^2*x*log(abs(F))^2 + 3*I*pi^2*b^2*c^2*d^2*e*sgn(F) +
 6*pi*b^2*c^2*d^2*e*log(abs(F))*sgn(F) - 3*I*pi^2*b^2*c^2*d^2*e - 6*pi*b^2*
c^2*d^2*e*log(abs(F)) + 6*I*b^2*c^2*d^2*e*log(abs(F))^2 - 6*pi*b*c*e^3*x*sg
n(F) + 6*pi*b*c*e^3*x - 12*I*b*c*e^3*x*log(abs(F)) - 6*pi*b*c*d*e^2*sgn(F)
+ 6*pi*b*c*d*e^2 - 12*I*b*c*d*e^2*log(abs(F)) + 12*I*e^3)*e^(-1/2*I*pi*b*c*
x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(pi^4*b^4*c
^4*sgn(F) - 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F)
)^2*sgn(F) + 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 + 4*I*pi^3*
b^4*c^4*log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 - 4*I*pi*b^4*c^4*log(abs
(F))^3 - 2*b^4*c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.50

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

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 79

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

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

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 79, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2207, 2225}

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

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

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.24 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.13 (sec) , antiderivative size = 91, normalized size of antiderivative = 1.15

method	result
gosper	$\frac{\left(e^2x^2c^2b^2\ln(F)^2+2\ln(F)^2b^2c^2dex+\ln(F)^2b^2c^2d^2-2\ln(F)bc\,e^2x-2\ln(F)bced+2e^2\right)F^{c(bx+a)}}{c^3b^3\ln(F)^3}$
risch	$\frac{\left(e^2x^2c^2b^2\ln(F)^2+2\ln(F)^2b^2c^2dex+\ln(F)^2b^2c^2d^2-2\ln(F)bc\,e^2x-2\ln(F)bced+2e^2\right)F^{c(bx+a)}}{c^3b^3\ln(F)^3}$
norman	$\frac{\left(\ln(F)^2b^2c^2d^2-2\ln(F)bced+2e^2\right)\mathrm{e}^{c(bx+a)\ln(F)}}{c^3b^3\ln(F)^3}+\frac{e^2x^2\mathrm{e}^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{2e(\ln(F)bcd-e)x\,\mathrm{e}^{c(bx+a)\ln(F)}}{c^2b^2\ln(F)^2}$
meijerg	$-\frac{F^{ca}e^2\left(2-\frac{\left(3b^2c^2x^2\ln(F)^2-6bcx\ln(F)+6\right)\mathrm{e}^{bcx\ln(F)}}{3}\right)}{c^3b^3\ln(F)^3}+\frac{2F^{ca}ed\left(1-\frac{(-2bcx\ln(F)+2)\mathrm{e}^{bcx\ln(F)}}{2}\right)}{c^2b^2\ln(F)^2}-\frac{F^{ca}d^2\left(1-\mathrm{e}^{bcx\ln(F)}\right)}{cb\ln(F)}$
parallelrisch	$\frac{x^2F^{c(bx+a)}e^2c^2b^2\ln(F)^2+2\ln(F)^2x\,F^{c(bx+a)}b^2c^2de+\ln(F)^2F^{c(bx+a)}b^2c^2d^2-2\ln(F)x\,F^{c(bx+a)}bc\,e^2-2\ln(F)F^{c(bx+a)}bcde-}{c^3b^3\ln(F)^3}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 84, normalized size of antiderivative = 1.06

$$\int F^{c(a+bx)}(d+ex)^2\,dx = \frac{\left((b^2c^2e^2x^2+2\,b^2c^2dex+b^2c^2d^2)\log\left(F\right)^2+2\,e^2-2\,(bce^2x+bcde)\log\left(F\right)\right)F^{bcx+ac}}{b^3c^3\log\left(F\right)^3}$$

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

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

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 133, normalized size of antiderivative = 1.68

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

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

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

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 123, normalized size of antiderivative = 1.56

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.35 (sec) , antiderivative size = 2214, normalized size of antiderivative = 28.03

$$\int F^{c(a+bx)}(d+ex)^2\,dx = \text{Too large to display}$$

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

```
[Out] -((2*(pi*b^2*c^2*e^2*x^2*log(abs(F))*sgn(F) - pi*b^2*c^2*e^2*x^2*log(abs(F)
) + 2*pi*b^2*c^2*d*e*x*log(abs(F))*sgn(F) - 2*pi*b^2*c^2*d*e*x*log(abs(F))
+ pi*b^2*c^2*d^2*log(abs(F))*sgn(F) - pi*b^2*c^2*d^2*log(abs(F)) - pi*b*c*e
^2*x*sgn(F) + pi*b*c*e^2*x - pi*b*c*d*e*sgn(F) + pi*b*c*d*e)*(pi^3*b^3*c^3*
sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3 + 3*pi*b^3*c^3*lo
g(abs(F))^2)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi
^3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sg
n(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2) - (pi^2*b^2
*c^2*e^2*x^2*sgn(F) - pi^2*b^2*c^2*e^2*x^2 + 2*b^2*c^2*e^2*x^2*log(abs(F))^
2 + 2*pi^2*b^2*c^2*d*e*x*sgn(F) - 2*pi^2*b^2*c^2*d*e*x + 4*b^2*c^2*d*e*x*lo
g(abs(F))^2 + pi^2*b^2*c^2*d^2*sgn(F) - pi^2*b^2*c^2*d^2 + 2*b^2*c^2*d^2*lo
g(abs(F))^2 - 4*b*c*e^2*x*log(abs(F)) - 4*b*c*d*e*log(abs(F)) + 4*e^2)*(3*p
i^2*b^3*c^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log
(abs(F))^3)/((pi^3*b^3*c^3*sgn(F) - 3*pi*b^3*c^3*log(abs(F))^2*sgn(F) - pi^
3*b^3*c^3 + 3*pi*b^3*c^3*log(abs(F))^2)^2 + (3*pi^2*b^3*c^3*log(abs(F))*sgn
(F) - 3*pi^2*b^3*c^3*log(abs(F)) + 2*b^3*c^3*log(abs(F))^3)^2))*cos(-1/2*pi
*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^2*b^2
*c^2*e^2*x^2*sgn(F) - pi^2*b^2*c^2*e^2*x^2 + 2*b^2*c^2*e^2*x^2*log(abs(F))^
```

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

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 91, normalized size of antiderivative = 1.15

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

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

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

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

Optimal result

Integrand size = 15, antiderivative size = 48

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

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

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2207, 2225}

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

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

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.14 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

method	result	size
gosper	$\frac{(\ln(F)bcex+\ln(F)bcd-e)F^{c(bx+a)}}{c^2b^2\ln(F)^2}$	38
risch	$\frac{(\ln(F)bcex+\ln(F)bcd-e)F^{c(bx+a)}}{c^2b^2\ln(F)^2}$	38
norman	$\frac{(\ln(F)bcd-e)\mathrm{e}^{c(bx+a)\ln(F)}}{c^2b^2\ln(F)^2}+\frac{ex\,\mathrm{e}^{c(bx+a)\ln(F)}}{cb\ln(F)}$	56
parallelrisch	$\frac{x\,F^{c(bx+a)}ecb\ln(F)+\ln(F)F^{c(bx+a)}bcd-F^{c(bx+a)}e}{c^2b^2\ln(F)^2}$	56
meijerg	$\frac{F^{ca}e\left(1-\frac{(-2bcx\ln(F)+2)\mathrm{e}^{bcx\ln(F)}}{2}\right)}{c^2b^2\ln(F)^2}-\frac{F^{ca}d(1-\mathrm{e}^{bcx\ln(F)})}{cb\ln(F)}$	68

```
[In] int(F^(c*(b*x+a))*(e*x+d),x,method=_RETURNVERBOSE)
[Out] (ln(F)*b*c*e*x+ln(F)*b*c*d-e)*F^(c*(b*x+a))/c^2/b^2/ln(F)^2
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

$$\int F^{c(a+bx)}(d+ex)\,dx = \frac{((bcex+bcd)\log(F)-e)F^{bcx+ac}}{b^2c^2\log(F)^2}$$

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

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 60, normalized size of antiderivative = 1.25

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

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

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 60, normalized size of antiderivative = 1.25

$$\int F^{c(a+bx)}(d+ex)\,dx = \frac{F^{bcx+ac}d}{bc\log(F)} + \frac{(F^{ac}bcx\log(F)-F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}$$

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.36 (sec) , antiderivative size = 898, normalized size of antiderivative = 18.71

$$\int F^{c(a+bx)}(d+ex)\,dx = \text{Too large to display}$$

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

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

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

$$\int F^{c(a+bx)}(d+ex)\,dx = \frac{F^{a\,c+b\,c\,x}\,\left(b\,c\,d\,\ln\left(F\right)-e+b\,c\,e\,x\,\ln\left(F\right)\right)}{b^2\,c^2\,\ln\left(F\right)^2}$$

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

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

Optimal result

Integrand size = 9, antiderivative size = 20

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

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

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2225}

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

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

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

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

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

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

method	result	size
gosper	$\frac{F^{c(bx+a)}}{bc\ln(F)}$	21
derivativedivides	$\frac{F^{c(bx+a)}}{bc\ln(F)}$	21
default	$\frac{F^{c(bx+a)}}{bc\ln(F)}$	21
risch	$\frac{F^{c(bx+a)}}{bc\ln(F)}$	21
parallelrisch	$\frac{F^{c(bx+a)}}{bc\ln(F)}$	21
norman	$\frac{e^{c(bx+a)\ln(F)}}{cb\ln(F)}$	22
meijerg	$-\frac{F^{ca}\left(1-e^{bcx\ln(F)}\right)}{cb\ln(F)}$	29

```
[In] int(F^(c*(b*x+a)),x,method=_RETURNVERBOSE)
[Out] F^(c*(b*x+a))/b/c/ln(F)
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

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

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

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

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

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

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

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

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

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

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

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

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}\,dx = \frac{F^{a\,c+b\,c\,x}}{b\,c\,\ln\left(F\right)}$$

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

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

Optimal result

Integrand size = 17, antiderivative size = 31

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

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

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2209}

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

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

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

Rule 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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.00

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

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

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

Maple [A] (verified)

Time = 0.11 (sec) , antiderivative size = 56, normalized size of antiderivative = 1.81

method	result	size
risch	$-\frac{F^{\frac{c(ae-bd)}{e}}\,\text{Ei}_1\left(-bcx\ln(F)-ca\ln(F)-\frac{-\ln(F)ace+\ln(F)bcd}{e}\right)}{e}$	56

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.26

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

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 57

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

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

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 57, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2208, 2209}

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

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

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

Rule 2208

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

```
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.30 (sec) , antiderivative size = 55, normalized size of antiderivative = 0.96

$$\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx = \frac{F^{ac}\left(-\frac{eF^{bcx}}{d+ex} + bcF^{-\frac{bcd}{e}}\,\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log(F)\right)}{e^2}$$

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

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

Maple [A] (verified)

Time = 0.09 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.74

method	result	size
risch	$-\frac{cb\ln(F)F^{bcx}F^{ca}}{e^2\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)} - \frac{cb\ln(F)F^{\frac{c(ae-bd)}{e}}\,\text{Ei}_1\left(-bcx\ln(F)-ca\ln(F)-\frac{-\ln(F)ace+\ln(F)bcd}{e}\right)}{e^2}$	99

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 77, normalized size of antiderivative = 1.35

$$\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx = -\frac{F^{bcx+ac}e - \frac{(bcex+bcd)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}}{e^3x+de^2}$$

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [F]

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

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

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

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^2}\,dx = \int \frac{F^{c\,(a+b\,x)}}{\left(d+e\,x\right)^2}\,dx$$

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

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

Optimal result

Integrand size = 17, antiderivative size = 95

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

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

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 95, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2208, 2209}

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

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

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

Rule 2208

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

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.24 (sec) , antiderivative size = 88, normalized size of antiderivative = 0.93

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

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

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

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 155, normalized size of antiderivative = 1.63

method	result
risch	$-\frac{c^2 b^2 \ln(F)^2 F^{bcx} F^{ca}}{2e^3 \left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^2}-\frac{c^2 b^2 \ln(F)^2 F^{bcx} F^{ca}}{2e^3 \left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-\frac{c^2 b^2 \ln(F)^2 F^{\frac{c(ae-bd)}{e}} \mathrm{Ei}_1\left(-bcx\ln(F)-ca\ln(F)-\frac{-\ln(F)ace+\ln(F)b}{e}\right.}{2e^3}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 134, normalized size of antiderivative = 1.41

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

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 128

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

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

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 128, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2208, 2209}

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

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

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

Rule 2208

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

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.77

$$\int\frac{F^{c(a+bx)}}{(d+ex)^4}\,dx = \frac{F^{ac}\left(b^3c^3F^{-\frac{bcd}{e}}\,\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^3(F)-\frac{eF^{bcx}\left(2e^2+bce(d+ex)\log(F)+b^2c^2(d+ex)^2\log^2(F)\right)}{(d+ex)^3}\right)}{6e^4}$$

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

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

Maple [A] (verified)

Time = 0.35 (sec) , antiderivative size = 199, normalized size of antiderivative = 1.55

method	result
risch	$-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{3e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^3}-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{6e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^2}-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{6e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-\frac{c^3b^3\ln(F)^3F^{\frac{c(ae-bd)}{e}}\mathrm{Ei}_1\left(-bcx\ln(\right.}{6e}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 209, normalized size of antiderivative = 1.63

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

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 17, antiderivative size = 161

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

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

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 161, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.118, Rules used = {2208, 2209}

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

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

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

Rule 2208

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

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.24 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.75

$$\int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx = \frac{F^{ac}\left(b^4c^4F^{-\frac{bcd}{e}}\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^4(F) - \frac{eF^{bcx}(6e^3+2bce^2(d+ex)\log(F)+b^2c^2e(d+ex)^2\log^2(F)+b^3c^3(d+ex}{(d+ex)^4}\right.}{24e^5}$$

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

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

Maple [A] (verified)

Time = 0.31 (sec) , antiderivative size = 243, normalized size of antiderivative = 1.51

method	result
risch	$-\frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{4e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^4}-\frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{12e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^3}-\frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{24e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^2}-\frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{24e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 300, normalized size of antiderivative = 1.86

$$\int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx = \frac{\frac{(b^4c^4e^4x^4+4\,b^4c^4de^3x^3+6\,b^4c^4d^2e^2x^2+4\,b^4c^4d^3ex+b^4c^4d^4)\,\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^4}{F^{\frac{bcd-ace}{e}}} - \left(6\,e^4+(b^3c^3e^4x^3+3\,b^3c^3de^3x^2+3\,b^3\right.}{24\,(e^9x^4+4\,de^8x^3+6}$$

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^5}\,dx = \int \frac{F^{c\,(a+b\,x)}}{\left(d+e\,x\right)^5}\,dx$$

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

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

Optimal result

Integrand size = 48, antiderivative size = 141

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

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

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 141, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.062, Rules used = {2218, 2207, 2225}

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

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

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

Rule 2207

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

Rule 2218

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

Rule 2225

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

Rubi steps

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

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

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 100, normalized size of antiderivative = 0.71

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

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

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

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 260, normalized size of antiderivative = 1.84

method	result
gosper	$\frac{\left(e^4x^4c^4b^4\ln(F)^4+4\ln(F)^4b^4c^4de^3x^3+6\ln(F)^4b^4c^4d^2e^2x^2+4\ln(F)^4b^4c^4d^3ex+\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3e^4x^3-12\ln(F)^3\right.}{}$
risch	$\frac{\left(e^4x^4c^4b^4\ln(F)^4+4\ln(F)^4b^4c^4de^3x^3+6\ln(F)^4b^4c^4d^2e^2x^2+4\ln(F)^4b^4c^4d^3ex+\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3e^4x^3-12\ln(F)^3\right.}{}$
norman	$\frac{\left(\ln(F)^4b^4c^4d^4-4\ln(F)^3b^3c^3d^3e+12c^2b^2\ln(F)^2d^2e^2-24de^3cb\ln(F)+24e^4\right)e^{c(bx+a)\ln(F)}}{c^5b^5\ln(F)^5}+\frac{e^4x^4e^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{4e\left(c^3b\right.}{}$
meijerg	$-\frac{F^{ca}e^4\left(24-\frac{\left(5b^4c^4x^4\ln(F)^4-20b^3c^3x^3\ln(F)^3+60b^2c^2x^2\ln(F)^2-120bcx\ln(F)+120\right)e^{bcx\ln(F)}}{5}\right)}{c^5b^5\ln(F)^5}+\frac{4F^{ca}e^3d\left(6-\frac{\left(-4b^3c^3x^3\ln(F\right.}{}\right.}{}$
parallelrisch	$\frac{x^4F^{c(bx+a)}e^4c^4b^4\ln(F)^4+4\ln(F)^4x^3F^{c(bx+a)}b^4c^4de^3+6\ln(F)^4x^2F^{c(bx+a)}b^4c^4d^2e^2+4\ln(F)^4xF^{c(bx+a)}b^4c^4d^3e+\ln(F)^4F}{}$

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

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

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

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 227, normalized size of antiderivative = 1.61

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

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

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

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 350 vs. 2(139) = 278.

Time = 0.11 (sec) , antiderivative size = 350, normalized size of antiderivative = 2.48

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

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

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

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 309 vs. $2(141) = 282$.

Time = 0.21 (sec) , antiderivative size = 309, normalized size of antiderivative = 2.19

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.60 (sec) , antiderivative size = 8802, normalized size of antiderivative = 62.43

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)\,dx=\text{Too large to display}$$

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

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

```
 - 6*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^3*sgn(F) - 6*pi^3*b^4*c^4*d^2*e^2*x
^2*log(abs(F)) + 6*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^3 + 4*pi^3*b^4*c^4*d^
3*e*x*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*d^3*e*x*log(abs(F))^3*sgn(F) - 4*pi
^3*b^4*c^4*d^3*e*x*log(abs(F)) + 4*pi*b^4*c^4*d^3*e*x*log(abs(F))^3 - pi^3*
b^3*c^3*e^4*x^3*sgn(F) + pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) + 3*pi*b^3*c^3
*e^4*x^3*log(abs(F))^2*sgn(F) - pi*b^4*c^4*d^4*log(abs(F))^3*sgn(F) + pi^3*
b^3*c^3*e^4*x^3 - pi^3*b^4*c^4*d^4*log(abs(F)) - 3*pi*b^3*c^3*e^4*x^3*log(a
bs(F))^2 + pi*b^4*c^4*d^4*log(abs(F))^3 - 3*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) +
 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*d*e^3*x^2 - 9
*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 - 3*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 9*p
i*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*d^2*e^2*x - 9*pi*
b^3*c^3*d^2*e^2*x*log(abs(F))^2 - pi^3*b^3*c^3*d^3*e*sgn(F) + 3*pi*b^3*c^3*
d^3*e*log(abs(F))^2*sgn(F) + pi^3*b^3*c^3*d^3*e - 3*pi*b^3*c^3*d^3*e*log(ab
s(F))^2 - 6*pi*b^2*c^2*e^4*x^2*log(abs(F))*sgn(F) + 6*pi*b^2*c^2*e^4*x^2*lo
g(abs(F)) - 12*pi*b^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 12*pi*b^2*c^2*d*e^3*
x*log(abs(F)) - 6*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 6*pi*b^2*c^2*d^2*
e^2*log(abs(F)) + 6*pi*b*c*e^4*x*sgn(F) - 6*pi*b*c*e^4*x + 6*pi*b*c*d*e^3*s
gn(F) - 6*pi*b*c*d*e^3)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^
2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c
^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*p
i^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5
*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 +
(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) -
 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log
(abs(F))^5)^2) - (pi^4*b^4*c^4*e^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*e^4*x^4*log(
abs(F))^2*sgn(F) - pi^4*b^4*c^4*e^4*x^4 + 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F)
)^2 - 2*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*pi^4*b^4*c^4*d*e^3*x^3*sgn(F) - 2
4*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d*e^3*x^3 +
24*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 - 8*b^4*c^4*d*e^3*x^3*log(abs(F))^4
 + 6*pi^4*b^4*c^4*d^2*e^2*x^2*sgn(F) - 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(
F))^2*sgn(F) - 6*pi^4*b^4*c^4*d^2*e^2*x^2 + 36*pi^2*b^4*c^4*d^2*e^2*x^2*log
(abs(F))^2 - 12*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*pi^4*b^4*c^4*d^3*e*x*
sgn(F) - 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d^3*
e*x + 24*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 - 8*b^4*c^4*d^3*e*x*log(abs(F))
^4 + pi^4*b^4*c^4*d^4*sgn(F) + 12*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) -
 6*pi^2*b^4*c^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*d^4 - 12*pi^2*b^3*c
^3*e^4*x^3*log(abs(F)) + 6*pi^2*b^4*c^4*d^4*log(abs(F))^2 + 8*b^3*c^3*e^4*x
^3*log(abs(F))^3 - 2*b^4*c^4*d^4*log(abs(F))^4 + 36*pi^2*b^3*c^3*d*e^3*x^2*
log(abs(F))*sgn(F) - 36*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) + 24*b^3*c^3*d*e
^3*x^2*log(abs(F))^3 + 36*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*sgn(F) - 36*pi
^2*b^3*c^3*d^2*e^2*x*log(abs(F)) + 24*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 12*
pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) - 12*pi^2*b^3*c^3*d^3*e*log(abs(F)) +
 8*b^3*c^3*d^3*e*log(abs(F))^3 - 12*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 12*pi^2*b
^2*c^2*e^4*x^2 - 24*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*pi^2*b^2*c^2*d*e^3*x
*sgn(F) + 24*pi^2*b^2*c^2*d*e^3*x - 48*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*p
```

```
i^2*b^2*c^2*d^2*e^2*sgn(F) + 12*pi^2*b^2*c^2*d^2*e^2 - 24*b^2*c^2*d^2*e^2*l
og(abs(F))^2 + 48*b*c*e^4*x*log(abs(F)) + 48*b*c*d*e^3*log(abs(F)) - 48*e^4
)*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F)
 - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*l
og(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F)
+ 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(ab
s(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F
) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*
pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*c*x
*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((pi^4*b^4*c^4*e
^4*x^4*sgn(F) - 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*
e^4*x^4 + 6*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 - 2*b^4*c^4*e^4*x^4*log(abs(
F))^4 + 4*pi^4*b^4*c^4*d*e^3*x^3*sgn(F) - 24*pi^2*b^4*c^4*d*e^3*x^3*log(abs
(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d*e^3*x^3 + 24*pi^2*b^4*c^4*d*e^3*x^3*log(ab
s(F))^2 - 8*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*pi^4*b^4*c^4*d^2*e^2*x^2*sg
n(F) - 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) - 6*pi^4*b^4*c^4*d^
2*e^2*x^2 + 36*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 - 12*b^4*c^4*d^2*e^2*
x^2*log(abs(F))^4 + 4*pi^4*b^4*c^4*d^3*e*x*sgn(F) - 24*pi^2*b^4*c^4*d^3*e*x
*log(abs(F))^2*sgn(F) - 4*pi^4*b^4*c^4*d^3*e*x + 24*pi^2*b^4*c^4*d^3*e*x*lo
g(abs(F))^2 - 8*b^4*c^4*d^3*e*x*log(abs(F))^4 + pi^4*b^4*c^4*d^4*sgn(F) + 1
2*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*d^4*log(abs(F))^
2*sgn(F) - pi^4*b^4*c^4*d^4 - 12*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*pi^2*
b^4*c^4*d^4*log(abs(F))^2 + 8*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*b^4*c^4*d^4
*log(abs(F))^4 + 36*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F))*sgn(F) - 36*pi^2*b^3
*c^3*d*e^3*x^2*log(abs(F)) + 24*b^3*c^3*d*e^3*x^2*log(abs(F))^3 + 36*pi^2*b
^3*c^3*d^2*e^2*x*log(abs(F))*sgn(F) - 36*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))
 + 24*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 12*pi^2*b^3*c^3*d^3*e*log(abs(F))*s
gn(F) - 12*pi^2*b^3*c^3*d^3*e*log(abs(F)) + 8*b^3*c^3*d^3*e*log(abs(F))^3 -
 12*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 12*pi^2*b^2*c^2*e^4*x^2 - 24*b^2*c^2*e^4*
x^2*log(abs(F))^2 - 24*pi^2*b^2*c^2*d*e^3*x*sgn(F) + 24*pi^2*b^2*c^2*d*e^3*
x - 48*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*pi^2*b^2*c^2*d^2*e^2*sgn(F) + 12*
pi^2*b^2*c^2*d^2*e^2 - 24*b^2*c^2*d^2*e^2*log(abs(F))^2 + 48*b*c*e^4*x*log(
abs(F)) + 48*b*c*d*e^3*log(abs(F)) - 48*e^4)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3
*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^
5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*
b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(ab
s(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^
5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*l
og(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(
F))^3 - 2*b^5*c^5*log(abs(F))^5)^2) + 4*(pi^3*b^4*c^4*e^4*x^4*log(abs(F))*s
gn(F) - pi*b^4*c^4*e^4*x^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*e^4*x^4*log(
abs(F)) + pi*b^4*c^4*e^4*x^4*log(abs(F))^3 + 4*pi^3*b^4*c^4*d*e^3*x^3*log(a
bs(F))*sgn(F) - 4*pi*b^4*c^4*d*e^3*x^3*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^
4*d*e^3*x^3*log(abs(F)) + 4*pi*b^4*c^4*d*e^3*x^3*log(abs(F))^3 + 6*pi^3*b^4
*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^
```

3*sgn(F) - 6*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F)) + 6*pi*b^4*c^4*d^2*e^2*x^
2*log(abs(F))^3 + 4*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*
d^3*e*x*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*d^3*e*x*log(abs(F)) + 4*pi*b^
4*c^4*d^3*e*x*log(abs(F))^3 - pi^3*b^3*c^3*e^4*x^3*sgn(F) + pi^3*b^4*c^4*d^
4*log(abs(F))*sgn(F) + 3*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) - pi*b^4*c
^4*d^4*log(abs(F))^3*sgn(F) + pi^3*b^3*c^3*e^4*x^3 - pi^3*b^4*c^4*d^4*log(a
bs(F)) - 3*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 + pi*b^4*c^4*d^4*log(abs(F))^3
- 3*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sg
n(F) + 3*pi^3*b^3*c^3*d*e^3*x^2 - 9*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 - 3*
pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 9*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F)
 + 3*pi^3*b^3*c^3*d^2*e^2*x - 9*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2 - pi^3*b
^3*c^3*d^3*e*sgn(F) + 3*pi*b^3*c^3*d^3*e*log(abs(F))^2*sgn(F) + pi^3*b^3*c^
3*d^3*e - 3*pi*b^3*c^3*d^3*e*log(abs(F))^2 - 6*pi*b^2*c^2*e^4*x^2*log(abs(F
))*sgn(F) + 6*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 12*pi*b^2*c^2*d*e^3*x*log(ab
s(F))*sgn(F) + 12*pi*b^2*c^2*d*e^3*x*log(abs(F)) - 6*pi*b^2*c^2*d^2*e^2*log
(abs(F))*sgn(F) + 6*pi*b^2*c^2*d^2*e^2*log(abs(F)) + 6*pi*b*c*e^4*x*sgn(F)
- 6*pi*b*c*e^4*x + 6*pi*b*c*d*e^3*sgn(F) - 6*pi*b*c*d*e^3)*(5*pi^4*b^5*c^5*
log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*
log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)/((pi
^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log
(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5
*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^
5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(a
bs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b
*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(
F))) - 8*I*((I*pi^4*b^4*c^4*e^4*x^4*sgn(F) - 4*pi^3*b^4*c^4*e^4*x^4*log(abs
(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*
e^4*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e^4*x^4 + 4*pi^3*b^4*c^4*e^4*
x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 - 4*pi*b^4*c^4*e^4
*x^4*log(abs(F))^3 - 2*I*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*I*pi^4*b^4*c^4*d
*e^3*x^3*sgn(F) - 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F))*sgn(F) - 24*I*pi^2*
b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) + 16*pi*b^4*c^4*d*e^3*x^3*log(abs(F)
)^3*sgn(F) - 4*I*pi^4*b^4*c^4*d*e^3*x^3 + 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs
(F)) + 24*I*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 - 16*pi*b^4*c^4*d*e^3*x^3*
log(abs(F))^3 - 8*I*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*I*pi^4*b^4*c^4*d^2*
e^2*x^2*sgn(F) - 24*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 36*I*pi^2
*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) + 24*pi*b^4*c^4*d^2*e^2*x^2*log(a
bs(F))^3*sgn(F) - 6*I*pi^4*b^4*c^4*d^2*e^2*x^2 + 24*pi^3*b^4*c^4*d^2*e^2*x^
2*log(abs(F)) + 36*I*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 - 24*pi*b^4*c^4
*d^2*e^2*x^2*log(abs(F))^3 - 12*I*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*I*p
i^4*b^4*c^4*d^3*e*x*sgn(F) - 16*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) - 2
4*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) + 16*pi*b^4*c^4*d^3*e*x*log(a
bs(F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d^3*e*x + 16*pi^3*b^4*c^4*d^3*e*x*log(ab
s(F)) + 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 - 16*pi*b^4*c^4*d^3*e*x*log
(abs(F))^3 - 8*I*b^4*c^4*d^3*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d^4*sgn(F)

+ 4*pi^3*b^3*c^3*e^4*x^3*sgn(F) - 4*pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) + 1
2*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d^4*log(abs(
F))^2*sgn(F) - 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*d^
4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*d^4 - 4*pi^3*b^3*c^3*e^4*x^3 + 4*pi
^3*b^4*c^4*d^4*log(abs(F)) - 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*I*pi
^2*b^4*c^4*d^4*log(abs(F))^2 + 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 - 4*pi*b
^4*c^4*d^4*log(abs(F))^3 + 8*I*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*I*b^4*c^4*
d^4*log(abs(F))^4 + 12*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 36*I*pi^2*b^3*c^3*d*
e^3*x^2*log(abs(F))*sgn(F) - 36*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F) -
 12*pi^3*b^3*c^3*d*e^3*x^2 - 36*I*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) + 36*p
i*b^3*c^3*d*e^3*x^2*log(abs(F))^2 + 24*I*b^3*c^3*d*e^3*x^2*log(abs(F))^3 +
12*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*
sgn(F) - 36*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) - 12*pi^3*b^3*c^3*d^2
*e^2*x - 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)) + 36*pi*b^3*c^3*d^2*e^2*x*
log(abs(F))^2 + 24*I*b^3*c^3*d^2*e^2*x*log(abs(F))^3 + 4*pi^3*b^3*c^3*d^3*e
*sgn(F) + 12*I*pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) - 12*pi*b^3*c^3*d^3*e*
log(abs(F))^2*sgn(F) - 4*pi^3*b^3*c^3*d^3*e - 12*I*pi^2*b^3*c^3*d^3*e*log(a
bs(F)) + 12*pi*b^3*c^3*d^3*e*log(abs(F))^2 + 8*I*b^3*c^3*d^3*e*log(abs(F))^
3 - 12*I*pi^2*b^2*c^2*e^4*x^2*sgn(F) + 24*pi*b^2*c^2*e^4*x^2*log(abs(F))*sg
n(F) + 12*I*pi^2*b^2*c^2*e^4*x^2 - 24*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 24*I
*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*I*pi^2*b^2*c^2*d*e^3*x*sgn(F) + 48*pi*b
^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*d*e^3*x - 48*pi*b^2*c
^2*d*e^3*x*log(abs(F)) - 48*I*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*I*pi^2*b^2
*c^2*d^2*e^2*sgn(F) + 24*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 12*I*pi^2*
b^2*c^2*d^2*e^2 - 24*pi*b^2*c^2*d^2*e^2*log(abs(F)) - 24*I*b^2*c^2*d^2*e^2*
log(abs(F))^2 - 24*pi*b*c*e^4*x*sgn(F) + 24*pi*b*c*e^4*x + 48*I*b*c*e^4*x*l
og(abs(F)) - 24*pi*b*c*d*e^3*sgn(F) + 24*pi*b*c*d*e^3 + 48*I*b*c*d*e^3*log(
abs(F)) - 48*I*e^4)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*
c*sgn(F) - 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(ab
s(F))*sgn(F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*l
og(abs(F))^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*
c^5 + 80*pi^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*
pi^2*b^5*c^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log
(abs(F))^5) - (I*pi^4*b^4*c^4*e^4*x^4*sgn(F) + 4*pi^3*b^4*c^4*e^4*x^4*log(a
bs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^
4*e^4*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e^4*x^4 - 4*pi^3*b^4*c^4*e^
4*x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*e^4*x^4*log(abs(F))^2 + 4*pi*b^4*c^4*e
^4*x^4*log(abs(F))^3 - 2*I*b^4*c^4*e^4*x^4*log(abs(F))^4 + 4*I*pi^4*b^4*c^4
*d*e^3*x^3*sgn(F) + 16*pi^3*b^4*c^4*d*e^3*x^3*log(abs(F))*sgn(F) - 24*I*pi^
2*b^4*c^4*d*e^3*x^3*log(abs(F))^2*sgn(F) - 16*pi*b^4*c^4*d*e^3*x^3*log(abs(
F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d*e^3*x^3 - 16*pi^3*b^4*c^4*d*e^3*x^3*log(a
bs(F)) + 24*I*pi^2*b^4*c^4*d*e^3*x^3*log(abs(F))^2 + 16*pi*b^4*c^4*d*e^3*x^
3*log(abs(F))^3 - 8*I*b^4*c^4*d*e^3*x^3*log(abs(F))^4 + 6*I*pi^4*b^4*c^4*d^
2*e^2*x^2*sgn(F) + 24*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F))*sgn(F) - 36*I*pi
^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2*sgn(F) - 24*pi*b^4*c^4*d^2*e^2*x^2*log

(abs(F))^3*sgn(F) - 6*I*pi^4*b^4*c^4*d^2*e^2*x^2 - 24*pi^3*b^4*c^4*d^2*e^2*x^2*log(abs(F)) + 36*I*pi^2*b^4*c^4*d^2*e^2*x^2*log(abs(F))^2 + 24*pi*b^4*c^4*d^2*e^2*x^2*log(abs(F))^3 - 12*I*b^4*c^4*d^2*e^2*x^2*log(abs(F))^4 + 4*I*pi^4*b^4*c^4*d^3*e*x*sgn(F) + 16*pi^3*b^4*c^4*d^3*e*x*log(abs(F))*sgn(F) - 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2*sgn(F) - 16*pi*b^4*c^4*d^3*e*x*log(abs(F))^3*sgn(F) - 4*I*pi^4*b^4*c^4*d^3*e*x - 16*pi^3*b^4*c^4*d^3*e*x*log(abs(F)) + 24*I*pi^2*b^4*c^4*d^3*e*x*log(abs(F))^2 + 16*pi*b^4*c^4*d^3*e*x*log(abs(F))^3 - 8*I*b^4*c^4*d^3*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d^4*sgn(F) - 4*pi^3*b^3*c^3*e^4*x^3*sgn(F) + 4*pi^3*b^4*c^4*d^4*log(abs(F))*sgn(F) + 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d^4*log(abs(F))^2*sgn(F) + 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*d^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*d^4 + 4*pi^3*b^3*c^3*e^4*x^3 - 4*pi^3*b^4*c^4*d^4*log(abs(F)) - 12*I*pi^2*b^3*c^3*e^4*x^3*log(abs(F)) + 6*I*pi^2*b^4*c^4*d^4*log(abs(F))^2 - 12*pi*b^3*c^3*e^4*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*d^4*log(abs(F))^3 + 8*I*b^3*c^3*e^4*x^3*log(abs(F))^3 - 2*I*b^4*c^4*d^4*log(abs(F))^4 - 12*pi^3*b^3*c^3*d*e^3*x^2*sgn(F) + 36*I*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F))*sgn(F) + 36*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2*sgn(F) + 12*pi^3*b^3*c^3*d*e^3*x^2 - 36*I*pi^2*b^3*c^3*d*e^3*x^2*log(abs(F)) - 36*pi*b^3*c^3*d*e^3*x^2*log(abs(F))^2 + 24*I*b^3*c^3*d*e^3*x^2*log(abs(F))^3 - 12*pi^3*b^3*c^3*d^2*e^2*x*sgn(F) + 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F))*sgn(F) + 36*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2*sgn(F) + 12*pi^3*b^3*c^3*d^2*e^2*x - 36*I*pi^2*b^3*c^3*d^2*e^2*x*log(abs(F)) - 36*pi*b^3*c^3*d^2*e^2*x*log(abs(F))^2 + 24*I*b^3*c^3*d^2*e^2*x*log(abs(F))^3 - 4*pi^3*b^3*c^3*d^3*e*sgn(F) + 12*I*pi^2*b^3*c^3*d^3*e*log(abs(F))*sgn(F) + 12*pi*b^3*c^3*d^3*e*log(abs(F))^2*sgn(F) + 4*pi^3*b^3*c^3*d^3*e - 12*I*pi^2*b^3*c^3*d^3*e*log(abs(F)) - 12*pi*b^3*c^3*d^3*e*log(abs(F))^2 + 8*I*b^3*c^3*d^3*e*log(abs(F))^3 - 12*I*pi^2*b^2*c^2*e^4*x^2*sgn(F) - 24*pi*b^2*c^2*e^4*x^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*c^2*e^4*x^2 + 24*pi*b^2*c^2*e^4*x^2*log(abs(F)) - 24*I*b^2*c^2*e^4*x^2*log(abs(F))^2 - 24*I*pi^2*b^2*c^2*d*e^3*x*sgn(F) - 48*pi*b^2*c^2*d*e^3*x*log(abs(F))*sgn(F) + 24*I*pi^2*b^2*c^2*d*e^3*x + 48*pi*b^2*c^2*d*e^3*x*log(abs(F)) - 48*I*b^2*c^2*d*e^3*x*log(abs(F))^2 - 12*I*pi^2*b^2*c^2*d^2*e^2*sgn(F) - 24*pi*b^2*c^2*d^2*e^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*c^2*d^2*e^2 + 24*pi*b^2*c^2*d^2*e^2*log(abs(F)) - 24*I*b^2*c^2*d^2*e^2*log(abs(F))^2 + 24*pi*b*c*e^4*x*sgn(F) - 24*pi*b*c*e^4*x + 48*I*b*c*e^4*x*log(abs(F)) + 24*pi*b*c*d*e^3*sgn(F) - 24*pi*b*c*d*e^3 + 48*I*b*c*d*e^3*log(abs(F)) - 48*I*e^4)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) + 16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 260, normalized size of antiderivative = 1.84

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

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

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

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

Optimal result

Integrand size = 37, antiderivative size = 110

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

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

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 110, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.081, Rules used = {2218, 2207, 2225}

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

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

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

Rule 2207

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

Rule 2218

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.50

method	result
gosper	$\frac{\left(e^3x^3c^3b^3\ln(F)^3+3\ln(F)^3b^3c^3d\,e^2x^2+3\ln(F)^3b^3c^3d^2ex+c^3b^3\ln(F)^3d^3-3\ln(F)^2b^2c^2e^3x^2-6\ln(F)^2b^2c^2d\,e^2x-3\ln(F)^2b^2c^2c}{c^4b^4\ln(F)^4}$
risch	$\frac{\left(e^3x^3c^3b^3\ln(F)^3+3\ln(F)^3b^3c^3d\,e^2x^2+3\ln(F)^3b^3c^3d^2ex+c^3b^3\ln(F)^3d^3-3\ln(F)^2b^2c^2e^3x^2-6\ln(F)^2b^2c^2d\,e^2x-3\ln(F)^2b^2c^2c}{c^4b^4\ln(F)^4}$
norman	$\frac{\left(c^3b^3\ln(F)^3d^3-3\ln(F)^2b^2c^2d^2e+6\ln(F)bcd\,e^2-6e^3\right)\mathrm{e}^{c(bx+a)\ln(F)}}{c^4b^4\ln(F)^4}+\frac{e^3x^3\mathrm{e}^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{3e\left(\ln(F)^2b^2c^2d^2-2\ln(F)bced-\right.}{c^3b^3\ln(F)^3}$
meijerg	$\frac{F^{ca}e^3\left(6-\frac{\left(-4b^3c^3x^3\ln(F)^3+12b^2c^2x^2\ln(F)^2-24bcx\ln(F)+24\right)\mathrm{e}^{bcx\ln(F)}}{4}\right)}{c^4b^4\ln(F)^4}-\frac{3F^{ca}e^2d\left(2-\frac{\left(3b^2c^2x^2\ln(F)^2-6bcx\ln(F)+6\right)\mathrm{e}^{bcx\ln(}}{3}\right.}{c^3b^3\ln(F)^3}$
parallelrisch	$\frac{x^3F^{c(bx+a)}e^3c^3b^3\ln(F)^3+3\ln(F)^3x^2F^{c(bx+a)}b^3c^3d\,e^2+3\ln(F)^3x\,F^{c(bx+a)}b^3c^3d^2e+\ln(F)^3F^{c(bx+a)}b^3c^3d^3-3\ln(F)^2x^2F^{c(bx-}}{c^4b^4}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 147, normalized size of antiderivative = 1.34

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

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

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

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 231 vs. $2(107) = 214$.

Time = 0.10 (sec) , antiderivative size = 231, normalized size of antiderivative = 2.10

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

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

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

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 206, normalized size of antiderivative = 1.87

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.41 (sec) , antiderivative size = 4706, normalized size of antiderivative = 42.78

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)\,dx=\text{Too large to display}$$

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

```
[Out] -(((3*pi^2*b^3*c^3*e^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e^3*x^3*log(
abs(F)) + 2*b^3*c^3*e^3*x^3*log(abs(F))^3 + 9*pi^2*b^3*c^3*d*e^2*x^2*log(ab
s(F))*sgn(F) - 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)) + 6*b^3*c^3*d*e^2*x^2*l
og(abs(F))^3 + 9*pi^2*b^3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*d
^2*e*x*log(abs(F)) + 6*b^3*c^3*d^2*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*d^3*l
og(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*d^3*log(abs(F)) + 2*b^3*c^3*d^3*log(abs(
F))^3 - 3*pi^2*b^2*c^2*e^3*x^2*sgn(F) + 3*pi^2*b^2*c^2*e^3*x^2 - 6*b^2*c^2*
e^3*x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 6*pi^2*b^2*c^2*d*e^
2*x - 12*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*pi^2*b^2*c^2*d^2*e*sgn(F) + 3*pi
^2*b^2*c^2*d^2*e - 6*b^2*c^2*d^2*e*log(abs(F))^2 + 12*b*c*e^3*x*log(abs(F))
 + 12*b*c*d*e^2*log(abs(F)) - 12*e^3)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4
*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4
*c^4*log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sg
n(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^
4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F
) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*c
^3*e^3*x^3*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^
3*e^3*x^3 + 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2 + 3*pi^3*b^3*c^3*d*e^2*x^2*s
gn(F) - 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*
x^2 + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F)
- 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d^2*e*x + 9*pi
*b^3*c^3*d^2*e*x*log(abs(F))^2 + pi^3*b^3*c^3*d^3*sgn(F) - 3*pi*b^3*c^3*d^3
*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 +
 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*e^3*x^2*log(abs(F))
 + 12*pi*b^2*c^2*d*e^2*x*log(abs(F))*sgn(F) - 12*pi*b^2*c^2*d*e^2*x*log(abs
(F)) + 6*pi*b^2*c^2*d^2*e*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*d^2*e*log(abs(F
)) - 6*pi*b*c*e^3*x*sgn(F) + 6*pi*b*c*e^3*x - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*
b*c*d*e^2)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(
F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sg
n(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*
log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*s
gn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4
*c^4*log(abs(F))^3)^2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*
c*sgn(F) + 1/2*pi*a*c) - ((pi^3*b^3*c^3*e^3*x^3*sgn(F) - 3*pi*b^3*c^3*e^3*x
```

```
^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e^3*x^3 + 3*pi*b^3*c^3*e^3*x^3*log(a
bs(F))^2 + 3*pi^3*b^3*c^3*d*e^2*x^2*sgn(F) - 9*pi*b^3*c^3*d*e^2*x^2*log(abs
(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F
))^2 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*s
gn(F) - 3*pi^3*b^3*c^3*d^2*e*x + 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2 + pi^3*
b^3*c^3*d^3*sgn(F) - 3*pi*b^3*c^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d
^3 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(
F) - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) + 12*pi*b^2*c^2*d*e^2*x*log(abs(F))*s
gn(F) - 12*pi*b^2*c^2*d*e^2*x*log(abs(F)) + 6*pi*b^2*c^2*d^2*e*log(abs(F))*
sgn(F) - 6*pi*b^2*c^2*d^2*e*log(abs(F)) - 6*pi*b*c*e^3*x*sgn(F) + 6*pi*b*c*
e^3*x - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*b*c*d*e^2)*(pi^4*b^4*c^4*sgn(F) - 6*pi
^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))
^2 - 2*b^4*c^4*log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(ab
s(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*lo
g(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F
))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(
3*pi^2*b^3*c^3*e^3*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e^3*x^3*log(abs(
F)) + 2*b^3*c^3*e^3*x^3*log(abs(F))^3 + 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)
)*sgn(F) - 9*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F)) + 6*b^3*c^3*d*e^2*x^2*log(a
bs(F))^3 + 9*pi^2*b^3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*d^2*e
*x*log(abs(F)) + 6*b^3*c^3*d^2*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*d^3*log(a
bs(F))*sgn(F) - 3*pi^2*b^3*c^3*d^3*log(abs(F)) + 2*b^3*c^3*d^3*log(abs(F))^
3 - 3*pi^2*b^2*c^2*e^3*x^2*sgn(F) + 3*pi^2*b^2*c^2*e^3*x^2 - 6*b^2*c^2*e^3*
x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 6*pi^2*b^2*c^2*d*e^2*x
- 12*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*pi^2*b^2*c^2*d^2*e*sgn(F) + 3*pi^2*b
^2*c^2*d^2*e - 6*b^2*c^2*d^2*e*log(abs(F))^2 + 12*b*c*e^3*x*log(abs(F)) + 1
2*b*c*d*e^2*log(abs(F)) - 12*e^3)*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4
*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F
))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^
4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^
3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c
^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1
/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*log(abs(F)) + a*c*l
og(abs(F))) - 1/2*I*((pi^3*b^3*c^3*e^3*x^3*sgn(F) + 3*I*pi^2*b^3*c^3*e^3*x^
3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3
*c^3*e^3*x^3 - 3*I*pi^2*b^3*c^3*e^3*x^3*log(abs(F)) + 3*pi*b^3*c^3*e^3*x^3*
log(abs(F))^2 + 2*I*b^3*c^3*e^3*x^3*log(abs(F))^3 + 3*pi^3*b^3*c^3*d*e^2*x^
2*sgn(F) + 9*I*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d*e
^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 - 9*I*pi^2*b^3*c^3*d
*e^2*x^2*log(abs(F)) + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 + 6*I*b^3*c^3*d
*e^2*x^2*log(abs(F))^3 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) + 9*I*pi^2*b^3*c^3*d
^2*e*x*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F) - 3*p
i^3*b^3*c^3*d^2*e*x - 9*I*pi^2*b^3*c^3*d^2*e*x*log(abs(F)) + 9*pi*b^3*c^3*d
^2*e*x*log(abs(F))^2 + 6*I*b^3*c^3*d^2*e*x*log(abs(F))^3 + pi^3*b^3*c^3*d^3
*sgn(F) + 3*I*pi^2*b^3*c^3*d^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*d^3*log(ab
```

s(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 - 3*I*pi^2*b^3*c^3*d^3*log(abs(F)) + 3*pi
*b^3*c^3*d^3*log(abs(F))^2 + 2*I*b^3*c^3*d^3*log(abs(F))^3 - 3*I*pi^2*b^2*c
^2*e^3*x^2*sgn(F) + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) + 3*I*pi^2*b^2*
c^2*e^3*x^2 - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) - 6*I*b^2*c^2*e^3*x^2*log(ab
s(F))^2 - 6*I*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 12*pi*b^2*c^2*d*e^2*x*log(abs(F
))*sgn(F) + 6*I*pi^2*b^2*c^2*d*e^2*x - 12*pi*b^2*c^2*d*e^2*x*log(abs(F)) -
12*I*b^2*c^2*d*e^2*x*log(abs(F))^2 - 3*I*pi^2*b^2*c^2*d^2*e*sgn(F) + 6*pi*b
^2*c^2*d^2*e*log(abs(F))*sgn(F) + 3*I*pi^2*b^2*c^2*d^2*e - 6*pi*b^2*c^2*d^2
*e*log(abs(F)) - 6*I*b^2*c^2*d^2*e*log(abs(F))^2 - 6*pi*b*c*e^3*x*sgn(F) +
6*pi*b*c*e^3*x + 12*I*b*c*e^3*x*log(abs(F)) - 6*pi*b*c*d*e^2*sgn(F) + 6*pi*
b*c*d*e^2 + 12*I*b*c*d*e^2*log(abs(F)) - 12*I*e^3)*e^(1/2*I*pi*b*c*x*sgn(F)
 - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(pi^4*b^4*c^4*sgn(F
) + 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(
F) - 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 - 4*I*pi^3*b^4*c^4*
log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 + 4*I*pi*b^4*c^4*log(abs(F))^3 -
 2*b^4*c^4*log(abs(F))^4) + (pi^3*b^3*c^3*e^3*x^3*sgn(F) - 3*I*pi^2*b^3*c^3
*e^3*x^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*e^3*x^3*log(abs(F))^2*sgn(F) - p
i^3*b^3*c^3*e^3*x^3 + 3*I*pi^2*b^3*c^3*e^3*x^3*log(abs(F)) + 3*pi*b^3*c^3*e
^3*x^3*log(abs(F))^2 - 2*I*b^3*c^3*e^3*x^3*log(abs(F))^3 + 3*pi^3*b^3*c^3*d
*e^2*x^2*sgn(F) - 9*I*pi^2*b^3*c^3*d*e^2*x^2*log(abs(F))*sgn(F) - 9*pi*b^3*
c^3*d*e^2*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*d*e^2*x^2 + 9*I*pi^2*b^
3*c^3*d*e^2*x^2*log(abs(F)) + 9*pi*b^3*c^3*d*e^2*x^2*log(abs(F))^2 - 6*I*b^
3*c^3*d*e^2*x^2*log(abs(F))^3 + 3*pi^3*b^3*c^3*d^2*e*x*sgn(F) - 9*I*pi^2*b^
3*c^3*d^2*e*x*log(abs(F))*sgn(F) - 9*pi*b^3*c^3*d^2*e*x*log(abs(F))^2*sgn(F
) - 3*pi^3*b^3*c^3*d^2*e*x + 9*I*pi^2*b^3*c^3*d^2*e*x*log(abs(F)) + 9*pi*b^
3*c^3*d^2*e*x*log(abs(F))^2 - 6*I*b^3*c^3*d^2*e*x*log(abs(F))^3 + pi^3*b^3*
c^3*d^3*sgn(F) - 3*I*pi^2*b^3*c^3*d^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*d^3
*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d^3 + 3*I*pi^2*b^3*c^3*d^3*log(abs(F))
 + 3*pi*b^3*c^3*d^3*log(abs(F))^2 - 2*I*b^3*c^3*d^3*log(abs(F))^3 + 3*I*pi^
2*b^2*c^2*e^3*x^2*sgn(F) + 6*pi*b^2*c^2*e^3*x^2*log(abs(F))*sgn(F) - 3*I*pi
^2*b^2*c^2*e^3*x^2 - 6*pi*b^2*c^2*e^3*x^2*log(abs(F)) + 6*I*b^2*c^2*e^3*x^2
*log(abs(F))^2 + 6*I*pi^2*b^2*c^2*d*e^2*x*sgn(F) + 12*pi*b^2*c^2*d*e^2*x*lo
g(abs(F))*sgn(F) - 6*I*pi^2*b^2*c^2*d*e^2*x - 12*pi*b^2*c^2*d*e^2*x*log(abs
(F)) + 12*I*b^2*c^2*d*e^2*x*log(abs(F))^2 + 3*I*pi^2*b^2*c^2*d^2*e*sgn(F) +
 6*pi*b^2*c^2*d^2*e*log(abs(F))*sgn(F) - 3*I*pi^2*b^2*c^2*d^2*e - 6*pi*b^2*
c^2*d^2*e*log(abs(F)) + 6*I*b^2*c^2*d^2*e*log(abs(F))^2 - 6*pi*b*c*e^3*x*sg
n(F) + 6*pi*b*c*e^3*x - 12*I*b*c*e^3*x*log(abs(F)) - 6*pi*b*c*d*e^2*sgn(F)
+ 6*pi*b*c*d*e^2 - 12*I*b*c*d*e^2*log(abs(F)) + 12*I*e^3)*e^(-1/2*I*pi*b*c*
x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(pi^4*b^4*c
^4*sgn(F) - 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F)
)^2*sgn(F) + 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 + 4*I*pi^3*
b^4*c^4*log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 - 4*I*pi*b^4*c^4*log(abs
(F))^3 - 2*b^4*c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.50

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

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

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

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

Optimal result

Integrand size = 26, antiderivative size = 79

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

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

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 79, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.115, Rules used = {27, 2207, 2225}

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

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

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

Rule 27

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 91, normalized size of antiderivative = 1.15

method	result
gosper	$\frac{\left(e^{2} x^{2} c^{2} b^{2} \ln \left(F\right)^{2}+2 \ln \left(F\right)^{2} b^{2} c^{2} d e x+\ln \left(F\right)^{2} b^{2} c^{2} d^{2}-2 \ln \left(F\right) b c \,e^{2} x-2 \ln \left(F\right) b c e d+2 e^{2}\right) F^{c \left(b x+a\right)}}{c^{3} b^{3} \ln \left(F\right)^{3}}$
risch	$\frac{\left(e^{2} x^{2} c^{2} b^{2} \ln \left(F\right)^{2}+2 \ln \left(F\right)^{2} b^{2} c^{2} d e x+\ln \left(F\right)^{2} b^{2} c^{2} d^{2}-2 \ln \left(F\right) b c \,e^{2} x-2 \ln \left(F\right) b c e d+2 e^{2}\right) F^{c \left(b x+a\right)}}{c^{3} b^{3} \ln \left(F\right)^{3}}$
norman	$\frac{\left(\ln \left(F\right)^{2} b^{2} c^{2} d^{2}-2 \ln \left(F\right) b c e d+2 e^{2}\right) {\mathrm e}^{c \left(b x+a\right) \ln \left(F\right)}}{c^{3} b^{3} \ln \left(F\right)^{3}}+\frac{e^{2} x^{2} {\mathrm e}^{c \left(b x+a\right) \ln \left(F\right)}}{c b \ln \left(F\right)}+\frac{2 e \left(\ln \left(F\right) b c d-e\right) x \,{\mathrm e}^{c \left(b x+a\right) \ln \left(F\right)}}{c^{2} b^{2} \ln \left(F\right)^{2}}$
meijerg	$-\frac{F^{c a} e^{2} \left(2-\frac{\left(3 b^{2} c^{2} x^{2} \ln \left(F\right)^{2}-6 b c x \ln \left(F\right)+6\right) {\mathrm e}^{b c x \ln \left(F\right)}}{3}\right)}{c^{3} b^{3} \ln \left(F\right)^{3}}+\frac{2 F^{c a} e d \left(1-\frac{\left(-2 b c x \ln \left(F\right)+2\right) {\mathrm e}^{b c x \ln \left(F\right)}}{2}\right)}{c^{2} b^{2} \ln \left(F\right)^{2}}-\frac{F^{c a} d^{2} \left(1-{\mathrm e}^{b c x \ln \left(F\right)}\right)}{c b \ln \left(F\right)}$
parallelrisch	$\frac{x^{2} F^{c \left(b x+a\right)} e^{2} c^{2} b^{2} \ln \left(F\right)^{2}+2 \ln \left(F\right)^{2} x \,F^{c \left(b x+a\right)} b^{2} c^{2} d e+\ln \left(F\right)^{2} F^{c \left(b x+a\right)} b^{2} c^{2} d^{2}-2 \ln \left(F\right) x \,F^{c \left(b x+a\right)} b c \,e^{2}-2 \ln \left(F\right) F^{c \left(b x+a\right)} b c d e+2}{c^{3} b^{3} \ln \left(F\right)^{3}}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 84, normalized size of antiderivative = 1.06

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

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

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

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 133, normalized size of antiderivative = 1.68

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

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

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

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 123, normalized size of antiderivative = 1.56

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

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.37 (sec) , antiderivative size = 2214, normalized size of antiderivative = 28.03

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)\,dx = \text{Too large to display}$$

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

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

```
*sgn(F) + 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) - 12*I*pi*b^3*c^3*
log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3) - (-I*pi^2*b^2*c^2*e^2*x^2*sgn(F)
- 2*pi*b^2*c^2*e^2*x^2*log(abs(F))*sgn(F) + I*pi^2*b^2*c^2*e^2*x^2 + 2*pi*b
^2*c^2*e^2*x^2*log(abs(F)) - 2*I*b^2*c^2*e^2*x^2*log(abs(F))^2 - 2*I*pi^2*b
^2*c^2*d*e*x*sgn(F) - 4*pi*b^2*c^2*d*e*x*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*
c^2*d*e*x + 4*pi*b^2*c^2*d*e*x*log(abs(F)) - 4*I*b^2*c^2*d*e*x*log(abs(F))^
2 - I*pi^2*b^2*c^2*d^2*sgn(F) - 2*pi*b^2*c^2*d^2*log(abs(F))*sgn(F) + I*pi^
2*b^2*c^2*d^2 + 2*pi*b^2*c^2*d^2*log(abs(F)) - 2*I*b^2*c^2*d^2*log(abs(F))^
2 + 2*pi*b*c*e^2*x*sgn(F) - 2*pi*b*c*e^2*x + 4*I*b*c*e^2*x*log(abs(F)) + 2*
pi*b*c*d*e*sgn(F) - 2*pi*b*c*d*e + 4*I*b*c*d*e*log(abs(F)) - 4*I*e^2)*e^(-1
/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)
/(4*I*pi^3*b^3*c^3*sgn(F) + 12*pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^
3*c^3*log(abs(F))^2*sgn(F) - 4*I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F))
 + 12*I*pi*b^3*c^3*log(abs(F))^2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(a
bs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 91, normalized size of antiderivative = 1.15

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

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

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

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

Optimal result

Integrand size = 28, antiderivative size = 57

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

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

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 57, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.107, Rules used = {27, 2208, 2209}

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

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

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

Rule 27

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

Rule 2208

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

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 55, normalized size of antiderivative = 0.96

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

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

Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.74

method	result	size
risch	$-\frac{cb\ln(F)F^{bcx}F^{ca}}{e^2\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-\frac{cb\ln(F)F^{\frac{c(ae-bd)}{e}}\,\text{Ei}_1\left(-bcx\ln(F)-ca\ln(F)-\frac{-\ln(F)ace+\ln(F)bcd}{e}\right)}{e^2}$	99

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

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

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 77, normalized size of antiderivative = 1.35

$$\int \frac{F^{c(a+bx)}}{d^2+2dex+e^2x^2}\,dx = -\frac{F^{bcx+ac}e - \frac{(bcex+bcd)\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}}{e^3x+de^2}$$

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 39, antiderivative size = 95

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

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

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 95, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.077, Rules used = {2218, 2208, 2209}

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

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

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

Rule 2208

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

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 2218

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 88, normalized size of antiderivative = 0.93

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

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

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 155, normalized size of antiderivative = 1.63

method	result
risch	$-\frac{c^{2} b^{2} \ln(F)^{2} F^{bcx} F^{ca}}{2e^{3}\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^{2}}-\frac{c^{2} b^{2} \ln(F)^{2} F^{bcx} F^{ca}}{2e^{3}\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-\frac{c^{2} b^{2} \ln(F)^{2} F^{\frac{c(ae-bd)}{e}} \operatorname{Ei}_{1}\left(-bcx\ln(F)-ca\ln(F)-\frac{-\ln(F)ace+\ln(F)b}{e}\right.}{2e^{3}}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 134, normalized size of antiderivative = 1.41

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

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

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

Optimal result

Integrand size = 50, antiderivative size = 128

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

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

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 128, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.060, Rules used = {2218, 2208, 2209}

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

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

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

Rule 2208

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

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 2218

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.77

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

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

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

Maple [A] (verified)

Time = 0.12 (sec) , antiderivative size = 199, normalized size of antiderivative = 1.55

method	result
risch	$-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{3e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^3}-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{6e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^2}-\frac{c^3b^3\ln(F)^3F^{bcx}F^{ca}}{6e^4\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)}-\frac{c^3b^3\ln(F)^3F^{\frac{c(ae-bd)}{e}}\,\text{Ei}_1\left(-bcx\ln(\right.}{6e}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 209, normalized size of antiderivative = 1.63

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

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [F]

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

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

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

Mupad [F(-1)]

Timed out.

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

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

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

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

Optimal result

Integrand size = 61, antiderivative size = 161

$$\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5} \, dx = -\frac{F^{c(a+bx)}}{4e(d+ex)^4}-\frac{bcF^{c(a+bx)}\log(F)}{12e^2(d+ex)^3}-\frac{b^2c^2F^{c(a+bx)}\log^2(F)}{24e^3(d+ex)^2} -\frac{b^3c^3F^{c(a+bx)}\log^3(F)}{24e^4(d+ex)}+\frac{b^4c^4F^{c\left(a-\frac{bd}{e}\right)}\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^4(F)}{24e^5}$$

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

Rubi [A] (verified)

Time = 0.12 (sec) , antiderivative size = 161, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.049, Rules used = {2218, 2208, 2209}

$$\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5} \, dx = \frac{b^4c^4\log^4(F)F^{c\left(a-\frac{bd}{e}\right)}\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)}{24e^5}-\frac{b^3c^3\log^3(F)F^{c(a+bx)}}{24e^4(d+ex)} -\frac{b^2c^2\log^2(F)F^{c(a+bx)}}{24e^3(d+ex)^2}-\frac{bc\log(F)F^{c(a+bx)}}{12e^2(d+ex)^3}-\frac{F^{c(a+bx)}}{4e(d+ex)^4}$$

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

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

Rule 2208

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

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 2218

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

Rubi steps

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

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.75

$$\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5}\,dx = \frac{F^{ac}\left(b^4c^4F^{-\frac{bcd}{e}}\,\text{ExpIntegralEi}\left(\frac{bc(d+ex)\log(F)}{e}\right)\log^4(F) - \frac{eF^{bcx}(6e^3+2bce^2(d+ex)\log(F)+b^2c^2e(d+ex)^2\log^2(F)+b^3c^3(d+e}{(d+ex)^4}\right.}{24e^5}$$

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

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

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 243, normalized size of antiderivative = 1.51

method	result
risch	$-\frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{4e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^4} - \frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{12e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^3} - \frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{24e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)^2} - \frac{c^4b^4\ln(F)^4F^{bcx}F^{ca}}{24e^5\left(bcx\ln(F)+\frac{bc\ln(F)d}{e}\right)} -$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 300, normalized size of antiderivative = 1.86

$$\int \frac{F^{c(a+bx)}}{d^5+5d^4ex+10d^3e^2x^2+10d^2e^3x^3+5de^4x^4+e^5x^5}\,dx$$
$$= \frac{\frac{(b^4c^4e^4x^4+4\,b^4c^4de^3x^3+6\,b^4c^4d^2e^2x^2+4\,b^4c^4d^3ex+b^4c^4d^4)\,\mathrm{Ei}\left(\frac{(bcex+bcd)\log(F)}{e}\right)\log(F)^4}{F^{\frac{bcd-ace}{e}}} - (6\,e^4 + (b^3c^3e^4x^3 + 3\,b^3c^3de^3x^2 + 3\,b^3}{24\,(e^9x^4 + 4\,de^8x^3 + 6}$$

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [F]

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

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

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

Mupad [F(-1)]

Timed out.

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

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

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

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

Optimal result

Integrand size = 19, antiderivative size = 72

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

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

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 72, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.105, Rules used = {1973, 2212}

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

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

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

Rule 1973

```
Int[(u_.)*((c_.)*((a_) + (b_.)*(x_)^(n_.))^(q_))^(p_), x_Symbol] :> Dist[Si
mp[(c*(a + b*x^n)^q)^p/(1 + b*(x^n/a))^(p*q)], Int[u*(1 + b*(x^n/a))^(p*q),
```

```
x], x] /; FreeQ[{a, b, c, n, p, q}, x] &&  !GeQ[a, 0]
```

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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 72, normalized size of antiderivative = 1.00

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

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

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.09 (sec) , antiderivative size = 68, normalized size of antiderivative = 0.94

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}((d+ex)^n)^m\,dx=\int F^{c\,(a+b\,x)}\,((d+e\,x)^n)^m\,dx$$

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

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

Optimal result

Integrand size = 50, antiderivative size = 71

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)^m\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^4\right)^m\Gamma\left(1+4m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-4m}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.040, Rules used = {2219, 2212}

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)^m\,dx = \frac{\left((d+ex)^4\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-4m}\Gamma\left(4m+1,-\frac{bc(d+ex)\log(F)}{e}\right)}{bc\log(F)}$$

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

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

Rule 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 2219

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00

$$\int F^{c(a+bx)}\left(d^4+4d^3ex+6d^2e^2x^2+4de^3x^3+e^4x^4\right)^m\,dx$$
$$= \frac{F^{c\left(a-\frac{bd}{e}\right)}((d+ex)^4)^m\,\Gamma\left(1+4m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-4m}}{bc\log(F)}$$

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

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

Maple [F]

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

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

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

Fricas [F]

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

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

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

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [F]

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

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

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

Mupad [F(-1)]

Timed out.

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

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

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

3.21 $\int F^{c(a+bx)}(d^3+3d^2ex+3de^2x^2+e^3x^3)^m\,dx$

Optimal result

Integrand size = 39, antiderivative size = 71

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^m\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^m\Gamma\left(1+3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-3m}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.051, Rules used = {2219, 2212}

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^m\,dx = \frac{\left((d+ex)^3\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-3m}\Gamma\left(3m+1,-\frac{bc(d+ex)\log(F)}{e}\right)}{bc\log(F)}$$

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

```
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^3)^m*Gamma[1 + 3*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(3*m))
```

Rule 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 2219

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

Rubi steps

$$\begin{aligned}\text{integral} &= (d+ex)^{-3m}\left((d+ex)^3\right)^m\int F^{c(a+bx)}(d+ex)^{3m}\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^m\Gamma\left(1+3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-3m}}{bc\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^m\,dx$$
$$=\frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^m\Gamma\left(1+3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-3m}}{bc\log(F)}$$

```
[In] Integrate[F^(c*(a + b*x))*(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^3)^m*Gamma[1 + 3*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(3*m))
```

Maple [F]

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

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

Fricas [F]

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

3.22 $\int F^{c(a+bx)}(d^2+2dex+e^2x^2)^m\,dx$

Optimal result

Integrand size = 28, antiderivative size = 71

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^m\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^m\Gamma\left(1+2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-2m}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.071, Rules used = {2219, 2212}

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^m\,dx = \frac{\left((d+ex)^2\right)^m F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{-2m}\Gamma\left(2m+1,-\frac{bc(d+ex)\log(F)}{e}\right)}{bc\log(F)}$$

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

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

Rule 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 2219

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

Rubi steps

$$\begin{aligned}\text{integral} &= (d+ex)^{-2m}\left((d+ex)^2\right)^m\int F^{c(a+bx)}(d+ex)^{2m}\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^m\Gamma\left(1+2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-2m}}{bc\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00

$$\begin{aligned}&\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^m\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^m\Gamma\left(1+2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{-2m}}{bc\log(F)}\end{aligned}$$

```
[In] Integrate[F^(c*(a + b*x))*(d^2 + 2*d*e*x + e^2*x^2)^m,x]
[Out] (F^(c*(a - (b*d)/e))*((d + e*x)^2)^m*Gamma[1 + 2*m, -((b*c*(d + e*x)*Log[F]
)/e)])/(b*c*Log[F]*(-((b*c*(d + e*x)*Log[F])/e))^(2*m))
```

Maple [F]

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

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

Fricas [F]

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

3.23 $\int F^{c(a+bx)}(d+ex)^m\,dx$

Optimal result

Integrand size = 17, antiderivative size = 67

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

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

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 67, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.059, Rules used = {2212}

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

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

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

Rule 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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 67, normalized size of antiderivative = 1.00

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

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

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 65, normalized size of antiderivative = 0.97

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

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^m,x, algorithm="fricas")
[Out] e^(-(e*m*log(-b*c*log(F)/e) + (b*c*d - a*c*e)*log(F))/e)*gamma(m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

3.24 $\int F^{c(a+bx)}(d+ex)^{-m}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 69

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

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

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 69, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.053, Rules used = {2212}

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

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

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

Rule 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]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 69, normalized size of antiderivative = 1.00

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

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

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 67, normalized size of antiderivative = 0.97

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

```
[In] integrate(F^(c*(b*x+a))/((e*x+d)^m),x, algorithm="fricas")
[Out] e^((e*m*log(-b*c*log(F)/e) - (b*c*d - a*c*e)*log(F))/e)*gamma(-m + 1, -(b*c
*e*x + b*c*d)*log(F)/e)/(b*c*log(F))
```

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}(d+ex)^{-m}\,dx=\int \frac{F^{c\,(a+b\,x)}}{(d+e\,x)^{m}}\,dx$$

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

3.25 $\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx$

Optimal result

Integrand size = 30, antiderivative size = 73

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^{-m}\Gamma\left(1-2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{2m}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.067, Rules used = {2219, 2212}

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx = \frac{\left((d+ex)^2\right)^{-m}F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{2m}\Gamma\left(1-2m,-\frac{bc(d+ex)\log(F)}{e}\right)}{bc\log(F)}$$

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

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

Rule 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 2219

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

Rubi steps

$$\text{integral} = (d+ex)^{2m}\left((d+ex)^2\right)^{-m}\int F^{c(a+bx)}(d+ex)^{-2m}\,dx$$
$$= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^{-m}\Gamma\left(1-2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{2m}}{bc\log(F)}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.00

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx$$
$$= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^2\right)^{-m}\Gamma\left(1-2m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{2m}}{bc\log(F)}$$

```
[In] Integrate[F^(c*(a + b*x))/(d^2 + 2*d*e*x + e^2*x^2)^m,x]
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 2*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(2*m))/(b*c*((d + e*x)^2)^m*Log[F])
```

Maple [F]

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

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

Fricas [F]

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

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

Sympy [F(-2)]

Exception generated.

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx=\text{Exception raised: HeuristicGCDFailed}$$

```
[In] integrate(F**(c*(b*x+a))/((e**2*x**2+2*d*e*x+d**2)**m),x)
[Out] Exception raised: HeuristicGCDFailed >> no luck
```

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}\left(d^2+2dex+e^2x^2\right)^{-m}\,dx=\int\frac{F^{c\,(a+b\,x)}}{\left(d^2+2\,d\,e\,x+e^2\,x^2\right)^m}\,dx$$

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

3.26 $\int F^{c(a+bx)}(d^3+3d^2ex+3de^2x^2+e^3x^3)^{-m}\,dx$

Optimal result

Integrand size = 41, antiderivative size = 73

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^{-m}\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^{-m}\Gamma\left(1-3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3m}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.049, Rules used = {2219, 2212}

$$\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^{-m}\,dx = \frac{\left((d+ex)^3\right)^{-m}F^{c\left(a-\frac{bd}{e}\right)}\left(-\frac{bc\log(F)(d+ex)}{e}\right)^{3m}\Gamma\left(1-3m,-\frac{bc(d+ex)\log(F)}{e}\right)}{bc\log(F)}$$

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

```
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 3*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(3*m))/(b*c*((d + e*x)^3)^m*Log[F])
```

Rule 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 2219

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

Rubi steps

$$\begin{aligned}\text{integral} &= (d+ex)^{3m}\left((d+ex)^3\right)^{-m}\int F^{c(a+bx)}(d+ex)^{-3m}\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^{-m}\Gamma\left(1-3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3m}}{bc\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.00

$$\begin{aligned}&\int F^{c(a+bx)}\left(d^3+3d^2ex+3de^2x^2+e^3x^3\right)^{-m}\,dx\\ &= \frac{F^{c\left(a-\frac{bd}{e}\right)}\left((d+ex)^3\right)^{-m}\Gamma\left(1-3m,-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3m}}{bc\log(F)}\end{aligned}$$

```
[In] Integrate[F^(c*(a + b*x))/(d^3 + 3*d^2*e*x + 3*d*e^2*x^2 + e^3*x^3)^m,x]
[Out] (F^(c*(a - (b*d)/e))*Gamma[1 - 3*m, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d
 + e*x)*Log[F])/e))^(3*m))/(b*c*((d + e*x)^3)^m*Log[F])
```

Maple [F]

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

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

Fricas [F]

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

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

Sympy [F]

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

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

Maxima [F]

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

3.27 $\int F^{2+5x}\,dx$

Optimal result

Integrand size = 7, antiderivative size = 15

$$\int F^{2+5x}\,dx=\frac{F^{2+5x}}{5\log(F)}$$

```
[Out] 1/5*F^(2+5*x)/ln(F)
```

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2225}

$$\int F^{2+5x}\,dx=\frac{F^{5x+2}}{5\log(F)}$$

```
[In] Int[F^(2 + 5*x),x]
```

```
[Out] F^(2 + 5*x)/(5*Log[F])
```

Rule 2225

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

Rubi steps

$$\text{integral}=\frac{F^{2+5x}}{5\log(F)}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int F^{2+5x}\,dx = \frac{F^{2+5x}}{5\log(F)}$$

```
[In] Integrate[F^(2 + 5*x),x]
[Out] F^(2 + 5*x)/(5*Log[F])
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.93

method	result	size
gosper	$\frac{F^{2+5x}}{5\ln(F)}$	14
derivativedivides	$\frac{F^{2+5x}}{5\ln(F)}$	14
default	$\frac{F^{2+5x}}{5\ln(F)}$	14
risch	$\frac{F^{2+5x}}{5\ln(F)}$	14
parallelrisch	$\frac{F^{2+5x}}{5\ln(F)}$	14
norman	$\frac{e^{(2+5x)\ln(F)}}{5\ln(F)}$	16
meijerg	$-\frac{F^{2}\left(1-e^{5x\ln(F)}\right)}{5\ln(F)}$	20

```
[In] int(F^(2+5*x),x,method=_RETURNVERBOSE)
[Out] 1/5*F^(2+5*x)/ln(F)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int F^{2+5x}\,dx = \frac{F^{5\,x+2}}{5\,\log\left(F\right)}$$

```
[In] integrate(F^(2+5*x),x, algorithm="fricas")
[Out] 1/5*F^(5*x + 2)/log(F)
```

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.93

$$\int F^{2+5x}\,dx = \begin{cases} \frac{F^{5x+2}}{5\log(F)} & \text{for } \log(F) \neq 0 \\ x & \text{otherwise} \end{cases}$$

```
[In] integrate(F**(2+5*x),x)
[Out] Piecewise((F**(5*x + 2)/(5*log(F)), Ne(log(F), 0)), (x, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int F^{2+5x}\,dx = \frac{F^{5x+2}}{5\log(F)}$$

```
[In] integrate(F^(2+5*x),x, algorithm="maxima")
[Out] 1/5*F^(5*x + 2)/log(F)
```

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int F^{2+5x}\,dx = \frac{F^{5x+2}}{5\log(F)}$$

```
[In] integrate(F^(2+5*x),x, algorithm="giac")
[Out] 1/5*F^(5*x + 2)/log(F)
```

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int F^{2+5x}\,dx = \frac{F^{5x+2}}{5\ln(F)}$$

```
[In] int(F^(5*x + 2),x)
[Out] F^(5*x + 2)/(5*log(F))
```

3.28 $\int F^{a+bx} \, dx$

Optimal result

Integrand size = 7, antiderivative size = 15

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

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

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {2225}

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

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

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

Rule 2225

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

Rubi steps

$$\text{integral} = \frac{F^{a+bx}}{b \log(F)}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

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

```
[In] Integrate[F^(a + b*x),x]
[Out] F^(a + b*x)/(b*Log[F])
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.07

method	result	size
gosper	$\frac{F^{bx+a}}{b\ln(F)}$	16
derivativedivides	$\frac{F^{bx+a}}{b\ln(F)}$	16
default	$\frac{F^{bx+a}}{b\ln(F)}$	16
risch	$\frac{F^{bx+a}}{b\ln(F)}$	16
parallelrisch	$\frac{F^{bx+a}}{b\ln(F)}$	16
norman	$\frac{e^{(bx+a)\ln(F)}}{b\ln(F)}$	18
meijerg	$-\frac{F^{a}\left(1-e^{xb\ln(F)}\right)}{b\ln(F)}$	23

```
[In] int(F^(b*x+a),x,method=_RETURNVERBOSE)
[Out] F^(b*x+a)/b/ln(F)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int F^{a+bx}\,dx=\frac{F^{bx+a}}{b\log\left(F\right)}$$

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

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int F^{a+bx}\,dx = \begin{cases} \frac{F^{a+bx}}{b\log(F)} & \text{for } b\log(F) \neq 0 \\ x & \text{otherwise} \end{cases}$$

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

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

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

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

Giac [A] (verification not implemented)

none

Time = 0.40 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

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

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

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int F^{a+bx} \, dx = \frac{F^{a+b\,x}}{b\,\ln{(F)}}$$

```
[In] int(F^(a + b*x),x)
[Out] F^(a + b*x)/(b*log(F))
```

3.29 $\int 10^{2+5x}\,dx$

Optimal result

Integrand size = 7, antiderivative size = 19

$$\int 10^{2+5x}\,dx=\frac{2^{2+5x}5^{1+5x}}{\log(10)}$$

```
[Out] 2^(2+5*x)*5^(1+5*x)/ln(10)
```

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2225}

$$\int 10^{2+5x}\,dx=\frac{2^{5x+2}5^{5x+1}}{\log(10)}$$

```
[In] Int[10^(2 + 5*x),x]
[Out] (2^(2 + 5*x)*5^(1 + 5*x))/Log[10]
```

Rule 2225

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

Rubi steps

$$\text{integral}=\frac{2^{2+5x}5^{1+5x}}{\log(10)}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int 10^{2+5x} \, dx = \frac{2^{2+5x} 5^{1+5x}}{\log(10)}$$

```
[In] Integrate[10^(2 + 5*x),x]
[Out] (2^(2 + 5*x)*5^(1 + 5*x))/Log[10]
```

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.63

method	result	size
derivativedivides	$\frac{20\,10^{5x}}{\ln(10)}$	12
default	$\frac{20\,10^{5x}}{\ln(10)}$	12
gosper	$\frac{10^{2+5x}}{5\ln(10)}$	14
parallelrisch	$\frac{10^{2+5x}}{5\ln(10)}$	14
norman	$\frac{e^{(2+5x)\ln(10)}}{5\ln(10)}$	16
risch	$\frac{20\,3125^{x} 32^{x}}{\ln(2)+\ln(5)}$	16
meijerg	$-\frac{20\left(1-e^{5x\ln(10)}\right)}{\ln(10)}$	17

```
[In] int(10^(2+5*x),x,method=_RETURNVERBOSE)
[Out] 20*(10^x)^5/ln(10)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.68

$$\int 10^{2+5x} \, dx = \frac{10^{5\,x+2}}{5\,\log{(10)}}$$

```
[In] integrate(10^(2+5*x),x, algorithm="fricas")
[Out] 1/5*10^(5*x + 2)/log(10)
```

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.53

$$\int 10^{2+5x}\,dx = \frac{10^{5x+2}}{5\log(10)}$$

```
[In] integrate(10**(2+5*x),x)
[Out] 10**(5*x + 2)/(5*log(10))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.68

$$\int 10^{2+5x}\,dx = \frac{10^{5\,x+2}}{5\,\log(10)}$$

```
[In] integrate(10^(2+5*x),x, algorithm="maxima")
[Out] 1/5*10^(5*x + 2)/log(10)
```

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.68

$$\int 10^{2+5x}\,dx = \frac{10^{5\,x+2}}{5\,\log(10)}$$

```
[In] integrate(10^(2+5*x),x, algorithm="giac")
[Out] 1/5*10^(5*x + 2)/log(10)
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.58

$$\int 10^{2+5x}\,dx = \frac{20\,10^{5\,x}}{\ln(10)}$$

```
[In] int(10^(5*x + 2),x)
[Out] (20*10^(5*x))/log(10)
```

3.30 $\int F^{a+bx} x^{7/2}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 131

$$\int F^{a+bx}x^{7/2}\,dx=\frac{105F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)}-\frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)}+\frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)}-\frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)}+\frac{F^{a+bx}x^{7/2}}{b\log(F)}$$

```
[Out] 35/4*F^(b*x+a)*x^(3/2)/b^3/ln(F)^3-7/2*F^(b*x+a)*x^(5/2)/b^2/ln(F)^2+F^(b*x
+a)*x^(7/2)/b/ln(F)+105/16*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b
^(9/2)/ln(F)^(9/2)-105/8*F^(b*x+a)*x^(1/2)/b^4/ln(F)^4
```

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 131, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2207, 2211, 2235}

$$\int F^{a+bx}x^{7/2}\,dx=\frac{105\sqrt{\pi}F^a\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)}-\frac{105\sqrt{x}F^{a+bx}}{8b^4\log^4(F)}+\frac{35x^{3/2}F^{a+bx}}{4b^3\log^3(F)}-\frac{7x^{5/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{x^{7/2}F^{a+bx}}{b\log(F)}$$

```
[In] Int[F^(a + b*x)*x^(7/2),x]
```

```
[Out] (105*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(16*b^(9/2)*Log[F]^(9
/2)) - (105*F^(a + b*x)*Sqrt[x])/(8*b^4*Log[F]^4) + (35*F^(a + b*x)*x^(3/2)
)/(4*b^3*Log[F]^3) - (7*F^(a + b*x)*x^(5/2))/(2*b^2*Log[F]^2) + (F^(a + b*x
)*x^(7/2))/(b*Log[F])
```

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{F^{a+bx}x^{7/2}}{b\log(F)} - \frac{7\int F^{a+bx}x^{5/2}\,dx}{2b\log(F)} \\
&= -\frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{35\int F^{a+bx}x^{3/2}\,dx}{4b^2\log^2(F)} \\
&= \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} - \frac{105\int F^{a+bx}\sqrt{x}\,dx}{8b^3\log^3(F)} \\
&= -\frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{105\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{16b^4\log^4(F)} \\
&= -\frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)} + \frac{105\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{8b^4\log^4(F)} \\
&= \frac{105F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{16b^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105F^{a+bx}\sqrt{x}}{8b^4\log^4(F)} + \frac{35F^{a+bx}x^{3/2}}{4b^3\log^3(F)} - \frac{7F^{a+bx}x^{5/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{7/2}}{b\log(F)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.27

$$\int F^{a+bx}x^{7/2}\,dx=\frac{F^a\Gamma\left(\frac{9}{2},-bx\log(F)\right)\sqrt{-bx\log(F)}}{b^5\sqrt{x}\log^5(F)}$$

```
[In] Integrate[F^(a + b*x)*x^(7/2),x]
```

```
[Out] (F^a*Gamma[9/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])])/(b^5*Sqrt[x]*Log[F]^5)
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.76

method	result	size
meijerg	$-\frac{F^a\left(-\frac{\sqrt{x}\,(-b)^{\frac{9}{2}}\sqrt{\ln(F)}\left(-72b^3x^3\ln(F)^3+252b^2x^2\ln(F)^2-630xb\ln(F)+945\right)e^{xb\ln(F)}}{72b^4}+\frac{105(-b)^{\frac{9}{2}}\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{16b^{\frac{9}{2}}}\right)}{(-b)^{\frac{7}{2}}\ln(F)^{\frac{9}{2}}b}$	99

```
[In] int(F^(b*x+a)*x^(7/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a/(-b)^(7/2)/ln(F)^(9/2)/b*(-1/72*x^(1/2)*(-b)^(9/2)*ln(F)^(1/2)*(-72*b^
3*x^3*ln(F)^3+252*b^2*x^2*ln(F)^2-630*x*b*ln(F)+945)/b^4*exp(x*b*ln(F))+105
/16*(-b)^(9/2)/b^(9/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 89, normalized size of antiderivative = 0.68

$$\int F^{a+bx}x^{7/2}\,dx=$$

$$-\frac{105\sqrt{\pi}\sqrt{-b\log(F)}F^a\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)-2\left(8\,b^4x^3\log(F)^4-28\,b^3x^2\log(F)^3+70\,b^2x\log(F)^2-10\right.}{16\,b^5\log(F)^5}$$

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="fricas")
```

```
[Out] -1/16*(105*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) - 2*(8
*b^4*x^3*log(F)^4 - 28*b^3*x^2*log(F)^3 + 70*b^2*x*log(F)^2 - 105*b*log(F))
*F^(b*x + a)*sqrt(x))/(b^5*log(F)^5)
```

Sympy [F]

$$\int F^{a+bx}x^{7/2}\,dx=\int F^{a+bx}x^{\frac{7}{2}}\,dx$$

```
[In] integrate(F**(b*x+a)*x**(7/2),x)
[Out] Integral(F**(a + b*x)*x**(7/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.18

$$\int F^{a+bx}x^{7/2}\,dx=-\frac{F^a x^{\frac{9}{2}}\Gamma\left(\frac{9}{2},-bx\log(F)\right)}{(-bx\log(F))^{\frac{9}{2}}}$$

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="maxima")
[Out] -F^a*x^(9/2)*gamma(9/2, -b*x*log(F))/(-b*x*log(F))^(9/2)
```

Giac [A] (verification not implemented)

none

Time = 0.31 (sec) , antiderivative size = 94, normalized size of antiderivative = 0.72

$$\int F^{a+bx}x^{7/2}\,dx=-\frac{105\sqrt{\pi}F^a\operatorname{erf}\left(-\sqrt{-b\log(F)}\sqrt{x}\right)}{16\sqrt{-b\log(F)}b^4\log(F)^4}+\frac{\left(8b^3x^{\frac{7}{2}}\log(F)^3-28b^2x^{\frac{5}{2}}\log(F)^2+70bx^{\frac{3}{2}}\log(F)-105\sqrt{x}\right)e^{(bx\log(F)+a\log(F))}}{8b^4\log(F)^4}$$

```
[In] integrate(F^(b*x+a)*x^(7/2),x, algorithm="giac")
[Out] -105/16*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^4*log
(F)^4) + 1/8*(8*b^3*x^(7/2)*log(F)^3 - 28*b^2*x^(5/2)*log(F)^2 + 70*b*x^(3/
2)*log(F) - 105*sqrt(x))*e^(b*x*log(F) + a*log(F))/(b^4*log(F)^4)
```

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 82, normalized size of antiderivative = 0.63

$$\int F^{a+bx}x^{7/2}\,dx=\frac{F^a\,x^{7/2}\,\left(\frac{105\,\sqrt{\pi }\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln(F)}\right)}{16}+F^{b\,x}\,\left(\frac{105\,\sqrt{-b\,x\,\ln(F)}}{8}+\frac{35\,{\left(-b\,x\,\ln(F)\right)}^{3/2}}{4}+\frac{7\,{\left(-b\,x\,\ln(F)\right)}^{5/2}}{2}+(-\right.\right.}{b\,\ln\left(F\right)\,{\left(-b\,x\,\ln\left(F\right)\right)}^{7/2}}$$

```
[In] int(F^(a + b*x)*x^(7/2),x)
```

```
[Out] (F^a*x^(7/2)*((105*pi^(1/2)*erfc((-b*x*log(F))^(1/2)))/16 + F^(b*x)*((105*(
-b*x*log(F))^(1/2))/8 + (35*(-b*x*log(F))^(3/2))/4 + (7*(-b*x*log(F))^(5/2)
)/2 + (-b*x*log(F))^(7/2))))/(b*log(F)*(-b*x*log(F))^(7/2))
```

3.31 $\int F^{a+bx}x^{5/2}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 108

$$\int F^{a+bx}x^{5/2}\,dx=-\frac{15F^a\sqrt{\pi}\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)}+\frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)}-\frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)}+\frac{F^{a+bx}x^{5/2}}{b\log(F)}$$

```
[Out] -5/2*F^(b*x+a)*x^(3/2)/b^2/ln(F)^2+F^(b*x+a)*x^(5/2)/b/ln(F)-15/8*F^a*erfi(
b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b^(7/2)/ln(F)^(7/2)+15/4*F^(b*x+a)*x^
(1/2)/b^3/ln(F)^3
```

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 108, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2207, 2211, 2235}

$$\int F^{a+bx}x^{5/2}\,dx=-\frac{15\sqrt{\pi}F^a\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)}+\frac{15\sqrt{x}F^{a+bx}}{4b^3\log^3(F)}-\frac{5x^{3/2}F^{a+bx}}{2b^2\log^2(F)}+\frac{x^{5/2}F^{a+bx}}{b\log(F)}$$

```
[In] Int[F^(a + b*x)*x^(5/2),x]
```

```
[Out] (-15*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(8*b^(7/2)*Log[F]^(7/
2)) + (15*F^(a + b*x)*Sqrt[x])/(4*b^3*Log[F]^3) - (5*F^(a + b*x)*x^(3/2))/(
2*b^2*Log[F]^2) + (F^(a + b*x)*x^(5/2))/(b*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
```

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !TrueQ[$UseGamma]
```

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{5\int F^{a+bx}x^{3/2}\,dx}{2b\log(F)} \\
&= -\frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} + \frac{15\int F^{a+bx}\sqrt{x}\,dx}{4b^2\log^2(F)} \\
&= \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{15\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{8b^3\log^3(F)} \\
&= \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)} - \frac{15\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{4b^3\log^3(F)} \\
&= -\frac{15F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{8b^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15F^{a+bx}\sqrt{x}}{4b^3\log^3(F)} - \frac{5F^{a+bx}x^{3/2}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{5/2}}{b\log(F)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.33

$$\int F^{a+bx}x^{5/2}\,dx = \frac{F^a\sqrt{x}\,\Gamma\left(\frac{7}{2}, -bx\log(F)\right)}{b^3\log^3(F)\sqrt{-bx\log(F)}}$$

```
[In] Integrate[F^(a + b*x)*x^(5/2),x]
[Out] (F^a*Sqrt[x]*Gamma[7/2, -(b*x*Log[F])])/(b^3*Log[F]^3*Sqrt[-(b*x*Log[F])])
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 87, normalized size of antiderivative = 0.81

method	result	size
meijerg	$-\frac{F^{a}\left(\frac{\sqrt{x}\,(-b)^{\frac{7}{2}}\sqrt{\ln(F)}\left(28b^{2}x^{2}\ln(F)^{2}-70xb\ln(F)+105\right)e^{xb\ln(F)}}{28b^{3}}-\frac{15(-b)^{\frac{7}{2}}\sqrt{\pi}\,\operatorname{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{8b^{\frac{7}{2}}}\right)}{(-b)^{\frac{5}{2}}\ln(F)^{\frac{7}{2}}b}$	87

```
[In] int(F^(b*x+a)*x^(5/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a/(-b)^(5/2)/ln(F)^(7/2)/b*(1/28*x^(1/2)*(-b)^(7/2)*ln(F)^(1/2)*(28*b^2*
x^2*ln(F)^2-70*x*b*ln(F)+105)/b^3*exp(x*b*ln(F))-15/8*(-b)^(7/2)/b^(7/2)*Pi
^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 77, normalized size of antiderivative = 0.71

$$\int F^{a+bx}x^{5/2}\,dx = \frac{15\sqrt{\pi}\sqrt{-b\log(F)}F^{a}\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)+2\left(4\,b^{3}x^{2}\log(F)^{3}-10\,b^{2}x\log(F)^{2}+15\,b\right.}{8\,b^{4}\log(F)^{4}}$$

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="fricas")
```

```
[Out] 1/8*(15*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) + 2*(4*b^
3*x^2*log(F)^3 - 10*b^2*x*log(F)^2 + 15*b*log(F))*F^(b*x + a)*sqrt(x))/(b^4
*log(F)^4)
```

Sympy [F]

$$\int F^{a+bx}x^{5/2}\,dx = \int F^{a+bx}x^{\frac{5}{2}}\,dx$$

```
[In] integrate(F**(b*x+a)*x**(5/2),x)
```

```
[Out] Integral(F**(a + b*x)*x**(5/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.22

$$\int F^{a+bx}x^{5/2}\,dx = -\frac{F^a x^{\frac{7}{2}}\Gamma\left(\frac{7}{2}, -bx\log\left(F\right)\right)}{\left(-bx\log\left(F\right)\right)^{\frac{7}{2}}}$$

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(7/2)*gamma(7/2, -b*x*log(F))/(-b*x*log(F))^(7/2)
```

Giac [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 82, normalized size of antiderivative = 0.76

$$\int F^{a+bx}x^{5/2}\,dx = \frac{15\,\sqrt{\pi}F^a\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{8\,\sqrt{-b\log\left(F\right)}b^3\log\left(F\right)^3} + \frac{\left(4\,b^2x^{\frac{5}{2}}\log\left(F\right)^2 - 10\,bx^{\frac{3}{2}}\log\left(F\right) + 15\,\sqrt{x}\right)e^{\left(bx\log\left(F\right)+a\log\left(F\right)\right)}}{4\,b^3\log\left(F\right)^3}$$

```
[In] integrate(F^(b*x+a)*x^(5/2),x, algorithm="giac")
```

```
[Out] 15/8*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^3*log(F)
^3) + 1/4*(4*b^2*x^(5/2)*log(F)^2 - 10*b*x^(3/2)*log(F) + 15*sqrt(x))*e^(b*
x*log(F) + a*log(F))/(b^3*log(F)^3)
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 72, normalized size of antiderivative = 0.67

$$\int F^{a+bx}x^{5/2}\,dx = \frac{F^a\,x^{5/2}\,\left(F^{b\,x}\,\left(\frac{15\,\sqrt{-b\,x\,\ln\left(F\right)}}{4}+\frac{5\,{\left(-b\,x\,\ln\left(F\right)\right)}^{3/2}}{2}+{\left(-b\,x\,\ln\left(F\right)\right)}^{5/2}\right)+\frac{15\,\sqrt{\pi}\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln\left(F\right)}\right)}{8}\right)}{b\,\ln\left(F\right)\,{\left(-b\,x\,\ln\left(F\right)\right)}^{5/2}}$$

```
[In] int(F^(a + b*x)*x^(5/2),x)
```

```
[Out] (F^a*x^(5/2)*(F^(b*x)*((15*(-b*x*log(F))^(1/2))/4 + (5*(-b*x*log(F))^(3/2))
/2 + (-b*x*log(F))^(5/2)) + (15*pi^(1/2)*erfc((-b*x*log(F))^(1/2)))/8))/(b*
log(F)*(-b*x*log(F))^(5/2))
```

3.32 $\int F^{a+bx}x^{3/2}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 85

$$\int F^{a+bx}x^{3/2}\,dx=\frac{3F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)}+\frac{F^{a+bx}x^{3/2}}{b\log(F)}$$

```
[Out] F^(b*x+a)*x^(3/2)/b/ln(F)+3/4*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2
)/b^(5/2)/ln(F)^(5/2)-3/2*F^(b*x+a)*x^(1/2)/b^2/ln(F)^2
```

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2207, 2211, 2235}

$$\int F^{a+bx}x^{3/2}\,dx=\frac{3\sqrt{\pi}F^a\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3\sqrt{x}F^{a+bx}}{2b^2\log^2(F)}+\frac{x^{3/2}F^{a+bx}}{b\log(F)}$$

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

```
[Out] (3*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(4*b^(5/2)*Log[F]^(5/2)
) - (3*F^(a + b*x)*Sqrt[x])/(2*b^2*Log[F]^2) + (F^(a + b*x)*x^(3/2))/(b*Log
[F])
```

Rule 2207

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

```
] && !TrueQ[$UseGamma]
```

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \frac{F^{a+bx}x^{3/2}}{b\log(F)} - \frac{3\int F^{a+bx}\sqrt{x}\,dx}{2b\log(F)} \\
&= -\frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)} + \frac{3\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{4b^2\log^2(F)} \\
&= -\frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)} + \frac{3\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{2b^2\log^2(F)} \\
&= \frac{3F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{4b^{5/2}\log^{\frac{5}{2}}(F)} - \frac{3F^{a+bx}\sqrt{x}}{2b^2\log^2(F)} + \frac{F^{a+bx}x^{3/2}}{b\log(F)}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.42

$$\int F^{a+bx}x^{3/2}\,dx = \frac{F^a\Gamma\left(\frac{5}{2}, -bx\log(F)\right)\sqrt{-bx\log(F)}}{b^3\sqrt{x}\log^3(F)}$$

```
[In] Integrate[F^(a + b*x)*x^(3/2),x]
[Out] (F^a*Gamma[5/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])])/(b^3*Sqrt[x]*Log[F]^3)
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 75, normalized size of antiderivative = 0.88

method	result	size
meijerg	$-\frac{F^{a}\left(-\frac{\sqrt{x}\,(-b)^{\frac{5}{2}}\sqrt{\ln(F)}\,(-10xb\ln(F)+15)\mathrm{e}^{xb\ln(F)}}{10b^{2}}+\frac{3(-b)^{\frac{5}{2}}\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{4b^{\frac{5}{2}}}\right)}{(-b)^{\frac{3}{2}}\ln(F)^{\frac{5}{2}}b}$	75

```
[In] int(F^(b*x+a)*x^(3/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a/(-b)^(3/2)/ln(F)^(5/2)/b*(-1/10*x^(1/2)*(-b)^(5/2)*ln(F)^(1/2)*(-10*x*
b*ln(F)+15)/b^2*exp(x*b*ln(F))+3/4*(-b)^(5/2)/b^(5/2)*Pi^(1/2)*erfi(b^(1/2)
*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 65, normalized size of antiderivative = 0.76

$$\int F^{a+bx}x^{3/2}\,dx = -\frac{3\,\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}\,\mathrm{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)-2\,\left(2\,b^{2}x\log\left(F\right)^{2}-3\,b\log\left(F\right)\right)F^{bx+a}\sqrt{x}}{4\,b^{3}\log\left(F\right)^{3}}$$

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

```
[Out] -1/4*(3*sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x)) - 2*(2*b^
2*x*log(F)^2 - 3*b*log(F))*F^(b*x + a)*sqrt(x))/(b^3*log(F)^3)
```

Sympy [F]

$$\int F^{a+bx}x^{3/2}\,dx = \int F^{a+bx}x^{\frac{3}{2}}\,dx$$

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

```
[Out] Integral(F**(a + b*x)*x**(3/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.28

$$\int F^{a+bx}x^{3/2}\,dx = -\frac{F^a x^{\frac{5}{2}}\Gamma\left(\frac{5}{2}, -bx\log\left(F\right)\right)}{\left(-bx\log\left(F\right)\right)^{\frac{5}{2}}}$$

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

```
[Out] -F^a*x^(5/2)*gamma(5/2, -b*x*log(F))/(-b*x*log(F))^(5/2)
```

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 70, normalized size of antiderivative = 0.82

$$\int F^{a+bx}x^{3/2}\,dx = -\frac{3\sqrt{\pi}F^a\operatorname{erf}\left(-\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{4\sqrt{-b\log\left(F\right)}b^2\log\left(F\right)^2} + \frac{\left(2\,bx^{\frac{3}{2}}\log\left(F\right) - 3\sqrt{x}\right)e^{\left(bx\log\left(F\right)+a\log\left(F\right)\right)}}{2\,b^2\log\left(F\right)^2}$$

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

```
[Out] -3/4*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b^2*log(F)
^2) + 1/2*(2*b*x^(3/2)*log(F) - 3*sqrt(x))*e^(b*x*log(F) + a*log(F))/(b^2*l
og(F)^2)
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 75, normalized size of antiderivative = 0.88

$$\int F^{a+bx}x^{3/2}\,dx = \frac{F^a\,F^{b\,x}\,x^{3/2}}{b\,\ln\left(F\right)} - \frac{3\,F^a\,F^{b\,x}\,\sqrt{x}}{2\,b^2\ln\left(F\right)^2} + \frac{3\,F^a\,x^{3/2}\,\sqrt{\pi}\operatorname{erfc}\left(\sqrt{-b\,x\,\ln\left(F\right)}\right)}{4\,b\,\ln\left(F\right)\,\left(-b\,x\,\ln\left(F\right)\right)^{3/2}}$$

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

```
[Out] (F^a*F^(b*x)*x^(3/2))/(b*log(F)) - (3*F^a*F^(b*x)*x^(1/2))/(2*b^2*log(F)^2)
 + (3*F^a*x^(3/2)*pi^(1/2)*erfc((-b*x*log(F))^(1/2)))/(4*b*log(F)*(-b*x*log
(F))^(3/2))
```

3.33 $\int F^{a+bx}\sqrt{x}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 62

$$\int F^{a+bx}\sqrt{x}\,dx = -\frac{F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)}+\frac{F^{a+bx}\sqrt{x}}{b\log(F)}$$

```
[Out] -1/2*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b^(3/2)/ln(F)^(3/2)+F^(
b*x+a)*x^(1/2)/b/ln(F)
```

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 62, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2207, 2211, 2235}

$$\int F^{a+bx}\sqrt{x}\,dx = \frac{\sqrt{x}F^{a+bx}}{b\log(F)}-\frac{\sqrt{\pi}F^a\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)}$$

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

```
[Out] -1/2*(F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(b^(3/2)*Log[F]^(3/2
)) + (F^(a + b*x)*Sqrt[x])/(b*Log[F])
```

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \frac{F^{a+bx}\sqrt{x}}{b\log(F)} - \frac{\int \frac{F^{a+bx}}{\sqrt{x}}\,dx}{2b\log(F)}\\ &= \frac{F^{a+bx}\sqrt{x}}{b\log(F)} - \frac{\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)}{b\log(F)}\\ &= -\frac{F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{2b^{3/2}\log^{\frac{3}{2}}(F)} + \frac{F^{a+bx}\sqrt{x}}{b\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.48

$$\int F^{a+bx}\sqrt{x}\,dx = -\frac{F^a x^{3/2}\Gamma\left(\frac{3}{2}, -bx\log(F)\right)}{(-bx\log(F))^{3/2}}$$

```
[In] Integrate[F^(a + b*x)*Sqrt[x],x]
[Out] -((F^a*x^(3/2)*Gamma[3/2, -(b*x*Log[F])])/(-(b*x*Log[F]))^(3/2))
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 66, normalized size of antiderivative = 1.06

method	result	size
meijerg	$-\frac{F^a\left(\frac{\sqrt{x}\,(-b)^{\frac{3}{2}}\sqrt{\ln(F)}\,e^{xb\ln(F)}}{b}-\frac{(-b)^{\frac{3}{2}}\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{2b^{\frac{3}{2}}}\right)}{\sqrt{-b}\,\ln(F)^{\frac{3}{2}}b}$	66

```
[In] int(F^(b*x+a)*x^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a/(-b)^(1/2)/ln(F)^(3/2)/b*(x^(1/2)*(-b)^(3/2)*ln(F)^(1/2)/b*exp(x*b*ln(
F))-1/2*(-b)^(3/2)/b^(3/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.82

$$\int F^{a+bx}\sqrt{x}\,dx = \frac{2\,F^{bx+a}b\sqrt{x}\log\left(F\right)+\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}\,\mathrm{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)}{2\,b^{2}\log\left(F\right)^{2}}$$

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="fricas")
```

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

Sympy [F]

$$\int F^{a+bx}\sqrt{x}\,dx = \int F^{a+bx}\sqrt{x}\,dx$$

```
[In] integrate(F**(b*x+a)*x**(1/2),x)
```

```
[Out] Integral(F**(a + b*x)*sqrt(x), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.39

$$\int F^{a+bx}\sqrt{x}\,dx = -\frac{F^{a}x^{\frac{3}{2}}\Gamma\left(\frac{3}{2},-bx\log\left(F\right)\right)}{\left(-bx\log\left(F\right)\right)^{\frac{3}{2}}}$$

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="maxima")
```

```
[Out] -F^a*x^(3/2)*gamma(3/2, -b*x*log(F))/(-b*x*log(F))^(3/2)
```

Giac [A] (verification not implemented)

none

Time = 0.31 (sec) , antiderivative size = 58, normalized size of antiderivative = 0.94

$$\int F^{a+bx}\sqrt{x}\,dx = \frac{\sqrt{\pi}F^a \operatorname{erf}\left(-\sqrt{-b\log(F)}\sqrt{x}\right)}{2\sqrt{-b\log(F)}b\log(F)} + \frac{\sqrt{x}e^{(bx\log(F)+a\log(F))}}{b\log(F)}$$

```
[In] integrate(F^(b*x+a)*x^(1/2),x, algorithm="giac")
```

```
[Out] 1/2*sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/(sqrt(-b*log(F))*b*log(F)) +
 sqrt(x)*e^(b*x*log(F) + a*log(F))/(b*log(F))
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 55, normalized size of antiderivative = 0.89

$$\int F^{a+bx}\sqrt{x}\,dx = \frac{F^a\,F^{b\,x}\,\sqrt{x}}{b\,\ln(F)} + \frac{F^a\,\sqrt{x}\,\sqrt{\pi}\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln(F)}\right)}{2\,b\,\ln(F)\,\sqrt{-b\,x\,\ln(F)}}$$

```
[In] int(F^(a + b*x)*x^(1/2),x)
```

```
[Out] (F^a*F^(b*x)*x^(1/2))/(b*log(F)) + (F^a*x^(1/2)*pi^(1/2)*erfc((-b*x*log(F))
^(1/2)))/(2*b*log(F)*(-b*x*log(F))^(1/2))
```

3.34 $\int \frac{F^{a+bx}}{\sqrt{x}}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 38

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx=\frac{F^a\sqrt{\pi}\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}$$

```
[Out] F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b^(1/2)/ln(F)^(1/2)
```

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 38, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.154, Rules used = {2211, 2235}

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx=\frac{\sqrt{\pi}F^a\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}$$

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

```
[Out] (F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]])/(Sqrt[b]*Sqrt[Log[F]])
```

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
```

```
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\text{integral} = 2\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right)$$
$$= \frac{F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)}{\sqrt{b}\sqrt{\log(F)}}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.79

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = -\frac{F^a\sqrt{x}\Gamma\left(\frac{1}{2}, -bx\log(F)\right)}{\sqrt{-bx\log(F)}}$$

```
[In] Integrate[F^(a + b*x)/Sqrt[x],x]
[Out] -((F^a*Sqrt[x]*Gamma[1/2, -(b*x*Log[F])])/Sqrt[-(b*x*Log[F])])
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.71

method	result	size
meijerg	$\frac{F^a\,\text{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)\sqrt{\pi}}{\sqrt{b}\,\sqrt{\ln(F)}}$	27

```
[In] int(F^(b*x+a)/x^(1/2),x,method=_RETURNVERBOSE)
[Out] F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*Pi^(1/2)/b^(1/2)/ln(F)^(1/2)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.89

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = -\frac{\sqrt{\pi}\sqrt{-b\log(F)}F^a\,\text{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)}{b\log(F)}$$

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="fricas")
[Out] -sqrt(pi)*sqrt(-b*log(F))*F^a*erf(sqrt(-b*log(F))*sqrt(x))/(b*log(F))
```

Sympy [F]

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = \int \frac{F^{a+bx}}{\sqrt{x}}\,dx$$

```
[In] integrate(F**(b*x+a)/x**(1/2),x)
[Out] Integral(F**(a + b*x)/sqrt(x), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.76

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = \frac{\sqrt{\pi}F^a\sqrt{x}\left(\operatorname{erf}\left(\sqrt{-bx\log(F)}\right)-1\right)}{\sqrt{-bx\log(F)}}$$

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="maxima")
[Out] sqrt(pi)*F^a*sqrt(x)*(erf(sqrt(-b*x*log(F))) - 1)/sqrt(-b*x*log(F))
```

Giac [A] (verification not implemented)

none

Time = 0.47 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.74

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = -\frac{\sqrt{\pi}F^a\operatorname{erf}\left(-\sqrt{-b\log(F)}\sqrt{x}\right)}{\sqrt{-b\log(F)}}$$

```
[In] integrate(F^(b*x+a)/x^(1/2),x, algorithm="giac")
[Out] -sqrt(pi)*F^a*erf(-sqrt(-b*log(F))*sqrt(x))/sqrt(-b*log(F))
```

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.84

$$\int \frac{F^{a+bx}}{\sqrt{x}}\,dx = \frac{F^a\operatorname{erfc}\left(\sqrt{-b\,x\,\ln(F)}\right)\,\sqrt{-\pi\,b\,x\,\ln(F)}}{b\,\sqrt{x}\,\ln(F)}$$

```
[In] int(F^(a + b*x)/x^(1/2),x)
[Out] (F^a*erfc((-b*x*log(F))^(1/2))*(-b*x*pi*log(F))^(1/2))/(b*x^(1/2)*log(F))
```

3.35 $\int \frac{F^{a+bx}}{x^{3/2}} dx$

Optimal result

Integrand size = 13, antiderivative size = 54

$$\int \frac{F^{a+bx}}{x^{3/2}} dx = -\frac{2F^{a+bx}}{\sqrt{x}} + 2\sqrt{b}F^a\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\sqrt{\log(F)}$$

```
[Out] -2*F^(b*x+a)/x^(1/2)+2*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*b^(1/2)*Pi^(1/
2)*ln(F)^(1/2)
```

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 54, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{a+bx}}{x^{3/2}} dx = 2\sqrt{\pi}\sqrt{b}F^a\sqrt{\log(F)}\,\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right) - \frac{2F^{a+bx}}{\sqrt{x}}$$

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

```
[Out] (-2*F^(a + b*x))/Sqrt[x] + 2*Sqrt[b]*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt
[Log[F]]]*Sqrt[Log[F]]
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{2F^{a+bx}}{\sqrt{x}} + (2b\log(F))\int \frac{F^{a+bx}}{\sqrt{x}}\,dx \\
&= -\frac{2F^{a+bx}}{\sqrt{x}} + (4b\log(F))\text{Subst}\left(\int F^{a+bx^2}\,dx, x, \sqrt{x}\right) \\
&= -\frac{2F^{a+bx}}{\sqrt{x}} + 2\sqrt{b}F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\sqrt{\log(F)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.70

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = -\frac{2F^a\left(F^{bx} - \Gamma\left(\frac{1}{2}, -bx\log(F)\right)\sqrt{-bx\log(F)}\right)}{\sqrt{x}}$$

```
[In] Integrate[F^(a + b*x)/x^(3/2),x]
[Out] (-2*F^a*(F^(b*x) - Gamma[1/2, -(b*x*Log[F])]*Sqrt[-(b*x*Log[F])]))/Sqrt[x]
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.19

method	result	size
meijerg	$-\frac{F^{a}(-b)^{\frac{3}{2}}\sqrt{\ln(F)}\left(-\frac{2\,\mathrm{e}^{xb\ln(F)}}{\sqrt{x}\,\sqrt{-b}\,\sqrt{\ln(F)}}+\frac{2\sqrt{b}\,\sqrt{\pi}\,\operatorname{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{\sqrt{-b}}\right)}{b}$	64

```
[In] int(F^(b*x+a)/x^(3/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a*(-b)^(3/2)*ln(F)^(1/2)/b*(-2/x^(1/2)/(-b)^(1/2)/ln(F)^(1/2)*exp(x*b*ln
(F))+2/(-b)^(1/2)*b^(1/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.81

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = -\frac{2\left(\sqrt{\pi}\sqrt{-b\log\left(F\right)}F^{a}x\operatorname{erf}\left(\sqrt{-b\log\left(F\right)}\sqrt{x}\right)+F^{bx+a}\sqrt{x}\right)}{x}$$

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="fricas")
[Out] -2*(sqrt(pi)*sqrt(-b*log(F))*F^a*x*erf(sqrt(-b*log(F))*sqrt(x)) + F^(b*x +
a)*sqrt(x))/x
```

Sympy [F]

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = \int \frac{F^{a+bx}}{x^{\frac{3}{2}}}\,dx$$

```
[In] integrate(F**(b*x+a)/x**(3/2),x)
[Out] Integral(F**(a + b*x)/x**(3/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.44

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = -\frac{\sqrt{-bx\log\left(F\right)}F^{a}\Gamma\left(-\frac{1}{2},-bx\log\left(F\right)\right)}{\sqrt{x}}$$

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="maxima")
[Out] -sqrt(-b*x*log(F))*F^a*gamma(-1/2, -b*x*log(F))/sqrt(x)
```

Giac [F]

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = \int \frac{F^{bx+a}}{x^{\frac{3}{2}}}\,dx$$

```
[In] integrate(F^(b*x+a)/x^(3/2),x, algorithm="giac")
[Out] integrate(F^(b*x + a)/x^(3/2), x)
```

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.78

$$\int \frac{F^{a+bx}}{x^{3/2}}\,dx = \frac{2\,F^a\,\sqrt{\pi}\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln\left(F\right)}\right)\,\sqrt{-b\,x\,\ln\left(F\right)}}{\sqrt{x}} - \frac{2\,F^a\,F^{b\,x}}{\sqrt{x}}$$

```
[In] int(F^(a + b*x)/x^(3/2),x)
[Out] (2*F^a*pi^(1/2)*erfc((-b*x*log(F))^(1/2))*(-b*x*log(F))^(1/2))/x^(1/2) - (2
*F^a*F^(b*x))/x^(1/2)
```

3.36 $\int \frac{F^{a+bx}}{x^{5/2}}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 77

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx=-\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{4}{3}b^{3/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{3}{2}}(F)$$

```
[Out] -2/3*F^(b*x+a)/x^(3/2)+4/3*b^(3/2)*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*ln
(F)^(3/2)*Pi^(1/2)-4/3*b*F^(b*x+a)*ln(F)/x^(1/2)
```

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 77, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx=\frac{4}{3}\sqrt{\pi}b^{3/2}F^a\log^{\frac{3}{2}}(F)\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)-\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4b\log(F)F^{a+bx}}{3\sqrt{x}}$$

```
[In] Int[F^(a + b*x)/x^(5/2),x]
```

```
[Out] (-2*F^(a + b*x))/(3*x^(3/2)) - (4*b*F^(a + b*x)*Log[F])/(3*Sqrt[x]) + (4*b^
(3/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(3/2))/3
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}\text{integral} &= -\frac{2F^{a+bx}}{3x^{3/2}}+\frac{1}{3}(2b\log(F))\int\frac{F^{a+bx}}{x^{3/2}}\,dx\\ &= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{1}{3}\left(4b^2\log^2(F)\right)\int\frac{F^{a+bx}}{\sqrt{x}}\,dx\\ &= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{1}{3}\left(8b^2\log^2(F)\right)\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)\\ &= -\frac{2F^{a+bx}}{3x^{3/2}}-\frac{4bF^{a+bx}\log(F)}{3\sqrt{x}}+\frac{4}{3}b^{3/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{3}{2}}(F)\end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 49, normalized size of antiderivative = 0.64

$$\int\frac{F^{a+bx}}{x^{5/2}}\,dx=-\frac{2F^a\left(2\Gamma\left(\frac{1}{2},-bx\log(F)\right)(-bx\log(F))^{3/2}+F^{bx}(1+2bx\log(F))\right)}{3x^{3/2}}$$

```
[In] Integrate[F^(a + b*x)/x^(5/2),x]
[Out] (-2*F^a*(2*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(3/2) + F^(b*x)*(1 + 2
*b*x*Log[F])))/(3*x^(3/2))
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 72, normalized size of antiderivative = 0.94

method	result	size
meijerg	$-\frac{F^{a}(-b)^{\frac{5}{2}}\ln(F)^{\frac{3}{2}}\left(-\frac{2(2xb\ln(F)+1)e^{xb\ln(F)}}{3x^{\frac{3}{2}}(-b)^{\frac{3}{2}}\ln(F)^{\frac{3}{2}}}+\frac{4b^{\frac{3}{2}}\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{3(-b)^{\frac{3}{2}}}\right)}{b}$	72

```
[In] int(F^(b*x+a)/x^(5/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a*(-b)^(5/2)*ln(F)^(3/2)/b*(-2/3/x^(3/2)/(-b)^(3/2)/ln(F)^(3/2)*(2*x*b*l
n(F)+1)*exp(x*b*ln(F))+4/3/(-b)^(3/2)*b^(3/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)
*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 58, normalized size of antiderivative = 0.75

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx = -\frac{2\left(2\sqrt{\pi}\sqrt{-b\log(F)}F^{a}bx^{2}\,\mathrm{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)\log(F)+(2\,bx\log(F)+1)F^{bx+a}\sqrt{x}\right)}{3\,x^{2}}$$

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="fricas")
```

```
[Out] -2/3*(2*sqrt(pi)*sqrt(-b*log(F))*F^a*b*x^2*erf(sqrt(-b*log(F))*sqrt(x))*log
(F) + (2*b*x*log(F) + 1)*F^(b*x + a)*sqrt(x))/x^2
```

Sympy [F]

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx = \int \frac{F^{a+bx}}{x^{\frac{5}{2}}}\,dx$$

```
[In] integrate(F**(b*x+a)/x**(5/2),x)
```

```
[Out] Integral(F**(a + b*x)/x**(5/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.31

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx = -\frac{\left(-bx\log\left(F\right)\right)^{\frac{3}{2}}F^{a}\Gamma\left(-\frac{3}{2},-bx\log\left(F\right)\right)}{x^{\frac{3}{2}}}$$

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="maxima")
[Out] -(-b*x*log(F))^(3/2)*F^a*gamma(-3/2, -b*x*log(F))/x^(3/2)
```

Giac [F]

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx = \int \frac{F^{bx+a}}{x^{\frac{5}{2}}}\,dx$$

```
[In] integrate(F^(b*x+a)/x^(5/2),x, algorithm="giac")
[Out] integrate(F^(b*x + a)/x^(5/2), x)
```

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.79

$$\int \frac{F^{a+bx}}{x^{5/2}}\,dx = \frac{4\,F^{a}\,b\,\sqrt{\pi}\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln\left(F\right)}\right)\,\ln\left(F\right)\,\sqrt{-b\,x\,\ln\left(F\right)}}{3\,\sqrt{x}} - \frac{4\,F^{a}\,F^{b\,x}\,b\,\ln\left(F\right)}{3\,\sqrt{x}} - \frac{2\,F^{a}\,F^{b\,x}}{3\,x^{3/2}}$$

```
[In] int(F^(a + b*x)/x^(5/2),x)
[Out] (4*F^a*b*pi^(1/2)*erfc((-b*x*log(F))^(1/2))*log(F)*(-b*x*log(F))^(1/2))/(3*
x^(1/2)) - (4*F^a*F^(b*x)*b*log(F))/(3*x^(1/2)) - (2*F^a*F^(b*x))/(3*x^(3/2
))
```

3.37 $\int \frac{F^{a+bx}}{x^{7/2}} dx$

Optimal result

Integrand size = 13, antiderivative size = 100

$$\int \frac{F^{a+bx}}{x^{7/2}} dx = -\frac{2F^{a+bx}}{5x^{5/2}} - \frac{4bF^{a+bx}\log(F)}{15x^{3/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}} + \frac{8}{15}b^{5/2}F^a\sqrt{\pi}\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{5}{2}}(F)$$

```
[Out] -2/5*F^(b*x+a)/x^(5/2)-4/15*b*F^(b*x+a)*ln(F)/x^(3/2)+8/15*b^(5/2)*F^a*erfi
(b^(1/2)*x^(1/2)*ln(F)^(1/2))*ln(F)^(5/2)*Pi^(1/2)-8/15*b^2*F^(b*x+a)*ln(F)
^2/x^(1/2)
```

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 100, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{a+bx}}{x^{7/2}} dx = \frac{8}{15}\sqrt{\pi}b^{5/2}F^a\log^{\frac{5}{2}}(F)\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right) - \frac{8b^2\log^2(F)F^{a+bx}}{15\sqrt{x}} - \frac{2F^{a+bx}}{5x^{5/2}} - \frac{4b\log(F)F^{a+bx}}{15x^{3/2}}$$

```
[In] Int[F^(a + b*x)/x^(7/2),x]
```

```
[Out] (-2*F^(a + b*x))/(5*x^(5/2)) - (4*b*F^(a + b*x)*Log[F])/(15*x^(3/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(15*Sqrt[x]) + (8*b^(5/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b
]*Sqrt[x]*Sqrt[Log[F]]]*Log[F]^(5/2))/15
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{2F^{a+bx}}{5x^{5/2}}+\frac{1}{5}(2b\log(F))\int\frac{F^{a+bx}}{x^{5/2}}\,dx\\
&= -\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4bF^{a+bx}\log(F)}{15x^{3/2}}+\frac{1}{15}\left(4b^2\log^2(F)\right)\int\frac{F^{a+bx}}{x^{3/2}}\,dx\\
&= -\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4bF^{a+bx}\log(F)}{15x^{3/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}}+\frac{1}{15}\left(8b^3\log^3(F)\right)\int\frac{F^{a+bx}}{\sqrt{x}}\,dx\\
&= -\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4bF^{a+bx}\log(F)}{15x^{3/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}}\\
&\quad+\frac{1}{15}\left(16b^3\log^3(F)\right)\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)\\
&= -\frac{2F^{a+bx}}{5x^{5/2}}-\frac{4bF^{a+bx}\log(F)}{15x^{3/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{15\sqrt{x}}+\frac{8}{15}b^{5/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{5}{2}}(F)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.13 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.61

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = -\frac{2F^a\left(-4\Gamma\left(\frac{1}{2},-bx\log(F)\right)(-bx\log(F))^{5/2}+F^{bx}\left(3+2bx\log(F)+4b^2x^2\log^2(F)\right)\right)}{15x^{5/2}}$$

```
[In] Integrate[F^(a + b*x)/x^(7/2),x]
```

```
[Out] (-2*F^a*(-4*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(5/2) + F^(b*x)*(3 +
2*b*x*Log[F] + 4*b^2*x^2*Log[F]^2)))/(15*x^(5/2))
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 84, normalized size of antiderivative = 0.84

method	result	size
meijerg	$-\frac{F^a(-b)^{\frac{7}{2}}\ln(F)^{\frac{5}{2}}\left(-\frac{2\left(\frac{4b^2x^2\ln(F)^2}{3}+\frac{2xb\ln(F)}{3}+1\right)e^{xb\ln(F)}}{5x^{\frac{5}{2}}(-b)^{\frac{5}{2}}\ln(F)^{\frac{5}{2}}}+\frac{8b^{\frac{5}{2}}\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\ln(F)}\right)}{15(-b)^{\frac{5}{2}}}\right)}{b}$	84

```
[In] int(F^(b*x+a)/x^(7/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a*(-b)^(7/2)*ln(F)^(5/2)/b*(-2/5/x^(5/2)/(-b)^(5/2)/ln(F)^(5/2)*(4/3*b^2
*x^2*ln(F)^2+2/3*x*b*ln(F)+1)*exp(x*b*ln(F))+8/15/(-b)^(5/2)*b^(5/2)*Pi^(1/
2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 74, normalized size of antiderivative = 0.74

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = -\frac{2\left(4\sqrt{\pi}\sqrt{-b\log(F)}F^ab^2x^3\,\mathrm{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)\log(F)^2+\left(4\,b^2x^2\log(F)^2+2\,bx\log(F)+3\right)F^{bx+a}\sqrt{x}\right)}{15\,x^3}$$

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="fricas")
```

```
[Out] -2/15*(4*sqrt(pi)*sqrt(-b*log(F))*F^a*b^2*x^3*erf(sqrt(-b*log(F))*sqrt(x))*
log(F)^2 + (4*b^2*x^2*log(F)^2 + 2*b*x*log(F) + 3)*F^(b*x + a)*sqrt(x))/x^3
```

Sympy [F]

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = \int \frac{F^{a+bx}}{x^{\frac{7}{2}}}\,dx$$

```
[In] integrate(F**(b*x+a)/x**(7/2),x)
[Out] Integral(F**(a + b*x)/x**(7/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.24

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = -\frac{(-bx\log(F))^{\frac{5}{2}}\,F^a\Gamma\left(-\frac{5}{2},-bx\log(F)\right)}{x^{\frac{5}{2}}}$$

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="maxima")
[Out] -(-b*x*log(F))^(5/2)*F^a*gamma(-5/2, -b*x*log(F))/x^(5/2)
```

Giac [F]

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = \int \frac{F^{bx+a}}{x^{\frac{7}{2}}}\,dx$$

```
[In] integrate(F^(b*x+a)/x^(7/2),x, algorithm="giac")
[Out] integrate(F^(b*x + a)/x^(7/2), x)
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 80, normalized size of antiderivative = 0.80

$$\int \frac{F^{a+bx}}{x^{7/2}}\,dx = -\frac{\frac{2\,F^{a+b\,x}}{5}+\frac{4\,F^{a+b\,x}\,b\,x\,\ln(F)}{15}+\frac{8\,F^{a+b\,x}\,b^2\,x^2\,\ln(F)^2}{15}-\frac{8\,F^a\,b^2\,x^2\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln(F)}\right)\,\ln(F)^2\,\sqrt{-\pi\,b\,x\,\ln(F)}}{15}}{x^{5/2}}$$

```
[In] int(F^(a + b*x)/x^(7/2),x)
[Out] -((2*F^(a + b*x))/5 + (4*F^(a + b*x)*b*x*log(F))/15 + (8*F^(a + b*x)*b^2*x^
2*log(F)^2)/15 - (8*F^a*b^2*x^2*erfc((-b*x*log(F))^(1/2))*log(F)^2*(-b*x*pi
*log(F))^(1/2))/15)/x^(5/2)
```

3.38 $\int \frac{F^{a+bx}}{x^{9/2}}\,dx$

Optimal result

Integrand size = 13, antiderivative size = 123

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{2F^{a+bx}}{7x^{7/2}} - \frac{4bF^{a+bx}\log(F)}{35x^{5/2}} - \frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}} - \frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}} + \frac{16}{105}b^{7/2}F^a\sqrt{\pi}\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{7}{2}}(F)$$

```
[Out] -2/7*F^(b*x+a)/x^(7/2)-4/35*b*F^(b*x+a)*ln(F)/x^(5/2)-8/105*b^2*F^(b*x+a)*l
n(F)^2/x^(3/2)+16/105*b^(7/2)*F^a*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2))*ln(F)^(
7/2)*Pi^(1/2)-16/105*b^3*F^(b*x+a)*ln(F)^3/x^(1/2)
```

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 123, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.231, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = \frac{16}{105}\sqrt{\pi}b^{7/2}F^a\log^{\frac{7}{2}}(F)\operatorname{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right) - \frac{16b^3\log^3(F)F^{a+bx}}{105\sqrt{x}} - \frac{8b^2\log^2(F)F^{a+bx}}{105x^{3/2}} - \frac{2F^{a+bx}}{7x^{7/2}} - \frac{4b\log(F)F^{a+bx}}{35x^{5/2}}$$

```
[In] Int[F^(a + b*x)/x^(9/2),x]
```

```
[Out] (-2*F^(a + b*x))/(7*x^(7/2)) - (4*b*F^(a + b*x)*Log[F])/(35*x^(5/2)) - (8*b
^2*F^(a + b*x)*Log[F]^2)/(105*x^(3/2)) - (16*b^3*F^(a + b*x)*Log[F]^3)/(105
*Sqrt[x]) + (16*b^(7/2)*F^a*Sqrt[Pi]*Erfi[Sqrt[b]*Sqrt[x]*Sqrt[Log[F]]]*Log
[F]^(7/2))/105
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= -\frac{2F^{a+bx}}{7x^{7/2}}+\frac{1}{7}(2b\log(F))\int\frac{F^{a+bx}}{x^{7/2}}\,dx\\
&= -\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4bF^{a+bx}\log(F)}{35x^{5/2}}+\frac{1}{35}\left(4b^2\log^2(F)\right)\int\frac{F^{a+bx}}{x^{5/2}}\,dx\\
&= -\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4bF^{a+bx}\log(F)}{35x^{5/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}}+\frac{1}{105}\left(8b^3\log^3(F)\right)\int\frac{F^{a+bx}}{x^{3/2}}\,dx\\
&= -\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4bF^{a+bx}\log(F)}{35x^{5/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}}\\
&\quad-\frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}}+\frac{1}{105}\left(16b^4\log^4(F)\right)\int\frac{F^{a+bx}}{\sqrt{x}}\,dx\\
&= -\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4bF^{a+bx}\log(F)}{35x^{5/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}}-\frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}}\\
&\quad+\frac{1}{105}\left(32b^4\log^4(F)\right)\text{Subst}\left(\int F^{a+bx^2}\,dx,x,\sqrt{x}\right)\\
&= -\frac{2F^{a+bx}}{7x^{7/2}}-\frac{4bF^{a+bx}\log(F)}{35x^{5/2}}-\frac{8b^2F^{a+bx}\log^2(F)}{105x^{3/2}}\\
&\quad-\frac{16b^3F^{a+bx}\log^3(F)}{105\sqrt{x}}+\frac{16}{105}b^{7/2}F^a\sqrt{\pi}\,\text{erfi}\left(\sqrt{b}\sqrt{x}\sqrt{\log(F)}\right)\log^{\frac{7}{2}}(F)
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.15 (sec) , antiderivative size = 73, normalized size of antiderivative = 0.59

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{2F^a\left(8\Gamma\left(\frac{1}{2},-bx\log(F)\right)(-bx\log(F))^{7/2}+F^{bx}\left(15+6bx\log(F)+4b^2x^2\log^2(F)+8b^3x^3\log^3(F)\right)\right)}{105x^{7/2}}$$

```
[In] Integrate[F^(a + b*x)/x^(9/2),x]
```

```
[Out] (-2*F^a*(8*Gamma[1/2, -(b*x*Log[F])]*(-(b*x*Log[F]))^(7/2) + F^(b*x)*(15 +
6*b*x*Log[F] + 4*b^2*x^2*Log[F]^2 + 8*b^3*x^3*Log[F]^3)))/(105*x^(7/2))
```

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.78

method	result	size
meijerg	$-\frac{F^{a}(-b)^{\frac{9}{2}}\ln(F)^{\frac{7}{2}}\left(-\frac{2\left(\frac{8b^{3}x^{3}\ln(F)^{3}}{15}+\frac{4b^{2}x^{2}\ln(F)^{2}}{15}+\frac{2xb\ln(F)}{5}+1\right)e^{xb\ln(F)}}{7x^{\frac{7}{2}}(-b)^{\frac{7}{2}}\ln(F)^{\frac{7}{2}}}+\frac{16b^{\frac{7}{2}}\sqrt{\pi}\,\mathrm{erfi}\left(\sqrt{b}\,\sqrt{x}\,\sqrt{\ln(F)}\right)}{105(-b)^{\frac{7}{2}}}\right)}{b}$	96

```
[In] int(F^(b*x+a)/x^(9/2),x,method=_RETURNVERBOSE)
```

```
[Out] -F^a*(-b)^(9/2)*ln(F)^(7/2)/b*(-2/7/x^(7/2)/(-b)^(7/2)/ln(F)^(7/2)*(8/15*b^
3*x^3*ln(F)^3+4/15*b^2*x^2*ln(F)^2+2/5*x*b*ln(F)+1)*exp(x*b*ln(F))+16/105/(
-b)^(7/2)*b^(7/2)*Pi^(1/2)*erfi(b^(1/2)*x^(1/2)*ln(F)^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 86, normalized size of antiderivative = 0.70

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{2\left(8\sqrt{\pi}\sqrt{-b\log(F)}F^ab^3x^4\operatorname{erf}\left(\sqrt{-b\log(F)}\sqrt{x}\right)\log(F)^3+\left(8b^3x^3\log(F)^3+4b^2x^2\log(F)^2+6bx\log(\right.\right.}{105x^4}$$

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="fricas")
```

```
[Out] -2/105*(8*sqrt(pi)*sqrt(-b*log(F))*F^a*b^3*x^4*erf(sqrt(-b*log(F))*sqrt(x))
*log(F)^3 + (8*b^3*x^3*log(F)^3 + 4*b^2*x^2*log(F)^2 + 6*b*x*log(F) + 15)*F
^(b*x + a)*sqrt(x))/x^4
```

Sympy [F]

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = \int \frac{F^{a+bx}}{x^{\frac{9}{2}}}\,dx$$

```
[In] integrate(F**(b*x+a)/x**(9/2),x)
[Out] Integral(F**(a + b*x)/x**(9/2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.20

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{(-bx\log(F))^{\frac{7}{2}}F^a\Gamma\left(-\frac{7}{2}, -bx\log(F)\right)}{x^{\frac{7}{2}}}$$

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="maxima")
[Out] -(-b*x*log(F))^(7/2)*F^a*gamma(-7/2, -b*x*log(F))/x^(7/2)
```

Giac [F]

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = \int \frac{F^{bx+a}}{x^{\frac{9}{2}}}\,dx$$

```
[In] integrate(F^(b*x+a)/x^(9/2),x, algorithm="giac")
[Out] integrate(F^(b*x + a)/x^(9/2), x)
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.80

$$\int \frac{F^{a+bx}}{x^{9/2}}\,dx = -\frac{\frac{2F^{a+bx}}{7} + \frac{4F^{a+bx}\,b\,x\,\ln(F)}{35} + \frac{8F^{a+bx}\,b^2\,x^2\ln(F)^2}{105} + \frac{16F^{a+bx}\,b^3\,x^3\ln(F)^3}{105} - \frac{16F^a\,b^3\,x^3\,\mathrm{erfc}\left(\sqrt{-b\,x\,\ln(F)}\right)\ln(F)^3\sqrt{-\pi\,b\,x\,\ln(F)}}{105}}{x^{7/2}}$$

```
[In] int(F^(a + b*x)/x^(9/2),x)
[Out] -((2*F^(a + b*x))/7 + (4*F^(a + b*x)*b*x*log(F))/35 + (8*F^(a + b*x)*b^2*x^
2*log(F)^2)/105 + (16*F^(a + b*x)*b^3*x^3*log(F)^3)/105 - (16*F^a*b^3*x^3*e
rfc((-b*x*log(F))^(1/2))*log(F)^3*(-b*x*pi*log(F))^(1/2))/105)/x^(7/2)
```

3.39 $\int F^{c(a+bx)}(d+ex)^{7/2}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 208

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \frac{105e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)}$$

```
[Out] 35/4*e^2*F^(c*(b*x+a))*(e*x+d)^(3/2)/b^3/c^3/ln(F)^3-7/2*e*F^(c*(b*x+a))*(e
*x+d)^(5/2)/b^2/c^2/ln(F)^2+F^(c*(b*x+a))*(e*x+d)^(7/2)/b/c/ln(F)+105/16*e^
(7/2)*F^(c*(a-b*d/e))*erfi(b^(1/2)*c^(1/2)*(e*x+d)^(1/2)*ln(F)^(1/2)/e^(1/2
))*Pi^(1/2)/b^(9/2)/c^(9/2)/ln(F)^(9/2)-105/8*e^3*F^(c*(b*x+a))*(e*x+d)^(1/
2)/b^4/c^4/ln(F)^4
```

Rubi [A] (verified)

Time = 0.18 (sec) , antiderivative size = 208, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2207, 2211, 2235}

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \frac{105\sqrt{\pi}e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105e^3\sqrt{d+ex}F^{c(a+bx)}}{8b^4c^4\log^4(F)} + \frac{35e^2(d+ex)^{3/2}F^{c(a+bx)}}{4b^3c^3\log^3(F)} - \frac{7e(d+ex)^{5/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)} + \frac{(d+ex)^{7/2}F^{c(a+bx)}}{bc\log(F)}$$

```
[In] Int[F^(c*(a + b*x))*(d + e*x)^(7/2),x]
```

```
[Out] (105*e^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(16*b^(9/2)*c^(9/2)*Log[F]^(9/2)) - (105*e^3*F^(
c*(a + b*x))*Sqrt[d + e*x])/(8*b^4*c^4*Log[F]^4) + (35*e^2*F^(c*(a + b*x))*
(d + e*x)^(3/2))/(4*b^3*c^3*Log[F]^3) - (7*e*F^(c*(a + b*x))*(d + e*x)^(5/2
))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(7/2))/(b*c*Log[F])
```

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} - \frac{(7e)\int F^{c(a+bx)}(d+ex)^{5/2}\,dx}{2bc\log(F)} \\
&= -\frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} + \frac{(35e^2)\int F^{c(a+bx)}(d+ex)^{3/2}\,dx}{4b^2c^2\log^2(F)} \\
&= \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} \\
&\quad + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} - \frac{(105e^3)\int F^{c(a+bx)}\sqrt{d+ex}\,dx}{8b^3c^3\log^3(F)} \\
&= -\frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} \\
&\quad - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} + \frac{(105e^4)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{16b^4c^4\log^4(F)}
\end{aligned}$$

$$= -\frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)} + \frac{(105e^3)\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{8b^4c^4\log^4(F)}$$

$$= \frac{105e^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{16b^{9/2}c^{9/2}\log^{\frac{9}{2}}(F)} - \frac{105e^3F^{c(a+bx)}\sqrt{d+ex}}{8b^4c^4\log^4(F)} + \frac{35e^2F^{c(a+bx)}(d+ex)^{3/2}}{4b^3c^3\log^3(F)} - \frac{7eF^{c(a+bx)}(d+ex)^{5/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{7/2}}{bc\log(F)}$$

Mathematica [A] (verified)

Time = 0.19 (sec) , antiderivative size = 72, normalized size of antiderivative = 0.35

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \frac{e^4F^{c\left(a-\frac{bd}{e}\right)}\Gamma\left(\frac{9}{2}, -\frac{bc(d+ex)\log(F)}{e}\right)\sqrt{-\frac{bc(d+ex)\log(F)}{e}}}{b^5c^5\sqrt{d+ex}\log^5(F)}$$

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(7/2),x]
```

```
[Out] (e^4*F^(c*(a - (b*d)/e))*Gamma[9/2, -((b*c*(d + e*x)*Log[F])/e)]*Sqrt[-((b*
c*(d + e*x)*Log[F])/e)])/(b^5*c^5*Sqrt[d + e*x]*Log[F]^5)
```

Maple [F]

$$\int F^{c(bx+a)}(ex+d)^{\frac{7}{2}}\,dx$$

```
[In] int(F^(c*(b*x+a))*(e*x+d)^(7/2),x)
```

```
[Out] int(F^(c*(b*x+a))*(e*x+d)^(7/2),x)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 230, normalized size of antiderivative = 1.11

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = -\frac{\frac{105\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^4\,\text{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}} + 2\left(105\,bce^3\log(F) - 8\left(b^4c^4e^3x^3 + 3\,b^4c^4de^2x^2 + 3\,b^4c^4d^2ex + b^4c^4d^3\right.\right.}{16\,b^5c^5}$$

[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="fricas")

[Out] -1/16*(105*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^4*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))/F^((b*c*d - a*c*e)/e) + 2*(105*b*c*e^3*log(F) - 8*(b^4*c^4*e^3*x^3 + 3*b^4*c^4*d*e^2*x^2 + 3*b^4*c^4*d^2*e*x + b^4*c^4*d^3)*log(F)^4 + 28*(b^3*c^3*e^3*x^2 + 2*b^3*c^3*d*e^2*x + b^3*c^3*d^2*e)*log(F)^3 - 70*(b^2*c^2*e^3*x + b^2*c^2*d*e^2)*log(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^5*c^5*log(F)^5)

Sympy [F(-1)]

Timed out.

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \text{Timed out}$$

[In] integrate(F**(c*(b*x+a))*(e*x+d)**(7/2),x)

[Out] Timed out

Maxima [F]

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \int (ex+d)^{\frac{7}{2}} F^{(bx+a)c}\,dx$$

[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="maxima")

[Out] integrate((e*x + d)^(7/2)*F^((b*x + a)*c), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1023 vs. $2(172) = 344$.

Time = 0.46 (sec) , antiderivative size = 1023, normalized size of antiderivative = 4.92

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx = \text{Too large to display}$$

[In] integrate(F^(c*(b*x+a))*(e*x+d)^(7/2),x, algorithm="giac")

[Out] -1/16*(16*sqrt(pi)*d^4*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/sqrt(-b*c*e*log(F)) - 32*d^3*(sqrt(pi)*(2*b*c*d*log(F) + e)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2*sqrt(e*x + d)*e*e^(((e*x + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b*c*log(F))) + 24*d^2*(sqrt(pi)*(4*b^2*c^2*d^2*log(F)^2 + 4*b*c*d*e*log(F) + 3*e^2)*e*erf(-s

```
qrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(s
qrt(-b*c*e*log(F))*b^2*c^2*log(F)^2) - 2*(2*(e*x + d)^(3/2)*b*c*e*log(F) -
4*sqrt(e*x + d)*b*c*d*e*log(F) - 3*sqrt(e*x + d)*e^2)*e^(((e*x + d)*b*c*log
(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b^2*c^2*log(F)^2)) - 8*d*(sqrt(pi)*(
8*b^3*c^3*d^3*log(F)^3 + 12*b^2*c^2*d^2*e*log(F)^2 + 18*b*c*d*e^2*log(F) +
15*e^3)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c
*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b^3*c^3*log(F)^3) + 2*(4*(e*x + d)^(5/2)
*b^2*c^2*e*log(F)^2 - 12*(e*x + d)^(3/2)*b^2*c^2*d*e*log(F)^2 + 12*sqrt(e*x
 + d)*b^2*c^2*d^2*e*log(F)^2 - 10*(e*x + d)^(3/2)*b*c*e^2*log(F) + 18*sqrt(
e*x + d)*b*c*d*e^2*log(F) + 15*sqrt(e*x + d)*e^3)*e^(((e*x + d)*b*c*log(F)
- b*c*d*log(F) + a*c*e*log(F))/e)/(b^3*c^3*log(F)^3)) + sqrt(pi)*(16*b^4*c^
4*d^4*log(F)^4 + 32*b^3*c^3*d^3*e*log(F)^3 + 72*b^2*c^2*d^2*e^2*log(F)^2 +
120*b*c*d*e^3*log(F) + 105*e^4)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)
*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b^4*c^4*log(F)^4
) - 2*(8*(e*x + d)^(7/2)*b^3*c^3*e*log(F)^3 - 32*(e*x + d)^(5/2)*b^3*c^3*d*
e*log(F)^3 + 48*(e*x + d)^(3/2)*b^3*c^3*d^2*e*log(F)^3 - 32*sqrt(e*x + d)*b
^3*c^3*d^3*e*log(F)^3 - 28*(e*x + d)^(5/2)*b^2*c^2*e^2*log(F)^2 + 80*(e*x +
 d)^(3/2)*b^2*c^2*d*e^2*log(F)^2 - 72*sqrt(e*x + d)*b^2*c^2*d^2*e^2*log(F)^
2 + 70*(e*x + d)^(3/2)*b*c*e^3*log(F) - 120*sqrt(e*x + d)*b*c*d*e^3*log(F)
- 105*sqrt(e*x + d)*e^4)*e^(((e*x + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*lo
g(F))/e)/(b^4*c^4*log(F)^4))/e
```

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}(d+ex)^{7/2}\,dx=\int F^{c\,(a+b\,x)}\,{(d+e\,x)}^{7/2}\,dx$$

```
[In] int(F^(c*(a + b*x))*(d + e*x)^(7/2),x)
[Out] int(F^(c*(a + b*x))*(d + e*x)^(7/2), x)
```

3.40 $\int F^{c(a+bx)}(d+ex)^{5/2}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 173

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = -\frac{15e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)}$$

```
[Out] -5/2*e*F^(c*(b*x+a))*(e*x+d)^(3/2)/b^2/c^2/ln(F)^2+F^(c*(b*x+a))*(e*x+d)^(5
/2)/b/c/ln(F)-15/8*e^(5/2)*F^(c*(a-b*d/e))*erfi(b^(1/2)*c^(1/2)*(e*x+d)^(1/
2)*ln(F)^(1/2)/e^(1/2))*Pi^(1/2)/b^(7/2)/c^(7/2)/ln(F)^(7/2)+15/4*e^2*F^(c*
(b*x+a))*(e*x+d)^(1/2)/b^3/c^3/ln(F)^3
```

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 173, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2207, 2211, 2235}

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = -\frac{15\sqrt{\pi}e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15e^2\sqrt{d+ex}F^{c(a+bx)}}{4b^3c^3\log^3(F)} - \frac{5e(d+ex)^{3/2}F^{c(a+bx)}}{2b^2c^2\log^2(F)} + \frac{(d+ex)^{5/2}F^{c(a+bx)}}{bc\log(F)}$$

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

```
[Out] (-15*e^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*
x]*Sqrt[Log[F]])/Sqrt[e]])/(8*b^(7/2)*c^(7/2)*Log[F]^(7/2)) + (15*e^2*F^(c*
```

```
(a + b*x))*Sqrt[d + e*x])/(4*b^3*c^3*Log[F]^3) - (5*e*F^(c*(a + b*x))*(d +
e*x)^(3/2))/(2*b^2*c^2*Log[F]^2) + (F^(c*(a + b*x))*(d + e*x)^(5/2))/(b*c*L
og[F])
```

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} - \frac{(5e)\int F^{c(a+bx)}(d+ex)^{3/2}\,dx}{2bc\log(F)} \\
&= -\frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} + \frac{(15e^2)\int F^{c(a+bx)}\sqrt{d+ex}\,dx}{4b^2c^2\log^2(F)} \\
&= \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} - \frac{(15e^3)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{8b^3c^3\log^3(F)} \\
&= \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)} \\
&\quad - \frac{(15e^2)\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{4b^3c^3\log^3(F)} \\
&= -\frac{15e^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{8b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)} + \frac{15e^2F^{c(a+bx)}\sqrt{d+ex}}{4b^3c^3\log^3(F)} \\
&\quad - \frac{5eF^{c(a+bx)}(d+ex)^{3/2}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{5/2}}{bc\log(F)}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.13 (sec) , antiderivative size = 72, normalized size of antiderivative = 0.42

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \frac{e^2F^{c\left(a-\frac{bd}{e}\right)}\sqrt{d+ex}\,\Gamma\left(\frac{7}{2},-\frac{bc(d+ex)\log(F)}{e}\right)}{b^3c^3\log^3(F)\sqrt{-\frac{bc(d+ex)\log(F)}{e}}}$$

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

```
[Out] (e^2*F^(c*(a - (b*d)/e))*Sqrt[d + e*x]*Gamma[7/2, -((b*c*(d + e*x)*Log[F])/
e)])/(b^3*c^3*Log[F]^3*Sqrt[-((b*c*(d + e*x)*Log[F])/e)])
```

Maple [F]

$$\int F^{c(bx+a)}(ex+d)^{\frac{5}{2}}\,dx$$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 167, normalized size of antiderivative = 0.97

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \frac{\frac{15\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^3\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}} + 2\left(15\,bce^2\log\left(F\right) + 4\left(b^3c^3e^2x^2 + 2\,b^3c^3dex + b^3c^3d^2\right)\log}{8\,b^4c^4\log\left(F\right)^4}$$

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

```
[Out] 1/8*(15*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^3*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)
/e))/F^((b*c*d - a*c*e)/e) + 2*(15*b*c*e^2*log(F) + 4*(b^3*c^3*e^2*x^2 + 2*
b^3*c^3*d*e*x + b^3*c^3*d^2)*log(F)^3 - 10*(b^2*c^2*e^2*x + b^2*c^2*d*e)*lo
g(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^4*c^4*log(F)^4)
```

Sympy [F]

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \int F^{c(a+bx)}(d+ex)^{\frac{5}{2}}\,dx$$

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

Maxima [F]

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \int (ex+d)^{\frac{5}{2}}F^{(bx+a)c}\,dx$$

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

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 643 vs. $2(141) = 282$.

Time = 0.43 (sec) , antiderivative size = 643, normalized size of antiderivative = 3.72

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx =$$

$$-\frac{\frac{8\sqrt{\pi}d^3e\,\mathrm{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}} - 12\,d^2\left(\frac{\sqrt{\pi}(2\,bcd\log(F)+e)e\,\mathrm{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log}{e}\right.}}{\sqrt{-bce\log(F)}bc\log(F)}\right.}{}$$

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(5/2),x, algorithm="giac")
[Out] -1/8*(8*sqrt(pi)*d^3*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d
*log(F) - a*c*e*log(F))/e)/sqrt(-b*c*e*log(F)) - 12*d^2*(sqrt(pi)*(2*b*c*d*
log(F) + e)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) -
 a*c*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2*sqrt(e*x + d)*e*e^((
(e*x + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b*c*log(F))) + 6*d*
(sqrt(pi)*(4*b^2*c^2*d^2*log(F)^2 + 4*b*c*d*e*log(F) + 3*e^2)*e*erf(-sqrt(-
b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(sqrt(-
b*c*e*log(F))*b^2*c^2*log(F)^2) - 2*(2*(e*x + d)^(3/2)*b*c*e*log(F) - 4*sqr
t(e*x + d)*b*c*d*e*log(F) - 3*sqrt(e*x + d)*e^2)*e^(((e*x + d)*b*c*log(F) -
 b*c*d*log(F) + a*c*e*log(F))/e)/(b^2*c^2*log(F)^2)) - sqrt(pi)*(8*b^3*c^3*
d^3*log(F)^3 + 12*b^2*c^2*d^2*e*log(F)^2 + 18*b*c*d*e^2*log(F) + 15*e^3)*e*
```

```
erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))
/e)/(sqrt(-b*c*e*log(F))*b^3*c^3*log(F)^3) - 2*(4*(e*x + d)^(5/2)*b^2*c^2*e
*log(F)^2 - 12*(e*x + d)^(3/2)*b^2*c^2*d*e*log(F)^2 + 12*sqrt(e*x + d)*b^2*
c^2*d^2*e*log(F)^2 - 10*(e*x + d)^(3/2)*b*c*e^2*log(F) + 18*sqrt(e*x + d)*b
*c*d*e^2*log(F) + 15*sqrt(e*x + d)*e^3)*e^(((e*x + d)*b*c*log(F) - b*c*d*lo
g(F) + a*c*e*log(F))/e)/(b^3*c^3*log(F)^3))/e
```

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}(d+ex)^{5/2}\,dx = \int F^{c\,(a+b\,x)}\,(d+e\,x)^{5/2}\,dx$$

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

3.41 $\int F^{c(a+bx)}(d+ex)^{3/2}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 138

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx=\frac{3e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\operatorname{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)}+\frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 138, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2207, 2211, 2235}

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx=\frac{3\sqrt{\pi}e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\operatorname{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)}-\frac{3e\sqrt{d+ex}F^{c(a+bx)}}{2b^2c^2\log^2(F)}+\frac{(d+ex)^{3/2}F^{c(a+bx)}}{bc\log(F)}$$

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

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

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

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\text{integral} = \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} - \frac{(3e)\int F^{c(a+bx)}\sqrt{d+ex}\,dx}{2bc\log(F)}$$

$$= -\frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} + \frac{(3e^2)\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{4b^2c^2\log^2(F)}$$

$$= -\frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)} + \frac{(3e)\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{2b^2c^2\log^2(F)}$$

$$= \frac{3e^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{4b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)} - \frac{3eF^{c(a+bx)}\sqrt{d+ex}}{2b^2c^2\log^2(F)} + \frac{F^{c(a+bx)}(d+ex)^{3/2}}{bc\log(F)}$$

Mathematica [A] (verified)

Time = 0.15 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.46

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx=-\frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^{5/2}\Gamma\left(\frac{5}{2},-\frac{bc(d+ex)\log(F)}{e}\right)}{e\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{5/2}}$$

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(3/2),x]
[Out] -((F^(c*(a - (b*d)/e))*(d + e*x)^(5/2)*Gamma[5/2, -((b*c*(d + e*x)*Log[F])/
e)])/(e*(-((b*c*(d + e*x)*Log[F])/e))^(5/2)))
```

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.88

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx=-\frac{\frac{3\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e^2\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}+2\left(3\,bce\log\left(F\right)-2\left(b^2c^2ex+b^2c^2d\right)\log\left(F\right)^2\right)\sqrt{ex+d}F^{bcx+ac}}{4\,b^3c^3\log\left(F\right)^3}$$

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(3/2),x, algorithm="fricas")
[Out] -1/4*(3*sqrt(pi)*sqrt(-b*c*log(F)/e)*e^2*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)
/e))/F^((b*c*d - a*c*e)/e) + 2*(3*b*c*e*log(F) - 2*(b^2*c^2*e*x + b^2*c^2*d
)*log(F)^2)*sqrt(e*x + d)*F^(b*c*x + a*c))/(b^3*c^3*log(F)^3)
```

Sympy [F]

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

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

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

Maxima [F]

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

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

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

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 372 vs. $2(110) = 220$.

Time = 0.44 (sec) , antiderivative size = 372, normalized size of antiderivative = 2.70

$$\int F^{c(a+bx)}(d+ex)^{3/2}\,dx = -\frac{\frac{4\sqrt{\pi}d^2e\,\mathrm{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}} - 4\,d\left(\frac{\sqrt{\pi}(2\,bcd\log(F)+e)e\,\mathrm{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}bc\log(F)}\right.}{}$$

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

[Out] -1/4*(4*sqrt(pi)*d^2*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/sqrt(-b*c*e*log(F)) - 4*d*(sqrt(pi)*(2*b*c*d*log(F) + e)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b*c*log(F)) + 2*sqrt(e*x + d)*e*e^(((e*x + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b*c*log(F))) + sqrt(pi)*(4*b^2*c^2*d^2*log(F)^2 + 4*b*c*d*e*log(F) + 3*e^2)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log(F))/e)/(sqrt(-b*c*e*log(F))*b^2*c^2*log(F)^2) - 2*(2*(e*x + d)^(3/2)*b*c*e*log(F) - 4*sqrt(e*x + d)*b*c*d*e*log(F) - 3*sqrt(e*x + d)*e^2)*e^(((e*x + d)*b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b^2*c^2*log(F)^2))/e

Mupad [F(-1)]

Timed out.

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

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

3.42 $\int F^{c(a+bx)}\sqrt{d+ex}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 105

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx=-\frac{\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)}+\frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 105, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2207, 2211, 2235}

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx=\frac{\sqrt{d+ex}F^{c(a+bx)}}{bc\log(F)}-\frac{\sqrt{\pi}\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)}$$

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

```
[Out] -1/2*(Sqrt[e]*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e
*x]*Sqrt[Log[F]])/Sqrt[e]])/(b^(3/2)*c^(3/2)*Log[F]^(3/2)) + (F^(c*(a + b*x
))*Sqrt[d + e*x])/(b*c*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
```

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)} - \frac{e\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{2bc\log(F)}\\ &= \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)} - \frac{\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{bc\log(F)}\\ &= -\frac{\sqrt{e}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{2b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)} + \frac{F^{c(a+bx)}\sqrt{d+ex}}{bc\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.60

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx = -\frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^{3/2}\Gamma\left(\frac{3}{2}, -\frac{bc(d+ex)\log(F)}{e}\right)}{e\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3/2}}$$

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

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 90, normalized size of antiderivative = 0.86

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx = \frac{2\sqrt{ex+d}F^{bcx+ac}bc\log(F) + \frac{\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}e\,\mathrm{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}}{2b^2c^2\log(F)^2}$$

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="fricas")
[Out] 1/2*(2*sqrt(e*x + d)*F^(b*c*x + a*c)*b*c*log(F) + sqrt(pi)*sqrt(-b*c*log(F)
/e)*e*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))/F^((b*c*d - a*c*e)/e))/(b^2*c^
2*log(F)^2)
```

Sympy [F]

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

```
[In] integrate(F**(c*(b*x+a))*(e*x+d)**(1/2),x)
[Out] Integral(F**(c*(a + b*x))*sqrt(d + e*x), x)
```

Maxima [F]

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

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="maxima")
[Out] integrate(sqrt(e*x + d)*F^((b*x + a)*c), x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 189 vs. $2(81) = 162$.

Time $= 0.32$ (sec) , antiderivative size $= 189$, normalized size of antiderivative $= 1.80$

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

$$-\frac{\frac{2\sqrt{\pi}de\operatorname{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}} - \frac{\sqrt{\pi}(2\,bcd\log(F)+e)e\operatorname{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}bc\log(F)} \cdots}{2\,e}$$

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(1/2),x, algorithm="giac")
```

```
[Out] -1/2*(2*sqrt(pi)*d*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*l
og(F) - a*c*e*log(F))/e)/sqrt(-b*c*e*log(F)) - sqrt(pi)*(2*b*c*d*log(F) + e
)*e*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c*e*log
(F))/e)/(sqrt(-b*c*e*log(F))*b*c*log(F)) - 2*sqrt(e*x + d)*e*e^(((e*x + d)*
b*c*log(F) - b*c*d*log(F) + a*c*e*log(F))/e)/(b*c*log(F)))/e
```

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}\sqrt{d+ex}\,dx = \int F^{c\,(a+b\,x)}\,\sqrt{d+e\,x}\,dx$$

```
[In] int(F^(c*(a + b*x))*(d + e*x)^(1/2),x)
```

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

3.43 $\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 72

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = \frac{F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}$$

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

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 72, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.105, Rules used = {2211, 2235}

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = \frac{\sqrt{\pi}F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}$$

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

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\text{integral} = \frac{2\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{e}$$
$$= \frac{F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)}{\sqrt{b}\sqrt{c}\sqrt{e}\sqrt{\log(F)}}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.88

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = -\frac{F^{c\left(a-\frac{bd}{e}\right)}\sqrt{d+ex}\,\Gamma\left(\frac{1}{2}, -\frac{bc(d+ex)\log(F)}{e}\right)}{e\sqrt{-\frac{bc(d+ex)\log(F)}{e}}}$$

```
[In] Integrate[F^(c*(a + b*x))/Sqrt[d + e*x],x]
[Out] -((F^(c*(a - (b*d)/e))*Sqrt[d + e*x]*Gamma[1/2, -((b*c*(d + e*x)*Log[F])/e)
])/(e*Sqrt[-((b*c*(d + e*x)*Log[F])/e)]))
```

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 64, normalized size of antiderivative = 0.89

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = -\frac{\sqrt{\pi}\sqrt{-\frac{bc\log(F)}{e}}\,\text{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}bc\log(F)}$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="fricas")
[Out] -sqrt(pi)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))/(F^((b
*c*d - a*c*e)/e)*b*c*log(F))
```

Sympy [F]

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

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(1/2),x)
[Out] Integral(F**(c*(a + b*x))/sqrt(d + e*x), x)
```

Maxima [F]

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

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="maxima")
[Out] integrate(F^((b*x + a)*c)/sqrt(e*x + d), x)
```

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.78

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = -\frac{\sqrt{\pi}\,\mathrm{erf}\left(-\frac{\sqrt{-bce\log(F)}\sqrt{ex+d}}{e}\right)e^{\left(-\frac{bcd\log(F)-ace\log(F)}{e}\right)}}{\sqrt{-bce\log(F)}}$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(1/2),x, algorithm="giac")
[Out] -sqrt(pi)*erf(-sqrt(-b*c*e*log(F))*sqrt(e*x + d)/e)*e^(-(b*c*d*log(F) - a*c
*e*log(F))/e)/sqrt(-b*c*e*log(F))
```

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx = \int \frac{F^{c\,(a+b\,x)}}{\sqrt{d+e\,x}}\,dx$$

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

3.44 $\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} \, dx$

Optimal result

Integrand size = 19, antiderivative size = 97

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} \, dx = -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{2\sqrt{b}\sqrt{c}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\sqrt{\log(F)}}{e^{3/2}}$$

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

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 97, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} \, dx = \frac{2\sqrt{\pi}\sqrt{b}\sqrt{c}\sqrt{\log(F)}F^{c\left(a-\frac{bd}{e}\right)}\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{e^{3/2}} - \frac{2F^{c(a+bx)}}{e\sqrt{d+ex}}$$

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

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

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
```

```
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}\text{integral} &= -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{(2bc\log(F))\int \frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{e}\\ &= -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{(4bc\log(F))\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{e^2}\\ &= -\frac{2F^{c(a+bx)}}{e\sqrt{d+ex}} + \frac{2\sqrt{b}\sqrt{c}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\sqrt{\log(F)}}{e^{3/2}}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 75, normalized size of antiderivative = 0.77

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx = -\frac{2\left(F^{c(a+bx)} - F^{c\left(a-\frac{bd}{e}\right)}\Gamma\left(\frac{1}{2}, -\frac{bc(d+ex)\log(F)}{e}\right)\sqrt{-\frac{bc(d+ex)\log(F)}{e}}\right)}{e\sqrt{d+ex}}$$

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(3/2),x]
[Out] (-2*(F^(c*(a + b*x)) - F^(c*(a - (b*d)/e))*Gamma[1/2, -((b*c*(d + e*x)*Log[
F])/e)]*Sqrt[-((b*c*(d + e*x)*Log[F])/e)]))/(e*Sqrt[d + e*x])
```

Maple [F]

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

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

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

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 90, normalized size of antiderivative = 0.93

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} dx = -\frac{2\left(\frac{\sqrt{\pi}(ex+d)\sqrt{-\frac{bc\log(F)}{e}}\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)}{F^{\frac{bcd-ace}{e}}}+\sqrt{ex+d}F^{bcx+ac}\right)}{e^2x+de}$$

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

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

Sympy [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} dx = \int \frac{F^{c(a+bx)}}{(d+ex)^{\frac{3}{2}}} dx$$

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

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

Maxima [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{3/2}} dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{3}{2}}} dx$$

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

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

Giac [F]

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

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

Mupad [F(-1)]

Timed out.

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

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

3.45 $\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 130

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx=-\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}}+\frac{4b^{3/2}c^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{3}{2}}(F)}{3e^{5/2}}$$

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

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 130, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx=\frac{4\sqrt{\pi}b^{3/2}c^{3/2}\log^{\frac{3}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{3e^{5/2}}-\frac{4bc\log(F)F^{c(a+bx)}}{3e^2\sqrt{d+ex}}-\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}$$

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

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

```
fi[(Sqrt[b]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(3/2))/(3*e
^(5/2))
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}+\frac{(2bc\log(F))\int\frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{3e}\\
&= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}}+\frac{\left(4b^2c^2\log^2(F)\right)\int\frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{3e^2}\\
&= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}}\\
&\quad+\frac{\left(8b^2c^2\log^2(F)\right)\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx,x,\sqrt{d+ex}\right)}{3e^3}\\
&= -\frac{2F^{c(a+bx)}}{3e(d+ex)^{3/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{3e^2\sqrt{d+ex}}+\frac{4b^{3/2}c^{3/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{3}{2}}(F)}{3e^{5/2}}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.28 (sec) , antiderivative size = 92, normalized size of antiderivative = 0.71

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = -\frac{2\left(2eF^{c\left(a-\frac{bd}{e}\right)}\Gamma\left(\frac{1}{2},-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{3/2}+F^{c(a+bx)}(e+2bc(d+ex)\log(F))\right)}{3e^2(d+ex)^{3/2}}$$

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

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

Maple [F]

$$\int \frac{F^{c(bx+a)}}{(ex+d)^{\frac{5}{2}}}dx$$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 140, normalized size of antiderivative = 1.08

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = -\frac{2\left(\frac{2\sqrt{\pi}(bce^2x^2+2\,bcdex+bcd^2)\sqrt{-\frac{bc\log(F)}{e}}\,\mathrm{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)}{F^{\frac{bcd-ace}{e}}}+\sqrt{ex+d}(2\,(bcex+bcd)\log(F)+e)F^{bcx+ac}\right)}{3\,(e^4x^2+2\,de^3x+d^2e^2)}$$

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

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

Sympy [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = \int \frac{F^{c(a+bx)}}{(d+ex)^{\frac{5}{2}}}\,dx$$

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

Maxima [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{5}{2}}}\,dx$$

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

Giac [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{5}{2}}}\,dx$$

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

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx = \int \frac{F^{c\,(a+b\,x)}}{(d+e\,x)^{5/2}}\,dx$$

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

3.46 $\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}} \, dx$

Optimal result

Integrand size = 19, antiderivative size = 165

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}} \, dx = -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}} + \frac{8b^{5/2}c^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{5}{2}}(F)}{15e^{7/2}}$$

```
[Out] -2/5*F^(c*(b*x+a))/e/(e*x+d)^(5/2)-4/15*b*c*F^(c*(b*x+a))*ln(F)/e^2/(e*x+d)
^(3/2)+8/15*b^(5/2)*c^(5/2)*F^(c*(a-b*d/e))*erfi(b^(1/2)*c^(1/2)*(e*x+d)^(1
/2)*ln(F)^(1/2)/e^(1/2))*ln(F)^(5/2)*Pi^(1/2)/e^(7/2)-8/15*b^2*c^2*F^(c*(b*
x+a))*ln(F)^2/e^3/(e*x+d)^(1/2)
```

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.158$, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}} \, dx = \frac{8\sqrt{\pi}b^{5/2}c^{5/2}\log^{\frac{5}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{15e^{7/2}} - \frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{15e^3\sqrt{d+ex}} - \frac{4bc\log(F)F^{c(a+bx)}}{15e^2(d+ex)^{3/2}} - \frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}$$

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(7/2),x]
```

```
[Out] (-2*F^(c*(a + b*x)))/(5*e*(d + e*x)^(5/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(15*e^2*(d + e*x)^(3/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(15*e^3*Sq
```

```
rt[d + e*x]) + (8*b^(5/2)*c^(5/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b
]*Sqrt[c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(5/2))/(15*e^(7/2))
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}+\frac{(2bc\log(F))\int\frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx}{5e}\\
&= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}}+\frac{\left(4b^2c^2\log^2(F)\right)\int\frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{15e^2}\\
&= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}}-\frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}}+\frac{\left(8b^3c^3\log^3(F)\right)\int\frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{15e^3}\\
&= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}}-\frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}}\\
&\quad+\frac{\left(16b^3c^3\log^3(F)\right)\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx,x,\sqrt{d+ex}\right)}{15e^4}\\
&= -\frac{2F^{c(a+bx)}}{5e(d+ex)^{5/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{15e^2(d+ex)^{3/2}}-\frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{15e^3\sqrt{d+ex}}\\
&\quad+\frac{8b^{5/2}c^{5/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{5}{2}}(F)}{15e^{7/2}}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 118, normalized size of antiderivative = 0.72

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = \frac{2\left(-3e^2F^{c(a+bx)} - 2bc(d+ex)\log(F)\left(2eF^{c\left(a-\frac{bd}{e}\right)}\Gamma\left(\frac{1}{2},-\frac{bc(d+ex)\log(F)}{e}\right)\left(-\frac{bc(d+ex)\log(F)}{e}\right.\right.\right.}{15e^3(d+ex)^{5/2}}$$

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(7/2),x]
```

```
[Out] (2*(-3*e^2*F^(c*(a + b*x)) - 2*b*c*(d + e*x)*Log[F]*(2*e*F^(c*(a - (b*d)/e)
)*Gamma[1/2, -((b*c*(d + e*x)*Log[F])/e)]*(-((b*c*(d + e*x)*Log[F])/e))^(3/
2) + F^(c*(a + b*x))*(e + 2*b*c*(d + e*x)*Log[F]))))/(15*e^3*(d + e*x)^(5/2
))
```

Maple [F]

$$\int \frac{F^{c(bx+a)}}{(ex+d)^{\frac{7}{2}}}dx$$

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(7/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(7/2),x)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 230, normalized size of antiderivative = 1.39

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx =$$

$$-\frac{2\left(\frac{4\sqrt{\pi}\left(b^2c^2e^3x^3+3\,b^2c^2de^2x^2+3\,b^2c^2d^2ex+b^2c^2d^3\right)\sqrt{-\frac{bc\log(F)}{e}}\,\mathrm{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)^2}{F^{\frac{bcd-ace}{e}}} + \left(4\left(b^2c^2e^2x^2+2\,b^2c^2dex+b^2\right.\right.\right.}{15\left(e^6x^3+3\,de^5x^2+3\,d^2e^4x+d^3e^3\right)}$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="fricas")
```

```
[Out] -2/15*(4*sqrt(pi)*(b^2*c^2*e^3*x^3 + 3*b^2*c^2*d*e^2*x^2 + 3*b^2*c^2*d^2*e*
x + b^2*c^2*d^3)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x + d)*sqrt(-b*c*log(F)/e))
*log(F)^2/F^((b*c*d - a*c*e)/e) + (4*(b^2*c^2*e^2*x^2 + 2*b^2*c^2*d*e*x + b
^2*c^2*d^2)*log(F)^2 + 3*e^2 + 2*(b*c*e^2*x + b*c*d*e)*log(F))*sqrt(e*x + d
)*F^(b*c*x + a*c))/(e^6*x^3 + 3*d*e^5*x^2 + 3*d^2*e^4*x + d^3*e^3)
```

Sympy [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = \int \frac{F^{c(a+bx)}}{(d+ex)^{\frac{7}{2}}}\,dx$$

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(7/2),x)
[Out] Integral(F**(c*(a + b*x))/(d + e*x)**(7/2), x)
```

Maxima [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{7}{2}}}\,dx$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="maxima")
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(7/2), x)
```

Giac [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{7}{2}}}\,dx$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(7/2),x, algorithm="giac")
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(7/2), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx = \int \frac{F^{c\,(a+b\,x)}}{(d+e\,x)^{7/2}}\,dx$$

```
[In] int(F^(c*(a + b*x))/(d + e*x)^(7/2),x)
[Out] int(F^(c*(a + b*x))/(d + e*x)^(7/2), x)
```

3.47 $\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 200

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{16b^{7/2}c^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{7}{2}}(F)}{105e^{9/2}}$$

```
[Out] -2/7*F^(c*(b*x+a))/e/(e*x+d)^(7/2)-4/35*b*c*F^(c*(b*x+a))*ln(F)/e^2/(e*x+d)
^(5/2)-8/105*b^2*c^2*F^(c*(b*x+a))*ln(F)^2/e^3/(e*x+d)^(3/2)+16/105*b^(7/2)
*c^(7/2)*F^(c*(a-b*d/e))*erfi(b^(1/2)*c^(1/2)*(e*x+d)^(1/2)*ln(F)^(1/2)/e^(
1/2))*ln(F)^(7/2)*Pi^(1/2)/e^(9/2)-16/105*b^3*c^3*F^(c*(b*x+a))*ln(F)^3/e^4
/(e*x+d)^(1/2)
```

Rubi [A] (verified)

Time = 0.14 (sec) , antiderivative size = 200, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2208, 2211, 2235}

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \frac{16\sqrt{\pi}b^{7/2}c^{7/2}\log^{\frac{7}{2}}(F)F^{c\left(a-\frac{bd}{e}\right)}\mathrm{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{\log(F)}\sqrt{d+ex}}{\sqrt{e}}\right)}{105e^{9/2}} - \frac{16b^3c^3\log^3(F)F^{c(a+bx)}}{105e^4\sqrt{d+ex}} - \frac{8b^2c^2\log^2(F)F^{c(a+bx)}}{105e^3(d+ex)^{3/2}} - \frac{4bc\log(F)F^{c(a+bx)}}{35e^2(d+ex)^{5/2}} - \frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}}$$

```
[In] Int[F^(c*(a + b*x))/(d + e*x)^(9/2),x]
```

```
[Out] (-2*F^(c*(a + b*x)))/(7*e*(d + e*x)^(7/2)) - (4*b*c*F^(c*(a + b*x))*Log[F])
/(35*e^2*(d + e*x)^(5/2)) - (8*b^2*c^2*F^(c*(a + b*x))*Log[F]^2)/(105*e^3*(
d + e*x)^(3/2)) - (16*b^3*c^3*F^(c*(a + b*x))*Log[F]^3)/(105*e^4*Sqrt[d + e
*x]) + (16*b^(7/2)*c^(7/2)*F^(c*(a - (b*d)/e))*Sqrt[Pi]*Erfi[(Sqrt[b]*Sqrt[
c]*Sqrt[d + e*x]*Sqrt[Log[F]])/Sqrt[e]]*Log[F]^(7/2))/(105*e^(9/2))
```

Rule 2208

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2235

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{
F, a, b, c, d}, x] && PosQ[b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}}+\frac{(2bc\log(F))\int\frac{F^{c(a+bx)}}{(d+ex)^{7/2}}\,dx}{7e}\\
&= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}}+\frac{\left(4b^2c^2\log^2(F)\right)\int\frac{F^{c(a+bx)}}{(d+ex)^{5/2}}\,dx}{35e^2}\\
&= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}}-\frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}}+\frac{\left(8b^3c^3\log^3(F)\right)\int\frac{F^{c(a+bx)}}{(d+ex)^{3/2}}\,dx}{105e^3}\\
&= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}}-\frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}}-\frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}}\\
&\quad-\frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}}+\frac{\left(16b^4c^4\log^4(F)\right)\int\frac{F^{c(a+bx)}}{\sqrt{d+ex}}\,dx}{105e^4}
\end{aligned}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{(32b^4c^4\log^4(F))\,\text{Subst}\left(\int F^{c\left(a-\frac{bd}{e}\right)+\frac{bcx^2}{e}}\,dx, x, \sqrt{d+ex}\right)}{105e^5}$$

$$= -\frac{2F^{c(a+bx)}}{7e(d+ex)^{7/2}} - \frac{4bcF^{c(a+bx)}\log(F)}{35e^2(d+ex)^{5/2}} - \frac{8b^2c^2F^{c(a+bx)}\log^2(F)}{105e^3(d+ex)^{3/2}} - \frac{16b^3c^3F^{c(a+bx)}\log^3(F)}{105e^4\sqrt{d+ex}} + \frac{16b^{7/2}c^{7/2}F^{c\left(a-\frac{bd}{e}\right)}\sqrt{\pi}\,\text{erfi}\left(\frac{\sqrt{b}\sqrt{c}\sqrt{d+ex}\sqrt{\log(F)}}{\sqrt{e}}\right)\log^{\frac{7}{2}}(F)}{105e^{9/2}}$$

Mathematica [A] (verified)

Time = 0.33 (sec) , antiderivative size = 144, normalized size of antiderivative = 0.72

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \frac{2\left(-15e^3F^{c(a+bx)} + 2bc(d+ex)\log(F)\left(-3e^2F^{c(a+bx)} - 2bc(d+ex)\log(F)\left(2eF^{c\left(a-\frac{bd}{e}\right)}\right.\right.\right.}{105e^4(d+e}$$

```
[In] Integrate[F^(c*(a + b*x))/(d + e*x)^(9/2),x]
```

```
[Out] (2*(-15*e^3*F^(c*(a + b*x)) + 2*b*c*(d + e*x)*Log[F]*(-3*e^2*F^(c*(a + b*x)
) - 2*b*c*(d + e*x)*Log[F]*(2*e*F^(c*(a - (b*d)/e))*Gamma[1/2, -((b*c*(d +
e*x)*Log[F])/e)]*(-((b*c*(d + e*x)*Log[F])/e))^(3/2) + F^(c*(a + b*x))*(e +
 2*b*c*(d + e*x)*Log[F])))))/(105*e^4*(d + e*x)^(7/2))
```

Maple [F]

$$\int \frac{F^{c(bx+a)}}{(ex+d)^{\frac{9}{2}}}dx$$

```
[In] int(F^(c*(b*x+a))/(e*x+d)^(9/2),x)
```

```
[Out] int(F^(c*(b*x+a))/(e*x+d)^(9/2),x)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 321, normalized size of antiderivative = 1.60

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx =$$

$$-\frac{2\left(\frac{8\sqrt{\pi}(b^3c^3e^4x^4+4b^3c^3de^3x^3+6b^3c^3d^2e^2x^2+4b^3c^3d^3ex+b^3c^3d^4)\sqrt{-\frac{bc\log(F)}{e}}\operatorname{erf}\left(\sqrt{ex+d}\sqrt{-\frac{bc\log(F)}{e}}\right)\log(F)^3}{F^{\frac{bcd-ace}{e}}} + \left(8\left(b^3c^3e^3x^3+3\right.\right.\right.}{105\,(e}$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="fricas")
```

```
[Out] -2/105*(8*sqrt(pi)*(b^3*c^3*e^4*x^4 + 4*b^3*c^3*d*e^3*x^3 + 6*b^3*c^3*d^2*e
^2*x^2 + 4*b^3*c^3*d^3*e*x + b^3*c^3*d^4)*sqrt(-b*c*log(F)/e)*erf(sqrt(e*x
+ d)*sqrt(-b*c*log(F)/e))*log(F)^3/F^((b*c*d - a*c*e)/e) + (8*(b^3*c^3*e^3*
x^3 + 3*b^3*c^3*d*e^2*x^2 + 3*b^3*c^3*d^2*e*x + b^3*c^3*d^3)*log(F)^3 + 15*
e^3 + 4*(b^2*c^2*e^3*x^2 + 2*b^2*c^2*d*e^2*x + b^2*c^2*d^2*e)*log(F)^2 + 6*
(b*c*e^3*x + b*c*d*e^2)*log(F))*sqrt(e*x + d)*F^(b*c*x + a*c))/(e^8*x^4 + 4
*d*e^7*x^3 + 6*d^2*e^6*x^2 + 4*d^3*e^5*x + d^4*e^4)
```

Sympy [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \text{Timed out}$$

```
[In] integrate(F**(c*(b*x+a))/(e*x+d)**(9/2),x)
```

```
[Out] Timed out
```

Maxima [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{9}{2}}}\,dx$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="maxima")
```

```
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(9/2), x)
```

Giac [F]

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \int \frac{F^{(bx+a)c}}{(ex+d)^{\frac{9}{2}}}\,dx$$

```
[In] integrate(F^(c*(b*x+a))/(e*x+d)^(9/2),x, algorithm="giac")
[Out] integrate(F^((b*x + a)*c)/(e*x + d)^(9/2), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{F^{c(a+bx)}}{(d+ex)^{9/2}}\,dx = \int \frac{F^{c\,(a+b\,x)}}{(d+e\,x)^{9/2}}\,dx$$

```
[In] int(F^(c*(a + b*x))/(d + e*x)^(9/2),x)
[Out] int(F^(c*(a + b*x))/(d + e*x)^(9/2), x)
```

3.48 $\int e^{-bx} x^{13/2}\, dx$

Optimal result

Integrand size = 12, antiderivative size = 151

$$\int e^{-bx} x^{13/2}\, dx = -\frac{135135 e^{-bx}\sqrt{x}}{64 b^7} - \frac{45045 e^{-bx} x^{3/2}}{32 b^6} - \frac{9009 e^{-bx} x^{5/2}}{16 b^5} - \frac{1287 e^{-bx} x^{7/2}}{8 b^4} - \frac{143 e^{-bx} x^{9/2}}{4 b^3} - \frac{13 e^{-bx} x^{11/2}}{2 b^2} - \frac{e^{-bx} x^{13/2}}{b} + \frac{135135\sqrt{\pi}\operatorname{erf}\left(\sqrt{b}\sqrt{x}\right)}{128 b^{15/2}}$$

```
[Out] -45045/32*x^(3/2)/b^6/exp(b*x)-9009/16*x^(5/2)/b^5/exp(b*x)-1287/8*x^(7/2)/
b^4/exp(b*x)-143/4*x^(9/2)/b^3/exp(b*x)-13/2*x^(11/2)/b^2/exp(b*x)-x^(13/2)
/b/exp(b*x)+135135/128*erf(b^(1/2)*x^(1/2))*Pi^(1/2)/b^(15/2)-135135/64*x^(
1/2)/b^7/exp(b*x)
```

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 151, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.250, Rules used = {2207, 2211, 2236}

$$\int e^{-bx} x^{13/2}\, dx = \frac{135135\sqrt{\pi}\operatorname{erf}\left(\sqrt{b}\sqrt{x}\right)}{128 b^{15/2}} - \frac{135135\sqrt{x} e^{-bx}}{64 b^7} - \frac{45045 x^{3/2} e^{-bx}}{32 b^6} - \frac{9009 x^{5/2} e^{-bx}}{16 b^5} - \frac{1287 x^{7/2} e^{-bx}}{8 b^4} - \frac{143 x^{9/2} e^{-bx}}{4 b^3} - \frac{13 x^{11/2} e^{-bx}}{2 b^2} - \frac{x^{13/2} e^{-bx}}{b}$$

```
[In] Int[x^(13/2)/E^(b*x),x]
```

```
[Out] (-135135*Sqrt[x])/(64*b^7*E^(b*x)) - (45045*x^(3/2))/(32*b^6*E^(b*x)) - (90
09*x^(5/2))/(16*b^5*E^(b*x)) - (1287*x^(7/2))/(8*b^4*E^(b*x)) - (143*x^(9/2
))/(4*b^3*E^(b*x)) - (13*x^(11/2))/(2*b^2*E^(b*x)) - x^(13/2)/(b*E^(b*x)) +
 (135135*Sqrt[Pi]*Erf[Sqrt[b]*Sqrt[x]])/(128*b^(15/2))
```

Rule 2207

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

Rule 2211

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :
> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*
x]], x] /; FreeQ[{F, c, d, e, f, g}, x] &&  !TrueQ[$UseGamma]
```

Rule 2236

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] :> Simp[F^a*Sqrt
[Pi]*(Erf[(c + d*x)*Rt[(-b)*Log[F], 2]]/(2*d*Rt[(-b)*Log[F], 2])), x] /; Fr
eeQ[{F, a, b, c, d}, x] && NegQ[b]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= -\frac{e^{-bx}x^{13/2}}{b}+\frac{13\int e^{-bx}x^{11/2}\,dx}{2b}\\
&= -\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{143\int e^{-bx}x^{9/2}\,dx}{4b^2}\\
&= -\frac{143e^{-bx}x^{9/2}}{4b^3}-\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{1287\int e^{-bx}x^{7/2}\,dx}{8b^3}\\
&= -\frac{1287e^{-bx}x^{7/2}}{8b^4}-\frac{143e^{-bx}x^{9/2}}{4b^3}-\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{9009\int e^{-bx}x^{5/2}\,dx}{16b^4}\\
&= -\frac{9009e^{-bx}x^{5/2}}{16b^5}-\frac{1287e^{-bx}x^{7/2}}{8b^4}-\frac{143e^{-bx}x^{9/2}}{4b^3}\\
&\quad-\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{45045\int e^{-bx}x^{3/2}\,dx}{32b^5}\\
&= -\frac{45045e^{-bx}x^{3/2}}{32b^6}-\frac{9009e^{-bx}x^{5/2}}{16b^5}-\frac{1287e^{-bx}x^{7/2}}{8b^4}-\frac{143e^{-bx}x^{9/2}}{4b^3}\\
&\quad-\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{135135\int e^{-bx}\sqrt{x}\,dx}{64b^6}\\
&= -\frac{135135e^{-bx}\sqrt{x}}{64b^7}-\frac{45045e^{-bx}x^{3/2}}{32b^6}-\frac{9009e^{-bx}x^{5/2}}{16b^5}-\frac{1287e^{-bx}x^{7/2}}{8b^4}\\
&\quad-\frac{143e^{-bx}x^{9/2}}{4b^3}-\frac{13e^{-bx}x^{11/2}}{2b^2}-\frac{e^{-bx}x^{13/2}}{b}+\frac{135135\int \frac{e^{-bx}}{\sqrt{x}}\,dx}{128b^7}
\end{aligned}
$$

$$= -\frac{135135e^{-bx}\sqrt{x}}{64b^7} - \frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{135135\text{Subst}\left(\int e^{-bx^2}\,dx, x, \sqrt{x}\right)}{64b^7}$$

$$= -\frac{135135e^{-bx}\sqrt{x}}{64b^7} - \frac{45045e^{-bx}x^{3/2}}{32b^6} - \frac{9009e^{-bx}x^{5/2}}{16b^5} - \frac{1287e^{-bx}x^{7/2}}{8b^4} - \frac{143e^{-bx}x^{9/2}}{4b^3} - \frac{13e^{-bx}x^{11/2}}{2b^2} - \frac{e^{-bx}x^{13/2}}{b} + \frac{135135\sqrt{\pi}\text{erf}\left(\sqrt{b}\sqrt{x}\right)}{128b^{15/2}}$$

Mathematica [A] (verified)

Time = 0.61 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.16

$$\int e^{-bx}x^{13/2}\,dx = -\frac{\sqrt{bx}\,\Gamma\left(\frac{15}{2}, bx\right)}{b^8\sqrt{x}}$$

```
[In] Integrate[x^(13/2)/E^(b*x),x]
[Out] -((Sqrt[b*x]*Gamma[15/2, b*x])/(b^8*Sqrt[x]))
```

Maple [A] (verified)

Time = 0.10 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.52

method	result
meijerg	$\frac{-\frac{\sqrt{x}\,\sqrt{b}\,\left(960b^{6}x^{6}+6240b^{5}x^{5}+34320b^{4}x^{4}+154440b^{3}x^{3}+540540b^{2}x^{2}+1351350bx+2027025\right)\mathrm{e}^{-bx}}{960}+\frac{135135\sqrt{\pi}\,\mathrm{erf}\left(\sqrt{b}\,\sqrt{x}\right)}{128}}{b^{\frac{15}{2}}}$
derivativedivides	$-\frac{x^{\frac{13}{2}}\mathrm{e}^{-bx}}{b}+\frac{-\frac{13x^{\frac{11}{2}}\mathrm{e}^{-bx}}{2b}+\frac{13\left(-\frac{11x^{\frac{9}{2}}\mathrm{e}^{-bx}}{4b}+\frac{11\left(-\frac{9x^{\frac{7}{2}}\mathrm{e}^{-bx}}{4b}+\frac{9\left(-\frac{7x^{\frac{5}{2}}\mathrm{e}^{-bx}}{4b}+\frac{7\left(-\frac{5x^{\frac{3}{2}}\mathrm{e}^{-bx}}{4b}+\frac{5\left(-\frac{3\sqrt{x}\,\mathrm{e}^{-bx}}{4b}+\frac{3\sqrt{\pi}\,\mathrm{erf}\left(\cdots\right)}{8b^{\cdots}}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{b}}{b}$
	$\cdots\frac{13\left(-\frac{11x^{\frac{9}{2}}\mathrm{e}^{-bx}}{4b}+\frac{11\left(-\frac{9x^{\frac{7}{2}}\mathrm{e}^{-bx}}{4b}+\frac{9\left(-\frac{7x^{\frac{5}{2}}\mathrm{e}^{-bx}}{4b}+\frac{7\left(-\frac{5x^{\frac{3}{2}}\mathrm{e}^{-bx}}{4b}+\frac{5\left(-\frac{3\sqrt{x}\,\mathrm{e}^{-bx}}{4b}+\frac{3\sqrt{\pi}\,\mathrm{erf}\left(\cdots\right)}{8b^{\cdots}}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{2b}\cdots\right)}{\cdots}\cdots$

```
[In] int(x^(13/2)/exp(b*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^(15/2)*(-1/960*x^(1/2)*b^(1/2)*(960*b^6*x^6+6240*b^5*x^5+34320*b^4*x^4+
154440*b^3*x^3+540540*b^2*x^2+1351350*b*x+2027025)*exp(-b*x)+135135/128*Pi^
(1/2)*erf(b^(1/2)*x^(1/2)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 82, normalized size of antiderivative = 0.54

$$\int e^{-bx}x^{13/2}\,dx =$$

$$-\frac{2\,(64\,b^7x^6+416\,b^6x^5+2288\,b^5x^4+10296\,b^4x^3+36036\,b^3x^2+90090\,b^2x+135135\,b)\sqrt{x}e^{(-bx)}-135135\,\sqrt{}}{128\,b^8}$$

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="fricas")
```

```
[Out] -1/128*(2*(64*b^7*x^6 + 416*b^6*x^5 + 2288*b^5*x^4 + 10296*b^4*x^3 + 36036*
b^3*x^2 + 90090*b^2*x + 135135*b)*sqrt(x)*e^(-b*x) - 135135*sqrt(pi)*sqrt(b
)*erf(sqrt(b)*sqrt(x)))/b^8
```

Sympy [A] (verification not implemented)

Time = 127.00 (sec) , antiderivative size = 138, normalized size of antiderivative = 0.91

$$\int e^{-bx}x^{13/2}\,dx = -\frac{x^{\frac{13}{2}}e^{-bx}}{b}-\frac{13x^{\frac{11}{2}}e^{-bx}}{2b^2}-\frac{143x^{\frac{9}{2}}e^{-bx}}{4b^3}-\frac{1287x^{\frac{7}{2}}e^{-bx}}{8b^4}-\frac{9009x^{\frac{5}{2}}e^{-bx}}{16b^5}-\frac{45045x^{\frac{3}{2}}e^{-bx}}{32b^6}-\frac{135135\sqrt{x}e^{-bx}}{64b^7}+\frac{135135\sqrt{\pi}\,\mathrm{erf}\left(\sqrt{b}\sqrt{x}\right)}{128b^{\frac{15}{2}}}$$

```
[In] integrate(x**(13/2)/exp(b*x),x)
```

```
[Out] -x**(13/2)*exp(-b*x)/b - 13*x**(11/2)*exp(-b*x)/(2*b**2) - 143*x**(9/2)*exp
(-b*x)/(4*b**3) - 1287*x**(7/2)*exp(-b*x)/(8*b**4) - 9009*x**(5/2)*exp(-b*x
)/(16*b**5) - 45045*x**(3/2)*exp(-b*x)/(32*b**6) - 135135*sqrt(x)*exp(-b*x)
/(64*b**7) + 135135*sqrt(pi)*erf(sqrt(b)*sqrt(x))/(128*b**(15/2))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 79, normalized size of antiderivative = 0.52

$$\int e^{-bx}x^{13/2}\,dx = -\frac{\left(64\,b^6x^{\frac{13}{2}} + 416\,b^5x^{\frac{11}{2}} + 2288\,b^4x^{\frac{9}{2}} + 10296\,b^3x^{\frac{7}{2}} + 36036\,b^2x^{\frac{5}{2}} + 90090\,bx^{\frac{3}{2}} + 135135\,\sqrt{x}\right)e^{(-bx)}}{64\,b^7} + \frac{135135\,\sqrt{\pi}\,\mathrm{erf}\left(\sqrt{b}\sqrt{x}\right)}{128\,b^{\frac{15}{2}}}$$

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="maxima")
```

```
[Out] -1/64*(64*b^6*x^(13/2) + 416*b^5*x^(11/2) + 2288*b^4*x^(9/2) + 10296*b^3*x^
(7/2) + 36036*b^2*x^(5/2) + 90090*b*x^(3/2) + 135135*sqrt(x))*e^(-b*x)/b^7
+ 135135/128*sqrt(pi)*erf(sqrt(b)*sqrt(x))/b^(15/2)
```

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 80, normalized size of antiderivative = 0.53

$$\int e^{-bx}x^{13/2}\,dx = -\frac{\left(64\,b^6x^{\frac{13}{2}} + 416\,b^5x^{\frac{11}{2}} + 2288\,b^4x^{\frac{9}{2}} + 10296\,b^3x^{\frac{7}{2}} + 36036\,b^2x^{\frac{5}{2}} + 90090\,bx^{\frac{3}{2}} + 135135\,\sqrt{x}\right)e^{(-bx)}}{64\,b^7} - \frac{135135\,\sqrt{\pi}\,\mathrm{erf}\left(-\sqrt{b}\sqrt{x}\right)}{128\,b^{\frac{15}{2}}}$$

```
[In] integrate(x^(13/2)/exp(b*x),x, algorithm="giac")
```

```
[Out] -1/64*(64*b^6*x^(13/2) + 416*b^5*x^(11/2) + 2288*b^4*x^(9/2) + 10296*b^3*x^
(7/2) + 36036*b^2*x^(5/2) + 90090*b*x^(3/2) + 135135*sqrt(x))*e^(-b*x)/b^7
- 135135/128*sqrt(pi)*erf(-sqrt(b)*sqrt(x))/b^(15/2)
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 89, normalized size of antiderivative = 0.59

$$\int e^{-bx}x^{13/2}\,dx = -\frac{135135\,x^{13/2}\,\sqrt{\pi}\,\mathrm{erfc}\left(\sqrt{b\,x}\right)}{128\,b\,{\left(b\,x\right)}^{13/2}} - \frac{x^{13/2}\,\mathrm{e}^{-b\,x}\,\left(\frac{135135\,\sqrt{b\,x}}{64}+\frac{45045\,{\left(b\,x\right)}^{3/2}}{32}+\frac{9009\,{\left(b\,x\right)}^{5/2}}{16}+\frac{1287\,{\left(b\,x\right)}^{7/2}}{8}+\frac{143\,{\left(b\,x\right)}^{9/2}}{4}+\frac{13\,{\left(b\,x\right)}^{11/2}}{2}+{\left(b\,x\right)}^{13/2}\right)}{b\,{\left(b\,x\right)}^{13/2}}$$

```
[In] int(x^(13/2)*exp(-b*x),x)
```

```
[Out] - (135135*x^(13/2)*pi^(1/2)*erfc((b*x)^(1/2)))/(128*b*(b*x)^(13/2)) - (x^(1
3/2)*exp(-b*x)*((135135*(b*x)^(1/2))/64 + (45045*(b*x)^(3/2))/32 + (9009*(b
*x)^(5/2))/16 + (1287*(b*x)^(7/2))/8 + (143*(b*x)^(9/2))/4 + (13*(b*x)^(11/
2))/2 + (b*x)^(13/2)))/(b*(b*x)^(13/2))
```

3.49 $\int F^{c(a+bx)}(d+ex)^{4/3}\,dx$

Optimal result

Integrand size = 19, antiderivative size = 71

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx=-\frac{eF^{c\left(a-\frac{bd}{e}\right)}\sqrt[3]{d+ex}\,\Gamma\left(\frac{7}{3},-\frac{bc(d+ex)\log(F)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc(d+ex)\log(F)}{e}}}$$

```
[Out] -e*F^(c*(a-b*d/e))*(e*x+d)^(1/3)*GAMMA(7/3,-b*c*(e*x+d)*ln(F)/e)/b^2/c^2/ln
(F)^2/(-b*c*(e*x+d)*ln(F)/e)^(1/3)
```

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.053, Rules used = {2212}

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx=-\frac{e\sqrt[3]{d+ex}F^{c\left(a-\frac{bd}{e}\right)}\Gamma\left(\frac{7}{3},-\frac{bc(d+ex)\log(F)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc\log(F)(d+ex)}{e}}}$$

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

```
[Out] -((e*F^(c*(a - (b*d)/e))*(d + e*x)^(1/3)*Gamma[7/3, -((b*c*(d + e*x)*Log[F]
)/e)])/(b^2*c^2*Log[F]^2*(-((b*c*(d + e*x)*Log[F])/e))^(1/3)))
```

Rule 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]
```

Rubi steps

$$\text{integral} = -\frac{eF^{c\left(a-\frac{bd}{e}\right)}\sqrt[3]{d+ex}\,\Gamma\left(\frac{7}{3},-\frac{bc(d+ex)\log(F)}{e}\right)}{b^2c^2\log^2(F)\sqrt[3]{-\frac{bc(d+ex)\log(F)}{e}}}$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.89

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = -\frac{F^{c\left(a-\frac{bd}{e}\right)}(d+ex)^{7/3}\Gamma\left(\frac{7}{3},-\frac{bc(d+ex)\log(F)}{e}\right)}{e\left(-\frac{bc(d+ex)\log(F)}{e}\right)^{7/3}}$$

```
[In] Integrate[F^(c*(a + b*x))*(d + e*x)^(4/3),x]
[Out] -((F^(c*(a - (b*d)/e))*(d + e*x)^(7/3)*Gamma[7/3, -((b*c*(d + e*x)*Log[F])/
e)])/(e*(-((b*c*(d + e*x)*Log[F])/e))^(7/3)))
```

Maple [F]

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

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

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 117, normalized size of antiderivative = 1.65

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = \frac{\frac{4\left(-\frac{bc\log(F)}{e}\right)^{\frac{2}{3}}e^2\Gamma\left(\frac{1}{3},-\frac{(bcex+bcd)\log(F)}{e}\right)}{F^{\frac{bcd-ace}{e}}} - 3\left(4\,bce\log\left(F\right) - 3\left(b^2c^2ex + b^2c^2d\right)\log\left(F\right)^2\right)(ex+d)^{\frac{1}{3}}F^{bc\cdots}}{9\,b^3c^3\log\left(F\right)^3}$$

```
[In] integrate(F^(c*(b*x+a))*(e*x+d)^(4/3),x, algorithm="fricas")
[Out] 1/9*(4*(-b*c*log(F)/e)^(2/3)*e^2*gamma(1/3, -(b*c*e*x + b*c*d)*log(F)/e)/F^
((b*c*d - a*c*e)/e) - 3*(4*b*c*e*log(F) - 3*(b^2*c^2*e*x + b^2*c^2*d)*log(F
)^2)*(e*x + d)^(1/3)*F^(b*c*x + a*c))/(b^3*c^3*log(F)^3)
```

Sympy [F]

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = \int F^{c(a+bx)}(d+ex)^{\frac{4}{3}}\,dx$$

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

Maxima [F]

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = \int (ex+d)^{\frac{4}{3}}F^{(bx+a)c}\,dx$$

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

Giac [F]

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = \int (ex+d)^{\frac{4}{3}}F^{(bx+a)c}\,dx$$

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

Mupad [F(-1)]

Timed out.

$$\int F^{c(a+bx)}(d+ex)^{4/3}\,dx = \int F^{c\,(a+b\,x)}\,(d+e\,x)^{4/3}\,dx$$

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

3.50 $\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx$

Optimal result

Integrand size = 21, antiderivative size = 98

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx=-\frac{eF^{c\left(a-\frac{bd}{e}\right)n-cn(a+bx)}\left(F^{c(a+bx)}\right)^n\sqrt[3]{d+ex}\,\Gamma\left(\frac{7}{3},-\frac{bcn(d+ex)\log(F)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn(d+ex)\log(F)}{e}}}$$

```
[Out] -e*F^(c*(a-b*d/e)*n-c*n*(b*x+a))*(F^(c*(b*x+a)))^n*(e*x+d)^(1/3)*GAMMA(7/3,
-b*c*n*(e*x+d)*ln(F)/e)/b^2/c^2/n^2/ln(F)^2/(-b*c*n*(e*x+d)*ln(F)/e)^(1/3)
```

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 98, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.095, Rules used = {2213, 2212}

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx=-\frac{e\sqrt[3]{d+ex}\left(F^{c(a+bx)}\right)^n F^{cn\left(a-\frac{bd}{e}\right)-cn(a+bx)}\Gamma\left(\frac{7}{3},-\frac{bcn(d+ex)\log(F)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn\log(F)(d+ex)}{e}}}$$

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

```
[Out] -((e*F^(c*(a - (b*d)/e)*n - c*n*(a + b*x))*(F^(c*(a + b*x)))^n*(d + e*x)^(1
/3)*Gamma[7/3, -((b*c*n*(d + e*x)*Log[F])/e)])/(b^2*c^2*n^2*Log[F]^2*(-((b*
c*n*(d + e*x)*Log[F])/e))^(1/3)))
```

Rule 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 2213

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rubi steps

$$\text{integral} = \left(F^{-cn(a+bx)}\left(F^{c(a+bx)}\right)^n\right)\int F^{cn(a+bx)}(d+ex)^{4/3}\,dx$$

$$= -\frac{eF^{c\left(a-\frac{bd}{e}\right)n-cn(a+bx)}\left(F^{c(a+bx)}\right)^n\sqrt[3]{d+ex}\,\Gamma\left(\frac{7}{3},-\frac{bcn(d+ex)\log(F)}{e}\right)}{b^2c^2n^2\log^2(F)\sqrt[3]{-\frac{bcn(d+ex)\log(F)}{e}}}$$

Mathematica [A] (verified)

Time = 0.20 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.80

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = -\frac{F^{-\frac{bcn(d+ex)}{e}}\left(F^{c(a+bx)}\right)^n (d+ex)^{7/3}\Gamma\left(\frac{7}{3},-\frac{bcn(d+ex)\log(F)}{e}\right)}{e\left(-\frac{bcn(d+ex)\log(F)}{e}\right)^{7/3}}$$

```
[In] Integrate[(F^(c*(a + b*x)))^n*(d + e*x)^(4/3),x]
[Out] -(((F^(c*(a + b*x)))^n*(d + e*x)^(7/3)*Gamma[7/3, -((b*c*n*(d + e*x)*Log[F]
)/e)])/(e*F^((b*c*n*(d + e*x))/e)*(-((b*c*n*(d + e*x)*Log[F])/e))^(7/3)))
```

Maple [F]

$$\int \left(F^{c(bx+a)}\right)^n (ex+d)^{\frac{4}{3}}\,dx$$

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

Fricas [A] (verification not implemented)

none

Time = 0.09 (sec) , antiderivative size = 133, normalized size of antiderivative = 1.36

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = \frac{\frac{4\left(-\frac{bcn\log(F)}{e}\right)^{\frac{2}{3}} e^2\Gamma\left(\frac{1}{3},-\frac{(bcenx+bcdn)\log(F)}{e}\right)}{F^{\frac{(bcd-ace)n}{e}}} - 3\left(4\,bcen\log\left(F\right) - 3\left(b^2c^2en^2x + b^2c^2dn^2\right)\log\left(F\right)^2\right)(ex\ \cdots}{9\,b^3c^3n^3\log\left(F\right)^3}$$

```
[In] integrate((F^(c*(b*x+a)))^n*(e*x+d)^(4/3),x, algorithm="fricas")
[Out] 1/9*(4*(-b*c*n*log(F)/e)^(2/3)*e^2*gamma(1/3, -(b*c*e*n*x + b*c*d*n)*log(F)
/e)/F^((b*c*d - a*c*e)*n/e) - 3*(4*b*c*e*n*log(F) - 3*(b^2*c^2*e*n^2*x + b^
2*c^2*d*n^2)*log(F)^2)*(e*x + d)^(1/3)*F^(b*c*n*x + a*c*n))/(b^3*c^3*n^3*lo
g(F)^3)
```

Sympy [F(-1)]

Timed out.

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = \text{Timed out}$$

```
[In] integrate((F**(c*(b*x+a)))**n*(e*x+d)**(4/3),x)
[Out] Timed out
```

Maxima [F]

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = \int (ex+d)^{\frac{4}{3}} \left(F^{(bx+a)c}\right)^n\,dx$$

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

Giac [F]

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = \int (ex+d)^{\frac{4}{3}}\left(F^{(bx+a)c}\right)^n\,dx$$

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

Mupad [F(-1)]

Timed out.

$$\int \left(F^{c(a+bx)}\right)^n (d+ex)^{4/3}\,dx = \int \left(F^{c\,(a+b\,x)}\right)^n (d+e\,x)^{4/3}\,dx$$

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

3.51 $\int F^{c(a+bx)}(d+ex)\,dx$

Optimal result

Integrand size = 15, antiderivative size = 48

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

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

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2207, 2225}

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

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

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

Rule 2207

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

Rule 2225

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

Rubi steps

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

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.71

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

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

Maple [A] (verified)

Time = 0.00 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

method	result	size
gosper	$\frac{(\ln(F)bcex+\ln(F)bcd-e)F^{c(bx+a)}}{c^2b^2\ln(F)^2}$	38
risch	$\frac{(\ln(F)bcex+\ln(F)bcd-e)F^{c(bx+a)}}{c^2b^2\ln(F)^2}$	38
norman	$\frac{(\ln(F)bcd-e)e^{c(bx+a)\ln(F)}}{c^2b^2\ln(F)^2}+\frac{ex\,e^{c(bx+a)\ln(F)}}{cb\ln(F)}$	56
parallelrisch	$\frac{x\,F^{c(bx+a)}ecb\ln(F)+\ln(F)F^{c(bx+a)}bcd-F^{c(bx+a)}e}{c^2b^2\ln(F)^2}$	56
meijerg	$\frac{F^{ca}e\left(1-\frac{(-2bcx\ln(F)+2)e^{bcx\ln(F)}}{2}\right)}{c^2b^2\ln(F)^2}-\frac{F^{ca}d\left(1-e^{bcx\ln(F)}\right)}{cb\ln(F)}$	68

```
[In] int(F^(c*(b*x+a))*(e*x+d),x,method=_RETURNVERBOSE)
[Out] (ln(F)*b*c*e*x+ln(F)*b*c*d-e)*F^(c*(b*x+a))/c^2/b^2/ln(F)^2
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

$$\int F^{c(a+bx)}(d+ex)\,dx = \frac{((bcex+bcd)\log(F)-e)F^{bcx+ac}}{b^2c^2\log(F)^2}$$

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

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

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 60, normalized size of antiderivative = 1.25

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

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

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

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 60, normalized size of antiderivative = 1.25

$$\int F^{c(a+bx)}(d+ex)\,dx = \frac{F^{bcx+ac}d}{bc\log(F)} + \frac{(F^{ac}bcx\log(F)-F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}$$

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.35 (sec) , antiderivative size = 898, normalized size of antiderivative = 18.71

$$\int F^{c(a+bx)}(d+ex)\,dx = \text{Too large to display}$$

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

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

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.79

$$\int F^{c(a+bx)}(d+ex)\,dx=\frac{F^{a\,c+b\,c\,x}\,\left(b\,c\,d\,\ln\left(F\right)-e+b\,c\,e\,x\,\ln\left(F\right)\right)}{b^2\,c^2\,\ln\left(F\right)^2}$$

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

3.52 $\int F^{c(a+bx)}(d+ex+fx^2)\,dx$

Optimal result

Integrand size = 20, antiderivative size = 135

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx=\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 135, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.150, Rules used = {2227, 2225, 2207}

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx=\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+\frac{fx^2F^{c(a+bx)}}{bc\log(F)}$$

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

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

Rule 2207

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

Rule 2225

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

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

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

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.41

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right) dx = \frac{F^{c(a+bx)}\left(2f - bc(e+2fx)\log(F) + b^2c^2(d+x(e+fx))\log^2(F)\right)}{b^3c^3\log^3(F)}$$

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

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 80, normalized size of antiderivative = 0.59

method	result
gosper	$\frac{\left(f\,x^{2} c^{2} b^{2} \ln\left(F\right)^{2}+\ln\left(F\right)^{2} b^{2} c^{2} e x+c^{2} b^{2} \ln\left(F\right)^{2} d-2 \ln\left(F\right) b c f x-\ln\left(F\right) b c e+2 f\right) F^{c\left(b x+a\right)}}{c^{3} b^{3} \ln\left(F\right)^{3}}$
risch	$\frac{\left(f\,x^{2} c^{2} b^{2} \ln\left(F\right)^{2}+\ln\left(F\right)^{2} b^{2} c^{2} e x+c^{2} b^{2} \ln\left(F\right)^{2} d-2 \ln\left(F\right) b c f x-\ln\left(F\right) b c e+2 f\right) F^{c\left(b x+a\right)}}{c^{3} b^{3} \ln\left(F\right)^{3}}$
norman	$\frac{\left(c^{2} b^{2} \ln\left(F\right)^{2} d-\ln\left(F\right) b c e+2 f\right) {\mathrm e}^{c\left(b x+a\right) \ln\left(F\right)}}{c^{3} b^{3} \ln\left(F\right)^{3}}+\frac{f\,x^{2} {\mathrm e}^{c\left(b x+a\right) \ln\left(F\right)}}{c b \ln\left(F\right)}+\frac{\left(\ln\left(F\right) b c e-2 f\right) x\,{\mathrm e}^{c\left(b x+a\right) \ln\left(F\right)}}{c^{2} b^{2} \ln\left(F\right)^{2}}$
meijerg	$-\frac{F^{c a} f\left(2-\frac{\left(3 b^{2} c^{2} x^{2} \ln\left(F\right)^{2}-6 b c x \ln\left(F\right)+6\right) {\mathrm e}^{b c x \ln\left(F\right)}}{3}\right)}{c^{3} b^{3} \ln\left(F\right)^{3}}+\frac{F^{c a} e\left(1-\frac{\left(-2 b c x \ln\left(F\right)+2\right) {\mathrm e}^{b c x \ln\left(F\right)}}{2}\right)}{c^{2} b^{2} \ln\left(F\right)^{2}}-\frac{F^{c a} d\left(1-{\mathrm e}^{b c x \ln\left(F\right)}\right)}{c b \ln\left(F\right)}$
parallelrisch	$\frac{x^{2} F^{c\left(b x+a\right)} f\,c^{2} b^{2} \ln\left(F\right)^{2}+\ln\left(F\right)^{2} x\,F^{c\left(b x+a\right)} b^{2} c^{2} e+\ln\left(F\right)^{2} F^{c\left(b x+a\right)} b^{2} c^{2} d-2 \ln\left(F\right) x\,F^{c\left(b x+a\right)} b c f-\ln\left(F\right) F^{c\left(b x+a\right)} b c e+2 F^{c\left(b x+a\right.}}{c^{3} b^{3} \ln\left(F\right)^{3}}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 74, normalized size of antiderivative = 0.55

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx$$
$$=\frac{\left(\left(b^2c^2fx^2+b^2c^2ex+b^2c^2d\right)\log\left(F\right)^2-\left(2\,bcfx+bce\right)\log\left(F\right)+2\,f\right)F^{bcx+ac}}{b^3c^3\log\left(F\right)^3}$$

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

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

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 116, normalized size of antiderivative = 0.86

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx = \begin{cases} \frac{F^{c(a+bx)}\left(b^2c^2d\log{(F)}^2+b^2c^2ex\log{(F)}^2+b^2c^2fx^2\log{(F)}^2-bce\log{(F)}-2bcfx\log{(F)}+2f\right)}{b^3c^3\log{(F)}^3} & \text{for } b^3c^3\log{(F)}^3\neq 0 \\ dx+\frac{ex^2}{2}+\frac{fx^3}{3} & \text{otherwise} \end{cases}$$

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

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

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 117, normalized size of antiderivative = 0.87

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx = \frac{F^{bcx+ac}d}{bc\log{(F)}} + \frac{(F^{ac}bcx\log{(F)}-F^{ac})F^{bcx}e}{b^2c^2\log{(F)}^2} + \frac{\left(F^{ac}b^2c^2x^2\log{(F)}^2-2\,F^{ac}bcx\log{(F)}+2\,F^{ac}\right)F^{bcx}f}{b^3c^3\log{(F)}^3}$$

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.35 (sec) , antiderivative size = 2068, normalized size of antiderivative = 15.32

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx = \text{Too large to display}$$

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

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

```
2*c^2*f*x^2*sgn(F) - 2*pi*b^2*c^2*f*x^2*log(abs(F))*sgn(F) + I*pi^2*b^2*c^2
*f*x^2 + 2*pi*b^2*c^2*f*x^2*log(abs(F)) - 2*I*b^2*c^2*f*x^2*log(abs(F))^2 -
 I*pi^2*b^2*c^2*e*x*sgn(F) - 2*pi*b^2*c^2*e*x*log(abs(F))*sgn(F) + I*pi^2*b
^2*c^2*e*x + 2*pi*b^2*c^2*e*x*log(abs(F)) - 2*I*b^2*c^2*e*x*log(abs(F))^2 -
 I*pi^2*b^2*c^2*d*sgn(F) - 2*pi*b^2*c^2*d*log(abs(F))*sgn(F) + I*pi^2*b^2*c
^2*d + 2*pi*b^2*c^2*d*log(abs(F)) - 2*I*b^2*c^2*d*log(abs(F))^2 + 2*pi*b*c*
f*x*sgn(F) - 2*pi*b*c*f*x + 4*I*b*c*f*x*log(abs(F)) + pi*b*c*e*sgn(F) - pi*
b*c*e + 2*I*b*c*e*log(abs(F)) - 4*I*f)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*pi
*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(4*I*pi^3*b^3*c^3*sgn(F) + 12*
pi^2*b^3*c^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*c^3*log(abs(F))^2*sgn(F) - 4*
I*pi^3*b^3*c^3 - 12*pi^2*b^3*c^3*log(abs(F)) + 12*I*pi*b^3*c^3*log(abs(F))^
2 + 8*b^3*c^3*log(abs(F))^3))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 80, normalized size of antiderivative = 0.59

$$\int F^{c(a+bx)}\left(d+ex+fx^2\right)\,dx = \frac{F^{a\,c+b\,c\,x}\,\left(f\,b^2\,c^2\,x^2\,\ln\left(F\right)^2+e\,b^2\,c^2\,x\,\ln\left(F\right)^2+d\,b^2\,c^2\,\ln\left(F\right)^2-2\,f\,b\,c\,x\,\ln\left(F\right)-e\,b\,c\,\ln\left(F\right)+2\,f\right)}{b^3\,c^3\,\ln\left(F\right)^3}$$

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

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

3.53 $\int F^{c(a+bx)}(d+ex+fx^2+gx^3)\,dx$

Optimal result

Integrand size = 25, antiderivative size = 229

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx=-\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}-\frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}+\frac{F^{c(a+bx)}gx^3}{bc\log(F)}$$

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

Rubi [A] (verified)

Time = 0.13 (sec) , antiderivative size = 229, normalized size of antiderivative = 1.00, number of steps used = 12, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.120, Rules used = {2227, 2225, 2207}

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx=-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+\frac{fx^2F^{c(a+bx)}}{bc\log(F)}+\frac{gx^3F^{c(a+bx)}}{bc\log(F)}$$

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

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

Rule 2207

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

Rule 2225

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

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(dF^{c(a+bx)} + eF^{c(a+bx)}x + fF^{c(a+bx)}x^2 + F^{c(a+bx)}gx^3\right)\,dx \\
&= d\int F^{c(a+bx)}\,dx + e\int F^{c(a+bx)}x\,dx + f\int F^{c(a+bx)}x^2\,dx + g\int F^{c(a+bx)}x^3\,dx \\
&= \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} \\
&\quad - \frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)} - \frac{(2f)\int F^{c(a+bx)}x\,dx}{bc\log(F)} - \frac{(3g)\int F^{c(a+bx)}x^2\,dx}{bc\log(F)} \\
&= -\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} \\
&\quad + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{(2f)\int F^{c(a+bx)}\,dx}{b^2c^2\log^2(F)} + \frac{(6g)\int F^{c(a+bx)}x\,dx}{b^2c^2\log^2(F)}
\end{aligned}
$$

$$
= \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} - \frac{(6g)\int F^{c(a+bx)}\,dx}{b^3c^3\log^3(F)}
$$

$$
= -\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)} + \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)}
$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 84, normalized size of antiderivative = 0.37

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

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

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

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 138, normalized size of antiderivative = 0.60

method	result
gosper	$\frac{(g x^3c^3b^3\ln(F)^3+\ln(F)^3b^3c^3f x^2+\ln(F)^3b^3c^3ex+c^3b^3\ln(F)^3d-3\ln(F)^2b^2c^2g x^2-2fx c^2b^2\ln(F)^2-\ln(F)^2b^2c^2e+6\ln(F)bcgx}{c^4b^4\ln(F)^4}$
risch	$\frac{(g x^3c^3b^3\ln(F)^3+\ln(F)^3b^3c^3f x^2+\ln(F)^3b^3c^3ex+c^3b^3\ln(F)^3d-3\ln(F)^2b^2c^2g x^2-2fx c^2b^2\ln(F)^2-\ln(F)^2b^2c^2e+6\ln(F)bcgx}{c^4b^4\ln(F)^4}$
norman	$\frac{\left(c^3b^3\ln(F)^3d-\ln(F)^2b^2c^2e+2\ln(F)bcf-6g\right)e^{c(bx+a)\ln(F)}}{c^4b^4\ln(F)^4}+\frac{g x^3e^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{(\ln(F)bcf-3g)x^2e^{c(bx+a)\ln(F)}}{c^2b^2\ln(F)^2}+ (\ln($
meijerg	$\frac{F^{ca}g\left(6-\frac{\left(-4b^3c^3x^3\ln(F)^3+12b^2c^2x^2\ln(F)^2-24bcx\ln(F)+24\right)e^{bcx\ln(F)}}{4}\right)}{c^4b^4\ln(F)^4}-\frac{F^{ca}f\left(2-\frac{\left(3b^2c^2x^2\ln(F)^2-6bcx\ln(F)+6\right)e^{bcx\ln(F)}}{3}\right)}{c^3b^3\ln(F)^3}$
parallelrisch	$\frac{x^3F^{c(bx+a)}g c^3b^3\ln(F)^3+\ln(F)^3x^2F^{c(bx+a)}b^3c^3f+\ln(F)^3x F^{c(bx+a)}b^3c^3e+\ln(F)^3F^{c(bx+a)}b^3c^3d-3\ln(F)^2x^2F^{c(bx+a)}b^2c^2g-}{c^4b^4\ln(F)^4}$

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

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

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 122, normalized size of antiderivative = 0.53

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

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

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

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 190, normalized size of antiderivative = 0.83

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx$$
$$=\begin{cases}\frac{F^{c(a+bx)}\left(b^3c^3d\log\left(F\right)^3+b^3c^3ex\log\left(F\right)^3+b^3c^3fx^2\log\left(F\right)^3+b^3c^3gx^3\log\left(F\right)^3-b^2c^2e\log\left(F\right)^2-2b^2c^2fx\log\left(F\right)^2-3b^2c^2gx^2\log\left(F\right)^2+2bcf\log\right.}{b^4c^4\log\left(F\right)^4} \\ dx+\frac{ex^2}{2}+\frac{fx^3}{3}+\frac{gx^4}{4}\end{cases}$$

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

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

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 194, normalized size of antiderivative = 0.85

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx = \frac{F^{bcx+ac}d}{bc\log(F)} + \frac{(F^{ac}bcx\log(F)-F^{ac})F^{bcx}e}{b^2c^2\log(F)^2} + \frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2\,F^{ac}bcx\log(F)+2\,F^{ac}\right)F^{bcx}f}{b^3c^3\log(F)^3} + \frac{\left(F^{ac}b^3c^3x^3\log(F)^3-3\,F^{ac}b^2c^2x^2\log(F)^2+6\,F^{ac}bcx\log(F)-6\,F^{ac}\right)F^{bcx}g}{b^4c^4\log(F)^4}$$

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.38 (sec) , antiderivative size = 4188, normalized size of antiderivative = 18.29

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx = \text{Too large to display}$$

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

```
[Out] -(((3*pi^2*b^3*c^3*g*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*g*x^3*log(abs(
F)) + 2*b^3*c^3*g*x^3*log(abs(F))^3 + 3*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(
F) - 3*pi^2*b^3*c^3*f*x^2*log(abs(F)) + 2*b^3*c^3*f*x^2*log(abs(F))^3 + 3*p
i^2*b^3*c^3*e*x*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e*x*log(abs(F)) + 2*b^3
*c^3*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*d*log(abs(F))*sgn(F) - 3*pi^2*b^3*c
^3*d*log(abs(F)) + 2*b^3*c^3*d*log(abs(F))^3 - 3*pi^2*b^2*c^2*g*x^2*sgn(F)
+ 3*pi^2*b^2*c^2*g*x^2 - 6*b^2*c^2*g*x^2*log(abs(F))^2 - 2*pi^2*b^2*c^2*f*x
*sgn(F) + 2*pi^2*b^2*c^2*f*x - 4*b^2*c^2*f*x*log(abs(F))^2 - pi^2*b^2*c^2*e
*sgn(F) + pi^2*b^2*c^2*e - 2*b^2*c^2*e*log(abs(F))^2 + 12*b*c*g*x*log(abs(F
)) + 4*b*c*f*log(abs(F)) - 12*g)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(
abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*
```

log(abs(F))^4)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F)
- pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2
+ 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - p
i^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^2) - 4*(pi^3*b^3*c^3*g*
x^3*sgn(F) - 3*pi*b^3*c^3*g*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*g*x^3 +
3*pi*b^3*c^3*g*x^3*log(abs(F))^2 + pi^3*b^3*c^3*f*x^2*sgn(F) - 3*pi*b^3*c^
3*f*x^2*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 + 3*pi*b^3*c^3*f*x^2*log(
abs(F))^2 + pi^3*b^3*c^3*e*x*sgn(F) - 3*pi*b^3*c^3*e*x*log(abs(F))^2*sgn(F)
- pi^3*b^3*c^3*e*x + 3*pi*b^3*c^3*e*x*log(abs(F))^2 + pi^3*b^3*c^3*d*sgn(F
) - 3*pi*b^3*c^3*d*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d + 3*pi*b^3*c^3*d*l
og(abs(F))^2 + 6*pi*b^2*c^2*g*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*c^2*g*x^2*l
og(abs(F)) + 4*pi*b^2*c^2*f*x*log(abs(F))*sgn(F) - 4*pi*b^2*c^2*f*x*log(abs
(F)) + 2*pi*b^2*c^2*e*log(abs(F))*sgn(F) - 2*pi*b^2*c^2*e*log(abs(F)) - 6*p
i*b*c*g*x*sgn(F) + 6*pi*b*c*g*x - 2*pi*b*c*f*sgn(F) + 2*pi*b*c*f)*(pi^3*b^4
*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*lo
g(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^
4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^
4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*l
og(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)^
2))*cos(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*
c) - ((pi^3*b^3*c^3*g*x^3*sgn(F) - 3*pi*b^3*c^3*g*x^3*log(abs(F))^2*sgn(F)
- pi^3*b^3*c^3*g*x^3 + 3*pi*b^3*c^3*g*x^3*log(abs(F))^2 + pi^3*b^3*c^3*f*x^
2*sgn(F) - 3*pi*b^3*c^3*f*x^2*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 + 3
*pi*b^3*c^3*f*x^2*log(abs(F))^2 + pi^3*b^3*c^3*e*x*sgn(F) - 3*pi*b^3*c^3*e*
x*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e*x + 3*pi*b^3*c^3*e*x*log(abs(F))^2
+ pi^3*b^3*c^3*d*sgn(F) - 3*pi*b^3*c^3*d*log(abs(F))^2*sgn(F) - pi^3*b^3*c^
3*d + 3*pi*b^3*c^3*d*log(abs(F))^2 + 6*pi*b^2*c^2*g*x^2*log(abs(F))*sgn(F)
- 6*pi*b^2*c^2*g*x^2*log(abs(F)) + 4*pi*b^2*c^2*f*x*log(abs(F))*sgn(F) - 4*
pi*b^2*c^2*f*x*log(abs(F)) + 2*pi*b^2*c^2*e*log(abs(F))*sgn(F) - 2*pi*b^2*c
^2*e*log(abs(F)) - 6*pi*b*c*g*x*sgn(F) + 6*pi*b*c*g*x - 2*pi*b*c*f*sgn(F) +
2*pi*b*c*f)*(pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)/((pi^
4*b^4*c^4*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*p
i^2*b^4*c^4*log(abs(F))^2 - 2*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*l
og(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(
F)) + pi*b^4*c^4*log(abs(F))^3)^2) + 4*(3*pi^2*b^3*c^3*g*x^3*log(abs(F))*sg
n(F) - 3*pi^2*b^3*c^3*g*x^3*log(abs(F)) + 2*b^3*c^3*g*x^3*log(abs(F))^3 + 3
*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*f*x^2*log(abs(F)) +
2*b^3*c^3*f*x^2*log(abs(F))^3 + 3*pi^2*b^3*c^3*e*x*log(abs(F))*sgn(F) - 3*
pi^2*b^3*c^3*e*x*log(abs(F)) + 2*b^3*c^3*e*x*log(abs(F))^3 + 3*pi^2*b^3*c^3
*d*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*d*log(abs(F)) + 2*b^3*c^3*d*log(abs(
F))^3 - 3*pi^2*b^2*c^2*g*x^2*sgn(F) + 3*pi^2*b^2*c^2*g*x^2 - 6*b^2*c^2*g*x^
2*log(abs(F))^2 - 2*pi^2*b^2*c^2*f*x*sgn(F) + 2*pi^2*b^2*c^2*f*x - 4*b^2*c^
2*f*x*log(abs(F))^2 - pi^2*b^2*c^2*e*sgn(F) + pi^2*b^2*c^2*e - 2*b^2*c^2*e*
log(abs(F))^2 + 12*b*c*g*x*log(abs(F)) + 4*b*c*f*log(abs(F)) - 12*g)*(pi^3*

b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4
*log(abs(F)) + pi*b^4*c^4*log(abs(F))^3)/((pi^4*b^4*c^4*sgn(F) - 6*pi^2*b^4
*c^4*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4 + 6*pi^2*b^4*c^4*log(abs(F))^2 - 2
*b^4*c^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*c^4*log(abs(F))*sgn(F) - pi*b^4*c^
4*log(abs(F))^3*sgn(F) - pi^3*b^4*c^4*log(abs(F)) + pi*b^4*c^4*log(abs(F))^
3)^2))*sin(-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi
*a*c))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F))) - 1/2*I*((pi^3*b^3*c^3*g*x^3
*sgn(F) + 3*I*pi^2*b^3*c^3*g*x^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*g*x^3*lo
g(abs(F))^2*sgn(F) - pi^3*b^3*c^3*g*x^3 - 3*I*pi^2*b^3*c^3*g*x^3*log(abs(F)
) + 3*pi*b^3*c^3*g*x^3*log(abs(F))^2 + 2*I*b^3*c^3*g*x^3*log(abs(F))^3 + pi
^3*b^3*c^3*f*x^2*sgn(F) + 3*I*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 3*pi*
b^3*c^3*f*x^2*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 - 3*I*pi^2*b^3*c^3*
f*x^2*log(abs(F)) + 3*pi*b^3*c^3*f*x^2*log(abs(F))^2 + 2*I*b^3*c^3*f*x^2*lo
g(abs(F))^3 + pi^3*b^3*c^3*e*x*sgn(F) + 3*I*pi^2*b^3*c^3*e*x*log(abs(F))*sg
n(F) - 3*pi*b^3*c^3*e*x*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e*x - 3*I*pi^2*
b^3*c^3*e*x*log(abs(F)) + 3*pi*b^3*c^3*e*x*log(abs(F))^2 + 2*I*b^3*c^3*e*x*
log(abs(F))^3 + pi^3*b^3*c^3*d*sgn(F) + 3*I*pi^2*b^3*c^3*d*log(abs(F))*sgn(
F) - 3*pi*b^3*c^3*d*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d - 3*I*pi^2*b^3*c^
3*d*log(abs(F)) + 3*pi*b^3*c^3*d*log(abs(F))^2 + 2*I*b^3*c^3*d*log(abs(F))^
3 - 3*I*pi^2*b^2*c^2*g*x^2*sgn(F) + 6*pi*b^2*c^2*g*x^2*log(abs(F))*sgn(F) +
 3*I*pi^2*b^2*c^2*g*x^2 - 6*pi*b^2*c^2*g*x^2*log(abs(F)) - 6*I*b^2*c^2*g*x^
2*log(abs(F))^2 - 2*I*pi^2*b^2*c^2*f*x*sgn(F) + 4*pi*b^2*c^2*f*x*log(abs(F)
)*sgn(F) + 2*I*pi^2*b^2*c^2*f*x - 4*pi*b^2*c^2*f*x*log(abs(F)) - 4*I*b^2*c^
2*f*x*log(abs(F))^2 - I*pi^2*b^2*c^2*e*sgn(F) + 2*pi*b^2*c^2*e*log(abs(F))*
sgn(F) + I*pi^2*b^2*c^2*e - 2*pi*b^2*c^2*e*log(abs(F)) - 2*I*b^2*c^2*e*log(
abs(F))^2 - 6*pi*b*c*g*x*sgn(F) + 6*pi*b*c*g*x + 12*I*b*c*g*x*log(abs(F)) -
 2*pi*b*c*f*sgn(F) + 2*pi*b*c*f + 4*I*b*c*f*log(abs(F)) - 12*I*g)*e^(1/2*I*
pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(pi^
4*b^4*c^4*sgn(F) + 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log
(abs(F))^2*sgn(F) - 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 - 4*
I*pi^3*b^4*c^4*log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 + 4*I*pi*b^4*c^4*
log(abs(F))^3 - 2*b^4*c^4*log(abs(F))^4) + (pi^3*b^3*c^3*g*x^3*sgn(F) - 3*I
*pi^2*b^3*c^3*g*x^3*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*g*x^3*log(abs(F))^2*s
gn(F) - pi^3*b^3*c^3*g*x^3 + 3*I*pi^2*b^3*c^3*g*x^3*log(abs(F)) + 3*pi*b^3*
c^3*g*x^3*log(abs(F))^2 - 2*I*b^3*c^3*g*x^3*log(abs(F))^3 + pi^3*b^3*c^3*f*
x^2*sgn(F) - 3*I*pi^2*b^3*c^3*f*x^2*log(abs(F))*sgn(F) - 3*pi*b^3*c^3*f*x^2
*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*f*x^2 + 3*I*pi^2*b^3*c^3*f*x^2*log(abs
(F)) + 3*pi*b^3*c^3*f*x^2*log(abs(F))^2 - 2*I*b^3*c^3*f*x^2*log(abs(F))^3 +
 pi^3*b^3*c^3*e*x*sgn(F) - 3*I*pi^2*b^3*c^3*e*x*log(abs(F))*sgn(F) - 3*pi*b
^3*c^3*e*x*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e*x + 3*I*pi^2*b^3*c^3*e*x*l
og(abs(F)) + 3*pi*b^3*c^3*e*x*log(abs(F))^2 - 2*I*b^3*c^3*e*x*log(abs(F))^3
 + pi^3*b^3*c^3*d*sgn(F) - 3*I*pi^2*b^3*c^3*d*log(abs(F))*sgn(F) - 3*pi*b^3
*c^3*d*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*d + 3*I*pi^2*b^3*c^3*d*log(abs(F
)) + 3*pi*b^3*c^3*d*log(abs(F))^2 - 2*I*b^3*c^3*d*log(abs(F))^3 + 3*I*pi^2*
b^2*c^2*g*x^2*sgn(F) + 6*pi*b^2*c^2*g*x^2*log(abs(F))*sgn(F) - 3*I*pi^2*b^2

```
*c^2*g*x^2 - 6*pi*b^2*c^2*g*x^2*log(abs(F)) + 6*I*b^2*c^2*g*x^2*log(abs(F))
^2 + 2*I*pi^2*b^2*c^2*f*x*sgn(F) + 4*pi*b^2*c^2*f*x*log(abs(F))*sgn(F) - 2*
I*pi^2*b^2*c^2*f*x - 4*pi*b^2*c^2*f*x*log(abs(F)) + 4*I*b^2*c^2*f*x*log(abs
(F))^2 + I*pi^2*b^2*c^2*e*sgn(F) + 2*pi*b^2*c^2*e*log(abs(F))*sgn(F) - I*pi
^2*b^2*c^2*e - 2*pi*b^2*c^2*e*log(abs(F)) + 2*I*b^2*c^2*e*log(abs(F))^2 - 6
*pi*b*c*g*x*sgn(F) + 6*pi*b*c*g*x - 12*I*b*c*g*x*log(abs(F)) - 2*pi*b*c*f*s
gn(F) + 2*pi*b*c*f - 4*I*b*c*f*log(abs(F)) + 12*I*g)*e^(-1/2*I*pi*b*c*x*sgn
(F) + 1/2*I*pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(pi^4*b^4*c^4*sg
n(F) - 4*I*pi^3*b^4*c^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*log(abs(F))^2*s
gn(F) + 4*I*pi*b^4*c^4*log(abs(F))^3*sgn(F) - pi^4*b^4*c^4 + 4*I*pi^3*b^4*c
^4*log(abs(F)) + 6*pi^2*b^4*c^4*log(abs(F))^2 - 4*I*pi*b^4*c^4*log(abs(F))^
3 - 2*b^4*c^4*log(abs(F))^4))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 138, normalized size of antiderivative = 0.60

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3\right)\,dx = \frac{F^{a\,c+b\,c\,x}\left(g\,b^3\,c^3\,x^3\ln\left(F\right)^3+f\,b^3\,c^3\,x^2\ln\left(F\right)^3+e\,b^3\,c^3\,x\ln\left(F\right)^3+d\,b^3\,c^3\ln\left(F\right)^3-3\,g\,b^2\,c^2\,x^2\ln\left(F\right)^2-2\,\cdots\right.}{b^4\,c^4\ln\left(F\right)^4}$$

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

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

3.54 $\int F^{c(a+bx)}(d+ex+fx^2+gx^3+hx^4)\,dx$

Optimal result

Integrand size = 30, antiderivative size = 348

$$\begin{aligned}\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx=&\frac{24F^{c(a+bx)}h}{b^5c^5\log^5(F)}-\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)}-\frac{24F^{c(a+bx)}hx}{b^4c^4\log^4(F)}\\&+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)}+\frac{12F^{c(a+bx)}hx^2}{b^3c^3\log^3(F)}\\&-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)}-\frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)}\\&-\frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{eF^{c(a+bx)}x}{bc\log(F)}\\&+\frac{fF^{c(a+bx)}x^2}{bc\log(F)}+\frac{F^{c(a+bx)}gx^3}{bc\log(F)}+\frac{F^{c(a+bx)}hx^4}{bc\log(F)}\end{aligned}$$

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

Rubi [A] (verified)

Time = 0.21 (sec) , antiderivative size = 348, normalized size of antiderivative = 1.00, number of steps used = 17, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.100, Rules used = {2227, 2225, 2207}

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx=\frac{24hF^{c(a+bx)}}{b^5c^5\log^5(F)}-\frac{6gF^{c(a+bx)}}{b^4c^4\log^4(F)}-\frac{24hxF^{c(a+bx)}}{b^4c^4\log^4(F)}+\frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{6gxF^{c(a+bx)}}{b^3c^3\log^3(F)}+\frac{12hx^2F^{c(a+bx)}}{b^3c^3\log^3(F)}-\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{2fxF^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{3gx^2F^{c(a+bx)}}{b^2c^2\log^2(F)}-\frac{4hx^3F^{c(a+bx)}}{b^2c^2\log^2(F)}+\frac{dF^{c(a+bx)}}{bc\log(F)}+\frac{exF^{c(a+bx)}}{bc\log(F)}+\frac{fx^2F^{c(a+bx)}}{bc\log(F)}+\frac{gx^3F^{c(a+bx)}}{bc\log(F)}+\frac{hx^4F^{c(a+bx)}}{bc\log(F)}$$

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

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

Rule 2207

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

Rule 2225

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

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
```

```
x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(dF^{c(a+bx)} + eF^{c(a+bx)}x + fF^{c(a+bx)}x^2 + F^{c(a+bx)}gx^3 + F^{c(a+bx)}hx^4\right) dx$$

$$= d\int F^{c(a+bx)}\,dx + e\int F^{c(a+bx)}x\,dx + f\int F^{c(a+bx)}x^2\,dx + g\int F^{c(a+bx)}x^3\,dx + h\int F^{c(a+bx)}x^4\,dx$$

$$= \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{F^{c(a+bx)}hx^4}{bc\log(F)} - \frac{e\int F^{c(a+bx)}\,dx}{bc\log(F)} - \frac{(2f)\int F^{c(a+bx)}x\,dx}{bc\log(F)} - \frac{(3g)\int F^{c(a+bx)}x^2\,dx}{bc\log(F)} - \frac{(4h)\int F^{c(a+bx)}x^3\,dx}{bc\log(F)}$$

$$= -\frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} - \frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{F^{c(a+bx)}hx^4}{bc\log(F)} + \frac{(2f)\int F^{c(a+bx)}\,dx}{b^2c^2\log^2(F)} + \frac{(6g)\int F^{c(a+bx)}x\,dx}{b^2c^2\log^2(F)} + \frac{(12h)\int F^{c(a+bx)}x^2\,dx}{b^2c^2\log^2(F)}$$

$$= \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} + \frac{12F^{c(a+bx)}hx^2}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} - \frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{F^{c(a+bx)}hx^4}{bc\log(F)} - \frac{(6g)\int F^{c(a+bx)}\,dx}{b^3c^3\log^3(F)} - \frac{(24h)\int F^{c(a+bx)}x\,dx}{b^3c^3\log^3(F)}$$

$$= -\frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)} - \frac{24F^{c(a+bx)}hx}{b^4c^4\log^4(F)} + \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} + \frac{12F^{c(a+bx)}hx^2}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} - \frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{F^{c(a+bx)}hx^4}{bc\log(F)} + \frac{(24h)\int F^{c(a+bx)}\,dx}{b^4c^4\log^4(F)}$$

$$= \frac{24F^{c(a+bx)}h}{b^5c^5\log^5(F)} - \frac{6F^{c(a+bx)}g}{b^4c^4\log^4(F)} - \frac{24F^{c(a+bx)}hx}{b^4c^4\log^4(F)} + \frac{2fF^{c(a+bx)}}{b^3c^3\log^3(F)} + \frac{6F^{c(a+bx)}gx}{b^3c^3\log^3(F)} + \frac{12F^{c(a+bx)}hx^2}{b^3c^3\log^3(F)} - \frac{eF^{c(a+bx)}}{b^2c^2\log^2(F)} - \frac{2fF^{c(a+bx)}x}{b^2c^2\log^2(F)} - \frac{3F^{c(a+bx)}gx^2}{b^2c^2\log^2(F)} - \frac{4F^{c(a+bx)}hx^3}{b^2c^2\log^2(F)} + \frac{dF^{c(a+bx)}}{bc\log(F)} + \frac{eF^{c(a+bx)}x}{bc\log(F)} + \frac{fF^{c(a+bx)}x^2}{bc\log(F)} + \frac{F^{c(a+bx)}gx^3}{bc\log(F)} + \frac{F^{c(a+bx)}hx^4}{bc\log(F)}$$

Mathematica [A] (verified)

Time = 0.54 (sec) , antiderivative size = 117, normalized size of antiderivative = 0.34

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx$$
$$=\frac{F^{c(a+bx)}\left(24h-6bc(g+4hx)\log(F)+2b^2c^2(f+3x(g+2hx))\log^2(F)-b^3c^3(e+x(2f+3gx+4hx^2))\,\mathrm{lo}\cdots\right.}{b^5c^5\log^5(F)}$$

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

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

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 212, normalized size of antiderivative = 0.61

method	result
gosper	$\frac{\left(h\,x^4c^4b^4\ln(F)^4+\ln(F)^4b^4c^4g\,x^3+\ln(F)^4b^4c^4f\,x^2+\ln(F)^4b^4c^4ex+\ln(F)^4b^4c^4d-4\ln(F)^3b^3c^3h\,x^3-3g\,x^2c^3b^3\ln(F)^3-2\ln(F\cdots\right.}{c^5b^5\ln(\cdots}$
risch	$\frac{\left(h\,x^4c^4b^4\ln(F)^4+\ln(F)^4b^4c^4g\,x^3+\ln(F)^4b^4c^4f\,x^2+\ln(F)^4b^4c^4ex+\ln(F)^4b^4c^4d-4\ln(F)^3b^3c^3h\,x^3-3g\,x^2c^3b^3\ln(F)^3-2\ln(F\cdots\right.}{c^5b^5\ln(\cdots}$
norman	$\frac{\left(\ln(F)^4b^4c^4d-\ln(F)^3b^3c^3e+2f\,c^2b^2\ln(F)^2-6\ln(F)bcg+24h\right)\mathrm{e}^{c(bx+a)\ln(F)}}{c^5b^5\ln(F)^5}+\frac{h\,x^4\mathrm{e}^{c(bx+a)\ln(F)}}{cb\ln(F)}+\frac{(\ln(F)bcg-4h)x^3\mathrm{e}^{c(b\cdots}}{c^2b^2\ln(F)^2\cdots}$
meijerg	$-\frac{F^{ca}h\left(24-\frac{\left(5b^4c^4x^4\ln(F)^4-20b^3c^3x^3\ln(F)^3+60b^2c^2x^2\ln(F)^2-120bcx\ln(F)+120\right)\mathrm{e}^{bcx\ln(F)}}{5}\right)}{c^5b^5\ln(F)^5}+\frac{F^{ca}g\left(6-\frac{\left(-4b^3c^3x^3\ln(F)^3+\cdots\right.}{\cdots}\right.}{\cdots}$
parallelrisch	$\frac{x^4F^{c(bx+a)}h\,c^4b^4\ln(F)^4+\ln(F)^4x^3F^{c(bx+a)}b^4c^4g+\ln(F)^4x^2F^{c(bx+a)}b^4c^4f+\ln(F)^4x\,F^{c(bx+a)}b^4c^4e+\ln(F)^4F^{c(bx+a)}b^4c^4d\cdots}{\cdots}$

```
[In] int(F^(c*(b*x+a))*(h*x^4+g*x^3+f*x^2+e*x+d),x,method=_RETURNVERBOSE)
```

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

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 182, normalized size of antiderivative = 0.52

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx$$
$$=\frac{\left(\left(b^4c^4hx^4+b^4c^4gx^3+b^4c^4fx^2+b^4c^4ex+b^4c^4d\right)\log\left(F\right)^4-\left(4\,b^3c^3hx^3+3\,b^3c^3gx^2+2\,b^3c^3fx+b^3c^3e\right)\log\left(\right.\right.}{b^5c^5\log\left(F\right)^5}$$

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

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

Sympy [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 284, normalized size of antiderivative = 0.82

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx$$
$$=\begin{cases}\frac{F^{c(a+bx)}\left(b^4c^4d\log\left(F\right)^4+b^4c^4ex\log\left(F\right)^4+b^4c^4fx^2\log\left(F\right)^4+b^4c^4gx^3\log\left(F\right)^4+b^4c^4hx^4\log\left(F\right)^4-b^3c^3e\log\left(F\right)^3-2b^3c^3fx\log\left(F\right)^3-3b^3c^3gx^2\right.}{b^5c^5\log\left(F\right)^5}\\ dx+\frac{ex^2}{2}+\frac{fx^3}{3}+\frac{gx^4}{4}+\frac{hx^5}{5}\end{cases}$$

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

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

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 291, normalized size of antiderivative = 0.84

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx=\frac{F^{bcx+ac}d}{bc\log(F)}+\frac{(F^{ac}bcx\log(F)-F^{ac})F^{bcx}e}{b^2c^2\log(F)^2}+\frac{\left(F^{ac}b^2c^2x^2\log(F)^2-2F^{ac}bcx\log(F)+2F^{ac}\right)F^{bcx}f}{b^3c^3\log(F)^3}+\frac{\left(F^{ac}b^3c^3x^3\log(F)^3-3F^{ac}b^2c^2x^2\log(F)^2+6F^{ac}bcx\log(F)-6F^{ac}\right)F^{bcx}g}{b^4c^4\log(F)^4}+\frac{\left(F^{ac}b^4c^4x^4\log(F)^4-4F^{ac}b^3c^3x^3\log(F)^3+12F^{ac}b^2c^2x^2\log(F)^2-24F^{ac}bcx\log(F)+24F^{ac}\right)F^{bcx}h}{b^5c^5\log(F)^5}$$

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

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

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.41 (sec) , antiderivative size = 7630, normalized size of antiderivative = 21.93

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx=\text{Too large to display}$$

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

```
[Out] -(((4*pi^3*b^4*c^4*h*x^4*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*h*x^4*log(abs(F)
)^3*sgn(F) - 4*pi^3*b^4*c^4*h*x^4*log(abs(F)) + 4*pi*b^4*c^4*h*x^4*log(abs(
F))^3 + 4*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*g*x^3*log(ab
s(F))^3*sgn(F) - 4*pi^3*b^4*c^4*g*x^3*log(abs(F)) + 4*pi*b^4*c^4*g*x^3*log(
abs(F))^3 + 4*pi^3*b^4*c^4*f*x^2*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*f*x^2*lo
g(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*f*x^2*log(abs(F)) + 4*pi*b^4*c^4*f*x^2*
log(abs(F))^3 + 4*pi^3*b^4*c^4*e*x*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*e*x*lo
g(abs(F))^3*sgn(F) - 4*pi^3*b^4*c^4*e*x*log(abs(F)) + 4*pi*b^4*c^4*e*x*log(
abs(F))^3 - 4*pi^3*b^3*c^3*h*x^3*sgn(F) + 4*pi^3*b^4*c^4*d*log(abs(F))*sgn(
```

F) + 12*pi*b^3*c^3*h*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*d*log(abs(F))^
3*sgn(F) + 4*pi^3*b^3*c^3*h*x^3 - 4*pi^3*b^4*c^4*d*log(abs(F)) - 12*pi*b^3*
c^3*h*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*d*log(abs(F))^3 - 3*pi^3*b^3*c^3*g*x
^2*sgn(F) + 9*pi*b^3*c^3*g*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*g*x^2
- 9*pi*b^3*c^3*g*x^2*log(abs(F))^2 - 2*pi^3*b^3*c^3*f*x*sgn(F) + 6*pi*b^3*c
^3*f*x*log(abs(F))^2*sgn(F) + 2*pi^3*b^3*c^3*f*x - 6*pi*b^3*c^3*f*x*log(abs
(F))^2 - pi^3*b^3*c^3*e*sgn(F) + 3*pi*b^3*c^3*e*log(abs(F))^2*sgn(F) + pi^3
*b^3*c^3*e - 3*pi*b^3*c^3*e*log(abs(F))^2 - 24*pi*b^2*c^2*h*x^2*log(abs(F))
*sgn(F) + 24*pi*b^2*c^2*h*x^2*log(abs(F)) - 12*pi*b^2*c^2*g*x*log(abs(F))*s
gn(F) + 12*pi*b^2*c^2*g*x*log(abs(F)) - 4*pi*b^2*c^2*f*log(abs(F))*sgn(F) +
4*pi*b^2*c^2*f*log(abs(F)) + 24*pi*b*c*h*x*sgn(F) - 24*pi*b*c*h*x + 6*pi*b
*c*g*sgn(F) - 6*pi*b*c*g)*(pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F)
)^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5
*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10
*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi
^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2
+ (5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F)
- 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*l
og(abs(F))^5)^2) - (pi^4*b^4*c^4*h*x^4*sgn(F) - 6*pi^2*b^4*c^4*h*x^4*log(ab
s(F))^2*sgn(F) - pi^4*b^4*c^4*h*x^4 + 6*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 -
2*b^4*c^4*h*x^4*log(abs(F))^4 + pi^4*b^4*c^4*g*x^3*sgn(F) - 6*pi^2*b^4*c^4*
g*x^3*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*g*x^3 + 6*pi^2*b^4*c^4*g*x^3*log(
abs(F))^2 - 2*b^4*c^4*g*x^3*log(abs(F))^4 + pi^4*b^4*c^4*f*x^2*sgn(F) - 6*p
i^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*f*x^2 + 6*pi^2*b^4*c^
4*f*x^2*log(abs(F))^2 - 2*b^4*c^4*f*x^2*log(abs(F))^4 + pi^4*b^4*c^4*e*x*sg
n(F) - 6*pi^2*b^4*c^4*e*x*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*e*x + 6*pi^2*
b^4*c^4*e*x*log(abs(F))^2 - 2*b^4*c^4*e*x*log(abs(F))^4 + pi^4*b^4*c^4*d*sg
n(F) + 12*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*d*log(abs(
F))^2*sgn(F) - pi^4*b^4*c^4*d - 12*pi^2*b^3*c^3*h*x^3*log(abs(F)) + 6*pi^2*
b^4*c^4*d*log(abs(F))^2 + 8*b^3*c^3*h*x^3*log(abs(F))^3 - 2*b^4*c^4*d*log(a
bs(F))^4 + 9*pi^2*b^3*c^3*g*x^2*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*g*x^2*l
og(abs(F)) + 6*b^3*c^3*g*x^2*log(abs(F))^3 + 6*pi^2*b^3*c^3*f*x*log(abs(F))
*sgn(F) - 6*pi^2*b^3*c^3*f*x*log(abs(F)) + 4*b^3*c^3*f*x*log(abs(F))^3 + 3*
pi^2*b^3*c^3*e*log(abs(F))*sgn(F) - 3*pi^2*b^3*c^3*e*log(abs(F)) + 2*b^3*c^
3*e*log(abs(F))^3 - 12*pi^2*b^2*c^2*h*x^2*sgn(F) + 12*pi^2*b^2*c^2*h*x^2 -
24*b^2*c^2*h*x^2*log(abs(F))^2 - 6*pi^2*b^2*c^2*g*x*sgn(F) + 6*pi^2*b^2*c^2
*g*x - 12*b^2*c^2*g*x*log(abs(F))^2 - 2*pi^2*b^2*c^2*f*sgn(F) + 2*pi^2*b^2*
c^2*f - 4*b^2*c^2*f*log(abs(F))^2 + 48*b*c*h*x*log(abs(F)) + 12*b*c*g*log(a
bs(F)) - 48*h)*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs
(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3
- 2*b^5*c^5*log(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(
F))^2*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b
^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(
abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(
abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*cos(

-1/2*pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c) - ((p
i^4*b^4*c^4*h*x^4*sgn(F) - 6*pi^2*b^4*c^4*h*x^4*log(abs(F))^2*sgn(F) - pi^4
*b^4*c^4*h*x^4 + 6*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 - 2*b^4*c^4*h*x^4*log(a
bs(F))^4 + pi^4*b^4*c^4*g*x^3*sgn(F) - 6*pi^2*b^4*c^4*g*x^3*log(abs(F))^2*s
gn(F) - pi^4*b^4*c^4*g*x^3 + 6*pi^2*b^4*c^4*g*x^3*log(abs(F))^2 - 2*b^4*c^4
*g*x^3*log(abs(F))^4 + pi^4*b^4*c^4*f*x^2*sgn(F) - 6*pi^2*b^4*c^4*f*x^2*log
(abs(F))^2*sgn(F) - pi^4*b^4*c^4*f*x^2 + 6*pi^2*b^4*c^4*f*x^2*log(abs(F))^2
 - 2*b^4*c^4*f*x^2*log(abs(F))^4 + pi^4*b^4*c^4*e*x*sgn(F) - 6*pi^2*b^4*c^4
*e*x*log(abs(F))^2*sgn(F) - pi^4*b^4*c^4*e*x + 6*pi^2*b^4*c^4*e*x*log(abs(F
))^2 - 2*b^4*c^4*e*x*log(abs(F))^4 + pi^4*b^4*c^4*d*sgn(F) + 12*pi^2*b^3*c^
3*h*x^3*log(abs(F))*sgn(F) - 6*pi^2*b^4*c^4*d*log(abs(F))^2*sgn(F) - pi^4*b
^4*c^4*d - 12*pi^2*b^3*c^3*h*x^3*log(abs(F)) + 6*pi^2*b^4*c^4*d*log(abs(F))
^2 + 8*b^3*c^3*h*x^3*log(abs(F))^3 - 2*b^4*c^4*d*log(abs(F))^4 + 9*pi^2*b^3
*c^3*g*x^2*log(abs(F))*sgn(F) - 9*pi^2*b^3*c^3*g*x^2*log(abs(F)) + 6*b^3*c^
3*g*x^2*log(abs(F))^3 + 6*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F) - 6*pi^2*b^3*
c^3*f*x*log(abs(F)) + 4*b^3*c^3*f*x*log(abs(F))^3 + 3*pi^2*b^3*c^3*e*log(ab
s(F))*sgn(F) - 3*pi^2*b^3*c^3*e*log(abs(F)) + 2*b^3*c^3*e*log(abs(F))^3 - 1
2*pi^2*b^2*c^2*h*x^2*sgn(F) + 12*pi^2*b^2*c^2*h*x^2 - 24*b^2*c^2*h*x^2*log(
abs(F))^2 - 6*pi^2*b^2*c^2*g*x*sgn(F) + 6*pi^2*b^2*c^2*g*x - 12*b^2*c^2*g*x
*log(abs(F))^2 - 2*pi^2*b^2*c^2*f*sgn(F) + 2*pi^2*b^2*c^2*f - 4*b^2*c^2*f*l
og(abs(F))^2 + 48*b*c*h*x*log(abs(F)) + 12*b*c*g*log(abs(F)) - 48*h)*(pi^5*
b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*c^5*log(ab
s(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log(abs(F))^2 - 5*pi*b^5*c^
5*log(abs(F))^4)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2*sgn(
F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^5*log
(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F))*sg
n(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) +
10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2) + (4*pi^3*b^4*c
^4*h*x^4*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) - 4*p
i^3*b^4*c^4*h*x^4*log(abs(F)) + 4*pi*b^4*c^4*h*x^4*log(abs(F))^3 + 4*pi^3*b
^4*c^4*g*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*g*x^3*log(abs(F))^3*sgn(F) -
 4*pi^3*b^4*c^4*g*x^3*log(abs(F)) + 4*pi*b^4*c^4*g*x^3*log(abs(F))^3 + 4*pi
^3*b^4*c^4*f*x^2*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*f*x^2*log(abs(F))^3*sgn(
F) - 4*pi^3*b^4*c^4*f*x^2*log(abs(F)) + 4*pi*b^4*c^4*f*x^2*log(abs(F))^3 +
4*pi^3*b^4*c^4*e*x*log(abs(F))*sgn(F) - 4*pi*b^4*c^4*e*x*log(abs(F))^3*sgn(
F) - 4*pi^3*b^4*c^4*e*x*log(abs(F)) + 4*pi*b^4*c^4*e*x*log(abs(F))^3 - 4*pi
^3*b^3*c^3*h*x^3*sgn(F) + 4*pi^3*b^4*c^4*d*log(abs(F))*sgn(F) + 12*pi*b^3*c
^3*h*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*d*log(abs(F))^3*sgn(F) + 4*pi^
3*b^3*c^3*h*x^3 - 4*pi^3*b^4*c^4*d*log(abs(F)) - 12*pi*b^3*c^3*h*x^3*log(ab
s(F))^2 + 4*pi*b^4*c^4*d*log(abs(F))^3 - 3*pi^3*b^3*c^3*g*x^2*sgn(F) + 9*pi
*b^3*c^3*g*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*g*x^2 - 9*pi*b^3*c^3*g
*x^2*log(abs(F))^2 - 2*pi^3*b^3*c^3*f*x*sgn(F) + 6*pi*b^3*c^3*f*x*log(abs(F
))^2*sgn(F) + 2*pi^3*b^3*c^3*f*x - 6*pi*b^3*c^3*f*x*log(abs(F))^2 - pi^3*b^
3*c^3*e*sgn(F) + 3*pi*b^3*c^3*e*log(abs(F))^2*sgn(F) + pi^3*b^3*c^3*e - 3*p
i*b^3*c^3*e*log(abs(F))^2 - 24*pi*b^2*c^2*h*x^2*log(abs(F))*sgn(F) + 24*pi*

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b^2*c^2*h*x^2*log(abs(F)) - 12*pi*b^2*c^2*g*x*log(abs(F))*sgn(F) + 12*pi*b^
2*c^2*g*x*log(abs(F)) - 4*pi*b^2*c^2*f*log(abs(F))*sgn(F) + 4*pi*b^2*c^2*f*
log(abs(F)) + 24*pi*b*c*h*x*sgn(F) - 24*pi*b*c*h*x + 6*pi*b*c*g*sgn(F) - 6*
pi*b*c*g)*(5*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^
3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b
^5*c^5*log(abs(F))^5)/((pi^5*b^5*c^5*sgn(F) - 10*pi^3*b^5*c^5*log(abs(F))^2
*sgn(F) + 5*pi*b^5*c^5*log(abs(F))^4*sgn(F) - pi^5*b^5*c^5 + 10*pi^3*b^5*c^
5*log(abs(F))^2 - 5*pi*b^5*c^5*log(abs(F))^4)^2 + (5*pi^4*b^5*c^5*log(abs(F
))*sgn(F) - 10*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*c^5*log(abs(F
)) + 10*pi^2*b^5*c^5*log(abs(F))^3 - 2*b^5*c^5*log(abs(F))^5)^2))*sin(-1/2*
pi*b*c*x*sgn(F) + 1/2*pi*b*c*x - 1/2*pi*a*c*sgn(F) + 1/2*pi*a*c))*e^(b*c*x*
log(abs(F)) + a*c*log(abs(F))) - 8*I*((I*pi^4*b^4*c^4*h*x^4*sgn(F) - 4*pi^3
*b^4*c^4*h*x^4*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2*sg
n(F) + 4*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*h*x^4 + 4*p
i^3*b^4*c^4*h*x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 - 4*pi
*b^4*c^4*h*x^4*log(abs(F))^3 - 2*I*b^4*c^4*h*x^4*log(abs(F))^4 + I*pi^4*b^4
*c^4*g*x^3*sgn(F) - 4*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*
c^4*g*x^3*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*g*x^3*log(abs(F))^3*sgn(F) -
I*pi^4*b^4*c^4*g*x^3 + 4*pi^3*b^4*c^4*g*x^3*log(abs(F)) + 6*I*pi^2*b^4*c^4*
g*x^3*log(abs(F))^2 - 4*pi*b^4*c^4*g*x^3*log(abs(F))^3 - 2*I*b^4*c^4*g*x^3*
log(abs(F))^4 + I*pi^4*b^4*c^4*f*x^2*sgn(F) - 4*pi^3*b^4*c^4*f*x^2*log(abs(
F))*sgn(F) - 6*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*f*x
^2*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*f*x^2 + 4*pi^3*b^4*c^4*f*x^2*log(a
bs(F)) + 6*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2 - 4*pi*b^4*c^4*f*x^2*log(abs(
F))^3 - 2*I*b^4*c^4*f*x^2*log(abs(F))^4 + I*pi^4*b^4*c^4*e*x*sgn(F) - 4*pi^
3*b^4*c^4*e*x*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e*x*log(abs(F))^2*sgn(F
) + 4*pi*b^4*c^4*e*x*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e*x + 4*pi^3*b^4
*c^4*e*x*log(abs(F)) + 6*I*pi^2*b^4*c^4*e*x*log(abs(F))^2 - 4*pi*b^4*c^4*e*
x*log(abs(F))^3 - 2*I*b^4*c^4*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d*sgn(F) +
 4*pi^3*b^3*c^3*h*x^3*sgn(F) - 4*pi^3*b^4*c^4*d*log(abs(F))*sgn(F) + 12*I*p
i^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d*log(abs(F))^2*sgn
(F) - 12*pi*b^3*c^3*h*x^3*log(abs(F))^2*sgn(F) + 4*pi*b^4*c^4*d*log(abs(F))
^3*sgn(F) - I*pi^4*b^4*c^4*d - 4*pi^3*b^3*c^3*h*x^3 + 4*pi^3*b^4*c^4*d*log(
abs(F)) - 12*I*pi^2*b^3*c^3*h*x^3*log(abs(F)) + 6*I*pi^2*b^4*c^4*d*log(abs(
F))^2 + 12*pi*b^3*c^3*h*x^3*log(abs(F))^2 - 4*pi*b^4*c^4*d*log(abs(F))^3 +
8*I*b^3*c^3*h*x^3*log(abs(F))^3 - 2*I*b^4*c^4*d*log(abs(F))^4 + 3*pi^3*b^3*
c^3*g*x^2*sgn(F) + 9*I*pi^2*b^3*c^3*g*x^2*log(abs(F))*sgn(F) - 9*pi*b^3*c^3
*g*x^2*log(abs(F))^2*sgn(F) - 3*pi^3*b^3*c^3*g*x^2 - 9*I*pi^2*b^3*c^3*g*x^2
*log(abs(F)) + 9*pi*b^3*c^3*g*x^2*log(abs(F))^2 + 6*I*b^3*c^3*g*x^2*log(abs
(F))^3 + 2*pi^3*b^3*c^3*f*x*sgn(F) + 6*I*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F
) - 6*pi*b^3*c^3*f*x*log(abs(F))^2*sgn(F) - 2*pi^3*b^3*c^3*f*x - 6*I*pi^2*b
^3*c^3*f*x*log(abs(F)) + 6*pi*b^3*c^3*f*x*log(abs(F))^2 + 4*I*b^3*c^3*f*x*l
og(abs(F))^3 + pi^3*b^3*c^3*e*sgn(F) + 3*I*pi^2*b^3*c^3*e*log(abs(F))*sgn(F
) - 3*pi*b^3*c^3*e*log(abs(F))^2*sgn(F) - pi^3*b^3*c^3*e - 3*I*pi^2*b^3*c^3
*e*log(abs(F)) + 3*pi*b^3*c^3*e*log(abs(F))^2 + 2*I*b^3*c^3*e*log(abs(F))^3
```

- 12*I*pi^2*b^2*c^2*h*x^2*sgn(F) + 24*pi*b^2*c^2*h*x^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*c^2*h*x^2 - 24*pi*b^2*c^2*h*x^2*log(abs(F)) - 24*I*b^2*c^2*h*x^2*log(abs(F))^2 - 6*I*pi^2*b^2*c^2*g*x*sgn(F) + 12*pi*b^2*c^2*g*x*log(abs(F))*sgn(F) + 6*I*pi^2*b^2*c^2*g*x - 12*pi*b^2*c^2*g*x*log(abs(F)) - 12*I*b^2*c^2*g*x*log(abs(F))^2 - 2*I*pi^2*b^2*c^2*f*sgn(F) + 4*pi*b^2*c^2*f*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*c^2*f - 4*pi*b^2*c^2*f*log(abs(F)) - 4*I*b^2*c^2*f*log(abs(F))^2 - 24*pi*b*c*h*x*sgn(F) + 24*pi*b*c*h*x + 48*I*b*c*h*x*log(abs(F)) - 6*pi*b*c*g*sgn(F) + 6*pi*b*c*g + 12*I*b*c*g*log(abs(F)) - 48*I*h)*e^(1/2*I*pi*b*c*x*sgn(F) - 1/2*I*pi*b*c*x + 1/2*I*pi*a*c*sgn(F) - 1/2*I*pi*a*c)/(16*I*pi^5*b^5*c^5*sgn(F) - 80*pi^4*b^5*c^5*log(abs(F))*sgn(F) - 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) + 80*I*pi*b^5*c^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) + 160*I*pi^3*b^5*c^5*log(abs(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 - 80*I*pi*b^5*c^5*log(abs(F))^4 + 32*b^5*c^5*log(abs(F))^5) - (I*pi^4*b^4*c^4*h*x^4*sgn(F) + 4*pi^3*b^4*c^4*h*x^4*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*h*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*h*x^4 - 4*pi^3*b^4*c^4*h*x^4*log(abs(F)) + 6*I*pi^2*b^4*c^4*h*x^4*log(abs(F))^2 + 4*pi*b^4*c^4*h*x^4*log(abs(F))^3 - 2*I*b^4*c^4*h*x^4*log(abs(F))^4 + I*pi^4*b^4*c^4*g*x^3*sgn(F) + 4*pi^3*b^4*c^4*g*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*g*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*g*x^3*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*g*x^3 - 4*pi^3*b^4*c^4*g*x^3*log(abs(F)) + 6*I*pi^2*b^4*c^4*g*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*g*x^3*log(abs(F))^3 - 2*I*b^4*c^4*g*x^3*log(abs(F))^4 + I*pi^4*b^4*c^4*f*x^2*sgn(F) + 4*pi^3*b^4*c^4*f*x^2*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*f*x^2*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*f*x^2 - 4*pi^3*b^4*c^4*f*x^2*log(abs(F)) + 6*I*pi^2*b^4*c^4*f*x^2*log(abs(F))^2 + 4*pi*b^4*c^4*f*x^2*log(abs(F))^3 - 2*I*b^4*c^4*f*x^2*log(abs(F))^4 + I*pi^4*b^4*c^4*e*x*sgn(F) + 4*pi^3*b^4*c^4*e*x*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*e*x*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*e*x*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*e*x - 4*pi^3*b^4*c^4*e*x*log(abs(F)) + 6*I*pi^2*b^4*c^4*e*x*log(abs(F))^2 + 4*pi*b^4*c^4*e*x*log(abs(F))^3 - 2*I*b^4*c^4*e*x*log(abs(F))^4 + I*pi^4*b^4*c^4*d*sgn(F) - 4*pi^3*b^3*c^3*h*x^3*sgn(F) + 4*pi^3*b^4*c^4*d*log(abs(F))*sgn(F) + 12*I*pi^2*b^3*c^3*h*x^3*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*c^4*d*log(abs(F))^2*sgn(F) + 12*pi*b^3*c^3*h*x^3*log(abs(F))^2*sgn(F) - 4*pi*b^4*c^4*d*log(abs(F))^3*sgn(F) - I*pi^4*b^4*c^4*d + 4*pi^3*b^3*c^3*h*x^3 - 4*pi^3*b^4*c^4*d*log(abs(F)) - 12*I*pi^2*b^3*c^3*h*x^3*log(abs(F)) + 6*I*pi^2*b^4*c^4*d*log(abs(F))^2 - 12*pi*b^3*c^3*h*x^3*log(abs(F))^2 + 4*pi*b^4*c^4*d*log(abs(F))^3 + 8*I*b^3*c^3*h*x^3*log(abs(F))^3 - 2*I*b^4*c^4*d*log(abs(F))^4 - 3*pi^3*b^3*c^3*g*x^2*sgn(F) + 9*I*pi^2*b^3*c^3*g*x^2*log(abs(F))*sgn(F) + 9*pi*b^3*c^3*g*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*c^3*g*x^2 - 9*I*pi^2*b^3*c^3*g*x^2*log(abs(F)) - 9*pi*b^3*c^3*g*x^2*log(abs(F))^2 + 6*I*b^3*c^3*g*x^2*log(abs(F))^3 - 2*pi^3*b^3*c^3*f*x*sgn(F) + 6*I*pi^2*b^3*c^3*f*x*log(abs(F))*sgn(F) + 6*pi*b^3*c^3*f*x*log(abs(F))^2*sgn(F) + 2*pi^3*b^3*c^3*f*x - 6*I*pi^2*b^3*c^3*f*x*log(abs(F)) - 6*pi*b^3*c^3*f*x*log(abs(F))^2 + 4*I*b^3*c^3*f*x*log(abs(F))^3 - pi^3*b^3*c^3*e*sgn(F) +

```
3*I*pi^2*b^3*c^3*e*log(abs(F))*sgn(F) + 3*pi*b^3*c^3*e*log(abs(F))^2*sgn(F)
 + pi^3*b^3*c^3*e - 3*I*pi^2*b^3*c^3*e*log(abs(F)) - 3*pi*b^3*c^3*e*log(abs
(F))^2 + 2*I*b^3*c^3*e*log(abs(F))^3 - 12*I*pi^2*b^2*c^2*h*x^2*sgn(F) - 24*
pi*b^2*c^2*h*x^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*c^2*h*x^2 + 24*pi*b^2*c
^2*h*x^2*log(abs(F)) - 24*I*b^2*c^2*h*x^2*log(abs(F))^2 - 6*I*pi^2*b^2*c^2*
g*x*sgn(F) - 12*pi*b^2*c^2*g*x*log(abs(F))*sgn(F) + 6*I*pi^2*b^2*c^2*g*x +
12*pi*b^2*c^2*g*x*log(abs(F)) - 12*I*b^2*c^2*g*x*log(abs(F))^2 - 2*I*pi^2*b
^2*c^2*f*sgn(F) - 4*pi*b^2*c^2*f*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*c^2*f +
4*pi*b^2*c^2*f*log(abs(F)) - 4*I*b^2*c^2*f*log(abs(F))^2 + 24*pi*b*c*h*x*sg
n(F) - 24*pi*b*c*h*x + 48*I*b*c*h*x*log(abs(F)) + 6*pi*b*c*g*sgn(F) - 6*pi*
b*c*g + 12*I*b*c*g*log(abs(F)) - 48*I*h)*e^(-1/2*I*pi*b*c*x*sgn(F) + 1/2*I*
pi*b*c*x - 1/2*I*pi*a*c*sgn(F) + 1/2*I*pi*a*c)/(-16*I*pi^5*b^5*c^5*sgn(F) -
 80*pi^4*b^5*c^5*log(abs(F))*sgn(F) + 160*I*pi^3*b^5*c^5*log(abs(F))^2*sgn(
F) + 160*pi^2*b^5*c^5*log(abs(F))^3*sgn(F) - 80*I*pi*b^5*c^5*log(abs(F))^4*
sgn(F) + 16*I*pi^5*b^5*c^5 + 80*pi^4*b^5*c^5*log(abs(F)) - 160*I*pi^3*b^5*c
^5*log(abs(F))^2 - 160*pi^2*b^5*c^5*log(abs(F))^3 + 80*I*pi*b^5*c^5*log(abs
(F))^4 + 32*b^5*c^5*log(abs(F))^5))*e^(b*c*x*log(abs(F)) + a*c*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.22 (sec) , antiderivative size = 212, normalized size of antiderivative = 0.61

$$\int F^{c(a+bx)}\left(d+ex+fx^2+gx^3+hx^4\right)\,dx$$
$$=\frac{F^{a\,c+b\,c\,x}\,\left(h\,b^4\,c^4\,x^4\ln\left(F\right)^4+g\,b^4\,c^4\,x^3\ln\left(F\right)^4+f\,b^4\,c^4\,x^2\ln\left(F\right)^4+e\,b^4\,c^4\,x\ln\left(F\right)^4+d\,b^4\,c^4\ln\left(F\right)^4-4\,h\,b^3}{}$$

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

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

3.55 $\int e^{-a-bx}x^m(a+bx)^3\,dx$

Optimal result

Integrand size = 21, antiderivative size = 116

$$\int e^{-a-bx}x^m(a+bx)^3\,dx=-\frac{a^3e^{-a}x^m(bx)^{-m}\Gamma(1+m,bx)}{b}-\frac{3a^2e^{-a}x^m(bx)^{-m}\Gamma(2+m,bx)}{b}-\frac{3ae^{-a}x^m(bx)^{-m}\Gamma(3+m,bx)}{b}-\frac{e^{-a}x^m(bx)^{-m}\Gamma(4+m,bx)}{b}$$

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

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 116, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.095, Rules used = {2230, 2212}

$$\int e^{-a-bx}x^m(a+bx)^3\,dx=-\frac{a^3e^{-a}x^m(bx)^{-m}\Gamma(m+1,bx)}{b}-\frac{3a^2e^{-a}x^m(bx)^{-m}\Gamma(m+2,bx)}{b}-\frac{3ae^{-a}x^m(bx)^{-m}\Gamma(m+3,bx)}{b}-\frac{e^{-a}x^m(bx)^{-m}\Gamma(m+4,bx)}{b}$$

```
[In] Int[E^(-a - b*x)*x^m*(a + b*x)^3,x]
```

```
[Out] -((a^3*x^m*Gamma[1 + m, b*x])/(b*E^a*(b*x)^m)) - (3*a^2*x^m*Gamma[2 + m, b*
x])/(b*E^a*(b*x)^m) - (3*a*x^m*Gamma[3 + m, b*x])/(b*E^a*(b*x)^m) - (x^m*Ga
mma[4 + m, b*x])/(b*E^a*(b*x)^m)
```

Rule 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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(a^3 e^{-a-bx} x^m + 3a^2 b e^{-a-bx} x^{1+m} + 3ab^2 e^{-a-bx} x^{2+m} + b^3 e^{-a-bx} x^{3+m}\right) dx \\
&= a^3 \int e^{-a-bx} x^m \, dx + \left(3a^2 b\right) \int e^{-a-bx} x^{1+m} \, dx + \left(3ab^2\right) \int e^{-a-bx} x^{2+m} \, dx + b^3 \int e^{-a-bx} x^{3+m} \, dx \\
&= -\frac{a^3 e^{-a} x^m (bx)^{-m} \Gamma(1+m, bx)}{b} - \frac{3a^2 e^{-a} x^m (bx)^{-m} \Gamma(2+m, bx)}{b} \\
&\quad - \frac{3a e^{-a} x^m (bx)^{-m} \Gamma(3+m, bx)}{b} - \frac{e^{-a} x^m (bx)^{-m} \Gamma(4+m, bx)}{b}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.22 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.53

$$
\begin{aligned}
&\int e^{-a-bx} x^m (a+bx)^3 \, dx \\
&= -\frac{e^{-a} x^m (bx)^{-m} \left(a^3 \Gamma(1+m, bx) + 3a^2 \Gamma(2+m, bx) + 3a \Gamma(3+m, bx) + \Gamma(4+m, bx)\right)}{b}
\end{aligned}
$$

```
[In] Integrate[E^(-a - b*x)*x^m*(a + b*x)^3,x]
[Out] -((x^m*(a^3*Gamma[1 + m, b*x] + 3*a^2*Gamma[2 + m, b*x] + 3*a*Gamma[3 + m,
b*x] + Gamma[4 + m, b*x]))/(b*E^a*(b*x)^m))
```

Maple [C] (verified)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 0.34 (sec) , antiderivative size = 334, normalized size of antiderivative = 2.88

method	result
meijerg	$b^{-m-1}\mathrm{e}^{-a}\left(x^m b^m (m^2+5m+6)\,(bx)^{-\frac{m}{2}}\,\mathrm{e}^{-\frac{bx}{2}} M_{\frac{m}{2},\frac{m}{2}+\frac{1}{2}}(bx) - x^m b^m (b^2x^2+bmx+3bx+m^2+5m\right.$

[In] int(exp(-b*x-a)*x^m*(b*x+a)^3,x,method=_RETURNVERBOSE)

[Out] b^(-m-1)*exp(-a)*(x^m*b^m*(m^2+5*m+6)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m,1/2*m+1/2,b*x)-x^m*b^m*(b^2*x^2+b*m*x+3*b*x+m^2+5*m+6)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m+1,1/2*m+1/2,b*x))+3*b^(-m-1)*exp(-a)*a*(x^m*b^m*(2+m)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m,1/2*m+1/2,b*x)-x^m*b^m*(b*x+m+2)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m+1,1/2*m+1/2,b*x))+3*b^(-m-1)*exp(-a)*a^2*(x^m*b^m*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m,1/2*m+1/2,b*x)+1/(2+m)*x^m*b^m*(-2-m)*(b*x)^(-1/2*m)*exp(-1/2*b*x)*WhittakerM(1/2*m+1,1/2*m+1/2,b*x))+exp(-a-1/2*b*x)/b*a^3/(1+m)*x^m*(b*x)^(-1/2*m)*WhittakerM(1/2*m,1/2*m+1/2,b*x)

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 126, normalized size of antiderivative = 1.09

$$\int e^{-a-bx}x^m(a+bx)^3\,dx = -\frac{(b^3x^3+(3\,(a+1)b^2+b^2m)x^2+((3\,a+5)bm+bm^2+3\,(a^2+2\,a+2)b)x)x^m e^{(-bx-a)}+(a^3+3\,(a+2}{b}$$

[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="fricas")

[Out] -((b^3*x^3 + (3*(a + 1)*b^2 + b^2*m)*x^2 + ((3*a + 5)*b*m + b*m^2 + 3*(a^2 + 2*a + 2)*b)*x)*x^m*e^(-b*x - a) + (a^3 + 3*(a + 2)*m^2 + m^3 + 3*a^2 + (3*a^2 + 9*a + 11)*m + 6*a + 6)*e^(-m*log(b) - a)*gamma(m + 1, b*x))/b

Sympy [A] (verification not implemented)

Time = 9.76 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.85

$$\int e^{-a-bx}x^m(a+bx)^3\,dx = \left(-\frac{a^3x^m(bx)^{-m}\,\Gamma(m+1,bx)}{b} - 3a^2x^{m+1}(bx)^{-m-1}\,\Gamma(m+2,bx) - 3abx^{m+2}(bx)^{-m-2}\,\Gamma(m+3,bx) - b^2x^{m+3}(bx)^{-m-3}\,\Gamma(m+4,bx)\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*x**m*(b*x+a)**3,x)
```

```
[Out] (-a**3*x**m*uppergamma(m + 1, b*x)/(b*(b*x)**m) - 3*a**2*x**(m + 1)*(b*x)**
(-m - 1)*uppergamma(m + 2, b*x) - 3*a*b*x**(m + 2)*(b*x)**(-m - 2)*uppergam
ma(m + 3, b*x) - b**2*x**(m + 3)*(b*x)**(-m - 3)*uppergamma(m + 4, b*x))*ex
p(-a)
```

Maxima [A] (verification not implemented)

none

Time = 0.11 (sec) , antiderivative size = 123, normalized size of antiderivative = 1.06

$$\int e^{-a-bx}x^m(a+bx)^3\,dx = -(bx)^{-m-4}\,b^3x^{m+4}e^{(-a)}\Gamma(m+4,bx) - 3\,(bx)^{-m-3}\,ab^2x^{m+3}e^{(-a)}\Gamma(m+3,bx) - 3\,(bx)^{-m-2}\,a^2bx^{m+2}e^{(-a)}\Gamma(m+2,bx) - (bx)^{-m-1}\,a^3x^{m+1}e^{(-a)}\Gamma(m+1,bx)$$

```
[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b*x)^(-m - 4)*b^3*x^(m + 4)*e^(-a)*gamma(m + 4, b*x) - 3*(b*x)^(-m - 3)*a
*b^2*x^(m + 3)*e^(-a)*gamma(m + 3, b*x) - 3*(b*x)^(-m - 2)*a^2*b*x^(m + 2)*
e^(-a)*gamma(m + 2, b*x) - (b*x)^(-m - 1)*a^3*x^(m + 1)*e^(-a)*gamma(m + 1,
 b*x)
```

Giac [F]

$$\int e^{-a-bx}x^m(a+bx)^3\,dx=\int (bx+a)^3x^me^{(-bx-a)}\,dx$$

```
[In] integrate(exp(-b*x-a)*x^m*(b*x+a)^3,x, algorithm="giac")
[Out] integrate((b*x + a)^3*x^m*e^(-b*x - a), x)
```

Mupad [F(-1)]

Timed out.

$$\int e^{-a-bx}x^m(a+bx)^3\,dx=\int x^m\,\mathrm{e}^{-a-b\,x}\,(a+b\,x)^3\,dx$$

```
[In] int(x^m*exp(- a - b*x)*(a + b*x)^3,x)
[Out] int(x^m*exp(- a - b*x)*(a + b*x)^3, x)
```

3.56 $\int e^{-a-bx}x^3(a+bx)^3\,dx$

Optimal result

Integrand size = 21, antiderivative size = 397

$$\begin{aligned}\int e^{-a-bx}x^3(a+bx)^3\,dx = & -\frac{720e^{-a-bx}}{b^4}-\frac{360ae^{-a-bx}}{b^4}-\frac{72a^2e^{-a-bx}}{b^4}-\frac{6a^3e^{-a-bx}}{b^4} \\ & -\frac{720e^{-a-bx}x}{b^3}-\frac{360ae^{-a-bx}x}{b^3}-\frac{72a^2e^{-a-bx}x}{b^3}-\frac{6a^3e^{-a-bx}x}{b^3} \\ & -\frac{360e^{-a-bx}x^2}{b^2}-\frac{180ae^{-a-bx}x^2}{b^2}-\frac{36a^2e^{-a-bx}x^2}{b^2} \\ & -\frac{3a^3e^{-a-bx}x^2}{b^2}-\frac{120e^{-a-bx}x^3}{b}-\frac{60ae^{-a-bx}x^3}{b} \\ & -\frac{12a^2e^{-a-bx}x^3}{b}-\frac{a^3e^{-a-bx}x^3}{b}-30e^{-a-bx}x^4-15ae^{-a-bx}x^4 \\ & -3a^2e^{-a-bx}x^4-6be^{-a-bx}x^5-3abe^{-a-bx}x^5-b^2e^{-a-bx}x^6\end{aligned}$$

```
[Out] -720*exp(-b*x-a)/b^4-360*a*exp(-b*x-a)/b^4-72*a^2*exp(-b*x-a)/b^4-6*a^3*exp
(-b*x-a)/b^4-720*exp(-b*x-a)*x/b^3-360*a*exp(-b*x-a)*x/b^3-72*a^2*exp(-b*x-
a)*x/b^3-6*a^3*exp(-b*x-a)*x/b^3-360*exp(-b*x-a)*x^2/b^2-180*a*exp(-b*x-a)*
x^2/b^2-36*a^2*exp(-b*x-a)*x^2/b^2-3*a^3*exp(-b*x-a)*x^2/b^2-120*exp(-b*x-a
)*x^3/b-60*a*exp(-b*x-a)*x^3/b-12*a^2*exp(-b*x-a)*x^3/b-a^3*exp(-b*x-a)*x^3
/b-30*exp(-b*x-a)*x^4-15*a*exp(-b*x-a)*x^4-3*a^2*exp(-b*x-a)*x^4-6*b*exp(-b
*x-a)*x^5-3*a*b*exp(-b*x-a)*x^5-b^2*exp(-b*x-a)*x^6
```

Rubi [A] (verified)

Time = 0.34 (sec) , antiderivative size = 397, normalized size of antiderivative = 1.00, number of steps used = 24, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2227, 2207, 2225}

$$\begin{aligned}\int e^{-a-bx}x^3(a+bx)^3\,dx = & -\frac{6a^3e^{-a-bx}}{b^4}-\frac{6a^3xe^{-a-bx}}{b^3}-\frac{3a^3x^2e^{-a-bx}}{b^2}-\frac{a^3x^3e^{-a-bx}}{b} \\ & -\frac{72a^2e^{-a-bx}}{b^4}-\frac{72a^2xe^{-a-bx}}{b^3}-\frac{36a^2x^2e^{-a-bx}}{b^2} \\ & -3a^2x^4e^{-a-bx}-\frac{12a^2x^3e^{-a-bx}}{b}-\frac{360ae^{-a-bx}}{b^4} \\ & -\frac{720e^{-a-bx}}{b^4}-\frac{360axe^{-a-bx}}{b^3}-\frac{720xe^{-a-bx}}{b^3}-b^2x^6e^{-a-bx} \\ & -\frac{180ax^2e^{-a-bx}}{b^2}-\frac{360x^2e^{-a-bx}}{b^2}-3abx^5e^{-a-bx}-6bx^5e^{-a-bx} \\ & -15ax^4e^{-a-bx}-30x^4e^{-a-bx}-\frac{60ax^3e^{-a-bx}}{b}-\frac{120x^3e^{-a-bx}}{b}\end{aligned}$$

```
[In] Int[E^(-a - b*x)*x^3*(a + b*x)^3,x]
```

```
[Out] (-720*E^(-a - b*x))/b^4 - (360*a*E^(-a - b*x))/b^4 - (72*a^2*E^(-a - b*x))/
b^4 - (6*a^3*E^(-a - b*x))/b^4 - (720*E^(-a - b*x)*x)/b^3 - (360*a*E^(-a -
b*x)*x)/b^3 - (72*a^2*E^(-a - b*x)*x)/b^3 - (6*a^3*E^(-a - b*x)*x)/b^3 - (3
60*E^(-a - b*x)*x^2)/b^2 - (180*a*E^(-a - b*x)*x^2)/b^2 - (36*a^2*E^(-a - b
*x)*x^2)/b^2 - (3*a^3*E^(-a - b*x)*x^2)/b^2 - (120*E^(-a - b*x)*x^3)/b - (6
0*a*E^(-a - b*x)*x^3)/b - (12*a^2*E^(-a - b*x)*x^3)/b - (a^3*E^(-a - b*x)*x
^3)/b - 30*E^(-a - b*x)*x^4 - 15*a*E^(-a - b*x)*x^4 - 3*a^2*E^(-a - b*x)*x^
4 - 6*b*E^(-a - b*x)*x^5 - 3*a*b*E^(-a - b*x)*x^5 - b^2*E^(-a - b*x)*x^6
```

Rule 2207

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

Rule 2225

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

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
```

```
x] && !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(a^3e^{-a-bx}x^3+3a^2be^{-a-bx}x^4+3ab^2e^{-a-bx}x^5+b^3e^{-a-bx}x^6\right)\,dx\\
&=a^3\int e^{-a-bx}x^3\,dx+\left(3a^2b\right)\int e^{-a-bx}x^4\,dx+\left(3ab^2\right)\int e^{-a-bx}x^5\,dx+b^3\int e^{-a-bx}x^6\,dx\\
&=-\frac{a^3e^{-a-bx}x^3}{b}-3a^2e^{-a-bx}x^4-3abe^{-a-bx}x^5-b^2e^{-a-bx}x^6+\left(12a^2\right)\int e^{-a-bx}x^3\,dx\\
&\quad+\frac{\left(3a^3\right)\int e^{-a-bx}x^2\,dx}{b}+(15ab)\int e^{-a-bx}x^4\,dx+\left(6b^2\right)\int e^{-a-bx}x^5\,dx\\
&=-\frac{3a^3e^{-a-bx}x^2}{b^2}-\frac{12a^2e^{-a-bx}x^3}{b}-\frac{a^3e^{-a-bx}x^3}{b}-15ae^{-a-bx}x^4-3a^2e^{-a-bx}x^4\\
&\quad-6be^{-a-bx}x^5-3abe^{-a-bx}x^5-b^2e^{-a-bx}x^6+(60a)\int e^{-a-bx}x^3\,dx\\
&\quad+\frac{\left(6a^3\right)\int e^{-a-bx}x\,dx}{b^2}+\frac{\left(36a^2\right)\int e^{-a-bx}x^2\,dx}{b}+(30b)\int e^{-a-bx}x^4\,dx\\
&=-\frac{6a^3e^{-a-bx}x}{b^3}-\frac{36a^2e^{-a-bx}x^2}{b^2}-\frac{3a^3e^{-a-bx}x^2}{b^2}-\frac{60ae^{-a-bx}x^3}{b}-\frac{12a^2e^{-a-bx}x^3}{b}-\frac{a^3e^{-a-bx}x^3}{b}\\
&\quad-30e^{-a-bx}x^4-15ae^{-a-bx}x^4-3a^2e^{-a-bx}x^4-6be^{-a-bx}x^5-3abe^{-a-bx}x^5-b^2e^{-a-bx}x^6\\
&\quad+120\int e^{-a-bx}x^3\,dx+\frac{\left(6a^3\right)\int e^{-a-bx}\,dx}{b^3}+\frac{\left(72a^2\right)\int e^{-a-bx}x\,dx}{b^2}+\frac{(180a)\int e^{-a-bx}x^2\,dx}{b}\\
&=-\frac{6a^3e^{-a-bx}}{b^4}-\frac{72a^2e^{-a-bx}x}{b^3}-\frac{6a^3e^{-a-bx}x}{b^3}-\frac{180ae^{-a-bx}x^2}{b^2}-\frac{36a^2e^{-a-bx}x^2}{b^2}\\
&\quad-\frac{3a^3e^{-a-bx}x^2}{b^2}-\frac{120e^{-a-bx}x^3}{b}-\frac{60ae^{-a-bx}x^3}{b}-\frac{12a^2e^{-a-bx}x^3}{b}-\frac{a^3e^{-a-bx}x^3}{b}\\
&\quad-30e^{-a-bx}x^4-15ae^{-a-bx}x^4-3a^2e^{-a-bx}x^4-6be^{-a-bx}x^5-3abe^{-a-bx}x^5\\
&\quad-b^2e^{-a-bx}x^6+\frac{\left(72a^2\right)\int e^{-a-bx}\,dx}{b^3}+\frac{(360a)\int e^{-a-bx}x\,dx}{b^2}+\frac{360\int e^{-a-bx}x^2\,dx}{b}\\
&=-\frac{72a^2e^{-a-bx}}{b^4}-\frac{6a^3e^{-a-bx}}{b^4}-\frac{360ae^{-a-bx}x}{b^3}-\frac{72a^2e^{-a-bx}x}{b^3}\\
&\quad-\frac{6a^3e^{-a-bx}x}{b^3}-\frac{360e^{-a-bx}x^2}{b^2}-\frac{180ae^{-a-bx}x^2}{b^2}-\frac{36a^2e^{-a-bx}x^2}{b^2}\\
&\quad-\frac{3a^3e^{-a-bx}x^2}{b^2}-\frac{120e^{-a-bx}x^3}{b}-\frac{60ae^{-a-bx}x^3}{b}-\frac{12a^2e^{-a-bx}x^3}{b}\\
&\quad-\frac{a^3e^{-a-bx}x^3}{b}-30e^{-a-bx}x^4-15ae^{-a-bx}x^4-3a^2e^{-a-bx}x^4-6be^{-a-bx}x^5\\
&\quad-3abe^{-a-bx}x^5-b^2e^{-a-bx}x^6+\frac{(360a)\int e^{-a-bx}\,dx}{b^3}+\frac{720\int e^{-a-bx}x\,dx}{b^2}
\end{aligned}$$

$$
\begin{aligned}
&= -\frac{360ae^{-a-bx}}{b^4} - \frac{72a^2e^{-a-bx}}{b^4} - \frac{6a^3e^{-a-bx}}{b^4} - \frac{720e^{-a-bx}x}{b^3} - \frac{360ae^{-a-bx}x}{b^3} \\
&\quad - \frac{72a^2e^{-a-bx}x}{b^3} - \frac{6a^3e^{-a-bx}x}{b^3} - \frac{360e^{-a-bx}x^2}{b^2} - \frac{180ae^{-a-bx}x^2}{b^2} \\
&\quad - \frac{36a^2e^{-a-bx}x^2}{b^2} - \frac{3a^3e^{-a-bx}x^2}{b^2} - \frac{120e^{-a-bx}x^3}{b} - \frac{60ae^{-a-bx}x^3}{b} \\
&\quad - \frac{12a^2e^{-a-bx}x^3}{b} - \frac{a^3e^{-a-bx}x^3}{b} - 30e^{-a-bx}x^4 - 15ae^{-a-bx}x^4 - 3a^2e^{-a-bx}x^4 \\
&\quad - 6be^{-a-bx}x^5 - 3abe^{-a-bx}x^5 - b^2e^{-a-bx}x^6 + \frac{720\int e^{-a-bx}\,dx}{b^3} \\
&= -\frac{720e^{-a-bx}}{b^4} - \frac{360ae^{-a-bx}}{b^4} - \frac{72a^2e^{-a-bx}}{b^4} - \frac{6a^3e^{-a-bx}}{b^4} - \frac{720e^{-a-bx}x}{b^3} - \frac{360ae^{-a-bx}x}{b^3} \\
&\quad - \frac{72a^2e^{-a-bx}x}{b^3} - \frac{6a^3e^{-a-bx}x}{b^3} - \frac{360e^{-a-bx}x^2}{b^2} - \frac{180ae^{-a-bx}x^2}{b^2} - \frac{36a^2e^{-a-bx}x^2}{b^2} \\
&\quad - \frac{3a^3e^{-a-bx}x^2}{b^2} - \frac{120e^{-a-bx}x^3}{b} - \frac{60ae^{-a-bx}x^3}{b} - \frac{12a^2e^{-a-bx}x^3}{b} - \frac{a^3e^{-a-bx}x^3}{b} \\
&\quad - 30e^{-a-bx}x^4 - 15ae^{-a-bx}x^4 - 3a^2e^{-a-bx}x^4 - 6be^{-a-bx}x^5 - 3abe^{-a-bx}x^5 - b^2e^{-a-bx}x^6
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.28 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.30

$$
\begin{aligned}
\int e^{-a-bx}x^3(a+bx)^3\,dx = e^{-a-bx}\Bigg(&-\frac{6(120+60a+12a^2+a^3)}{b^4} - \frac{6(120+60a+12a^2+a^3)\,x}{b^3} \\
&- \frac{3(120+60a+12a^2+a^3)\,x^2}{b^2} - \frac{(120+60a+12a^2+a^3)\,x^3}{b} \\
&- 3\left(10+5a+a^2\right)x^4 - 3(2+a)bx^5 - b^2x^6\Bigg)
\end{aligned}
$$

```
[In] Integrate[E^(-a - b*x)*x^3*(a + b*x)^3,x]
```

```
[Out] E^(-a - b*x)*((-6*(120 + 60*a + 12*a^2 + a^3))/b^4 - (6*(120 + 60*a + 12*a^
2 + a^3)*x)/b^3 - (3*(120 + 60*a + 12*a^2 + a^3)*x^2)/b^2 - ((120 + 60*a +
12*a^2 + a^3)*x^3)/b - 3*(10 + 5*a + a^2)*x^4 - 3*(2 + a)*b*x^5 - b^2*x^6)
```

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 178, normalized size of antiderivative = 0.45

method	result
norman	$(-3ab-6b)\,x^5\mathrm{e}^{-bx-a}+(-3a^2-15a-30)\,x^4\mathrm{e}^{-bx-a}-b^2\mathrm{e}^{-bx-a}x^6-\frac{6(a^3+12a^2+60a+120)\mathrm{e}^{-}}{b^4}$
gosper	$-\frac{(b^6x^6+3b^5x^5a+3a^2b^4x^4+6b^5x^5+a^3b^3x^3+15a\,b^4x^4+12a^2b^3x^3+30b^4x^4+3a^3b^2x^2+60a\,b^3x^3+36a^2b^2x^2+120b^3x^3+6a^3}{b^4}$
risch	$-\frac{(b^6x^6+3b^5x^5a+3a^2b^4x^4+6b^5x^5+a^3b^3x^3+15a\,b^4x^4+12a^2b^3x^3+30b^4x^4+3a^3b^2x^2+60a\,b^3x^3+36a^2b^2x^2+120b^3x^3+6a^3}{b^4}$
meijerg	$\frac{\mathrm{e}^{-a}\left(720-\frac{(7b^6x^6+42b^5x^5+210b^4x^4+840b^3x^3+2520b^2x^2+5040bx+5040)\mathrm{e}^{-bx}}{7}\right)}{b^4}+\frac{3\,\mathrm{e}^{-a}a\left(120-\frac{(6b^5x^5+30b^4x^4+120b^3x^3+36}{6}\right.}{b^4}$
parallelrisch	$-\frac{b^6\mathrm{e}^{-bx-a}x^6+3b^5\mathrm{e}^{-bx-a}x^5a+6b^5\mathrm{e}^{-bx-a}x^5+3x^4\mathrm{e}^{-bx-a}a^2b^4+15x^4\mathrm{e}^{-bx-a}a\,b^4+x^3\mathrm{e}^{-bx-a}a^3b^3+30\,\mathrm{e}^{-bx-a}b^4x^4+12x}{}$
derivativedivides	$-\frac{\mathrm{e}^{-bx-a}(-bx-a)^6-6(-bx-a)^5\mathrm{e}^{-bx-a}+30(-bx-a)^4\mathrm{e}^{-bx-a}-120\,\mathrm{e}^{-bx-a}(-bx-a)^3+360(-bx-a)^2\mathrm{e}^{-bx-a}-720(-bx}{}$
default	$-\frac{\mathrm{e}^{-bx-a}(-bx-a)^6-6(-bx-a)^5\mathrm{e}^{-bx-a}+30(-bx-a)^4\mathrm{e}^{-bx-a}-120\,\mathrm{e}^{-bx-a}(-bx-a)^3+360(-bx-a)^2\mathrm{e}^{-bx-a}-720(-bx}{}$
parts	$-b^2\mathrm{e}^{-bx-a}x^6-3ab\,\mathrm{e}^{-bx-a}x^5-3a^2\mathrm{e}^{-bx-a}x^4-\frac{a^3\mathrm{e}^{-bx-a}x^3}{b}-\frac{3\left(-\frac{2\left((-bx-a)^5\mathrm{e}^{-bx-a}-5(-bx-a)^4\mathrm{e}^{-bx}\right.}{}\right.}{}$

```
[In] int(exp(-b*x-a)*x^3*(b*x+a)^3,x,method=_RETURNVERBOSE)
```

```
[Out] (-3*a*b-6*b)*x^5*exp(-b*x-a)+(-3*a^2-15*a-30)*x^4*exp(-b*x-a)-b^2*exp(-b*x-
a)*x^6-6*(a^3+12*a^2+60*a+120)/b^4*exp(-b*x-a)-6*(a^3+12*a^2+60*a+120)/b^3*
x*exp(-b*x-a)-3*(a^3+12*a^2+60*a+120)/b^2*x^2*exp(-b*x-a)-(a^3+12*a^2+60*a+
120)/b*x^3*exp(-b*x-a)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.30

$$\int e^{-a-bx}x^3(a+bx)^3\,dx = -\frac{(b^6x^6+3\,(a+2)b^5x^5+3\,(a^2+5\,a+10)b^4x^4+(a^3+12\,a^2+60\,a+120)b^3x^3+3\,(a^3+12\,a^2+60\,a+12}{b^4}$$

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^6*x^6 + 3*(a + 2)*b^5*x^5 + 3*(a^2 + 5*a + 10)*b^4*x^4 + (a^3 + 12*a^2
+ 60*a + 120)*b^3*x^3 + 3*(a^3 + 12*a^2 + 60*a + 120)*b^2*x^2 + 6*a^3 + 6*(
a^3 + 12*a^2 + 60*a + 120)*b*x + 72*a^2 + 360*a + 720)*e^(-b*x - a)/b^4
```

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 236, normalized size of antiderivative = 0.59

$$\int e^{-a-bx}x^3(a+bx)^3\,dx$$
$$= \begin{cases} \frac{(-a^3b^3x^3-3a^3b^2x^2-6a^3bx-6a^3-3a^2b^4x^4-12a^2b^3x^3-36a^2b^2x^2-72a^2bx-72a^2-3ab^5x^5-15ab^4x^4-60ab^3x^3-180ab^2x^2-360abx-360a-b^6x}{b^4} \\ \frac{a^3x^4}{4}+\frac{3a^2bx^5}{5}+\frac{ab^2x^6}{2}+\frac{b^3x^7}{7} \end{cases}$$

```
[In] integrate(exp(-b*x-a)*x**3*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3*b**3*x**3 - 3*a**3*b**2*x**2 - 6*a**3*b*x - 6*a**3 - 3*a*
*2*b**4*x**4 - 12*a**2*b**3*x**3 - 36*a**2*b**2*x**2 - 72*a**2*b*x - 72*a**
2 - 3*a*b**5*x**5 - 15*a*b**4*x**4 - 60*a*b**3*x**3 - 180*a*b**2*x**2 - 360
*a*b*x - 360*a - b**6*x**6 - 6*b**5*x**5 - 30*b**4*x**4 - 120*b**3*x**3 - 3
60*b**2*x**2 - 720*b*x - 720)*exp(-a - b*x)/b**4, Ne(b**4, 0)), (a**3*x**4/
4 + 3*a**2*b*x**5/5 + a*b**2*x**6/2 + b**3*x**7/7, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 196, normalized size of antiderivative = 0.49

$$\begin{aligned} \int e^{-a-bx}x^3(a+bx)^3\,dx &= -\frac{(b^3x^3+3\,b^2x^2+6\,bx+6)a^3e^{(-bx-a)}}{b^4} \\ &- \frac{3\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)a^2e^{(-bx-a)}}{b^4} \\ &- \frac{3\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)ae^{(-bx-a)}}{b^4} \\ &- \frac{(b^6x^6+6\,b^5x^5+30\,b^4x^4+120\,b^3x^3+360\,b^2x^2+720\,bx+720)e^{(-bx-a)}}{b^4} \end{aligned}$$

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*e^(-b*x - a)/b^4 - 3*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*e^(-b*x - a)/b^4 - 3*(b^5*x^5 + 5*b^4
*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*a*e^(-b*x - a)/b^4 - (b^6*x
^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b*x + 720)*e^
(-b*x - a)/b^4
```

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 202, normalized size of antiderivative = 0.51

$$\int e^{-a-bx}x^3(a+bx)^3\,dx = -\frac{(b^9x^6+3\,ab^8x^5+3\,a^2b^7x^4+6\,b^8x^5+a^3b^6x^3+15\,ab^7x^4+12\,a^2b^6x^3+30\,b^7x^4+3\,a^3b^5x^2+60\,ab^6x^3+36}{}$$

```
[In] integrate(exp(-b*x-a)*x^3*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^9*x^6 + 3*a*b^8*x^5 + 3*a^2*b^7*x^4 + 6*b^8*x^5 + a^3*b^6*x^3 + 15*a*b^
7*x^4 + 12*a^2*b^6*x^3 + 30*b^7*x^4 + 3*a^3*b^5*x^2 + 60*a*b^6*x^3 + 36*a^2
*b^5*x^2 + 120*b^6*x^3 + 6*a^3*b^4*x + 180*a*b^5*x^2 + 72*a^2*b^4*x + 360*b
^5*x^2 + 6*a^3*b^3 + 360*a*b^4*x + 72*a^2*b^3 + 720*b^4*x + 360*a*b^3 + 720
*b^3)*e^(-b*x - a)/b^7
```

Mupad [B] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 175, normalized size of antiderivative = 0.44

$$\begin{aligned}\int e^{-a-bx}x^3(a+bx)^3\,dx = &-x^4\,\mathrm{e}^{-a-b\,x}\,\left(3\,a^2+15\,a+30\right)-b^2\,x^6\,\mathrm{e}^{-a-b\,x}\\ &-\frac{6\,\mathrm{e}^{-a-b\,x}\,\left(a^3+12\,a^2+60\,a+120\right)}{b^4}-3\,b\,x^5\,\mathrm{e}^{-a-b\,x}\,\left(a+2\right)\\ &-\frac{6\,x\,\mathrm{e}^{-a-b\,x}\,\left(a^3+12\,a^2+60\,a+120\right)}{b^3}\\ &-\frac{x^3\,\mathrm{e}^{-a-b\,x}\,\left(a^3+12\,a^2+60\,a+120\right)}{b}\\ &-\frac{3\,x^2\,\mathrm{e}^{-a-b\,x}\,\left(a^3+12\,a^2+60\,a+120\right)}{b^2}\end{aligned}$$

```
[In] int(x^3*exp(- a - b*x)*(a + b*x)^3,x)
```

```
[Out] - x^4*exp(- a - b*x)*(15*a + 3*a^2 + 30) - b^2*x^6*exp(- a - b*x) - (6*exp(
- a - b*x)*(60*a + 12*a^2 + a^3 + 120))/b^4 - 3*b*x^5*exp(- a - b*x)*(a + 2
) - (6*x*exp(- a - b*x)*(60*a + 12*a^2 + a^3 + 120))/b^3 - (x^3*exp(- a - b
*x)*(60*a + 12*a^2 + a^3 + 120))/b - (3*x^2*exp(- a - b*x)*(60*a + 12*a^2 +
 a^3 + 120))/b^2
```

3.57 $\int e^{-a-bx}x^2(a+bx)^3\,dx$

Optimal result

Integrand size = 21, antiderivative size = 318

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = -\frac{120e^{-a-bx}}{b^3}-\frac{72ae^{-a-bx}}{b^3}-\frac{18a^2e^{-a-bx}}{b^3}-\frac{2a^3e^{-a-bx}}{b^3} -\frac{120e^{-a-bx}x}{b^2}-\frac{72ae^{-a-bx}x}{b^2}-\frac{18a^2e^{-a-bx}x}{b^2} -\frac{2a^3e^{-a-bx}x}{b^2}-\frac{60e^{-a-bx}x^2}{b}-\frac{36ae^{-a-bx}x^2}{b} -\frac{9a^2e^{-a-bx}x^2}{b}-\frac{a^3e^{-a-bx}x^2}{b}-20e^{-a-bx}x^3-12ae^{-a-bx}x^3 -3a^2e^{-a-bx}x^3-5be^{-a-bx}x^4-3abe^{-a-bx}x^4-b^2e^{-a-bx}x^5$$

```
[Out] -120*exp(-b*x-a)/b^3-72*a*exp(-b*x-a)/b^3-18*a^2*exp(-b*x-a)/b^3-2*a^3*exp(
-b*x-a)/b^3-120*exp(-b*x-a)*x/b^2-72*a*exp(-b*x-a)*x/b^2-18*a^2*exp(-b*x-a)
*x/b^2-2*a^3*exp(-b*x-a)*x/b^2-60*exp(-b*x-a)*x^2/b-36*a*exp(-b*x-a)*x^2/b-
9*a^2*exp(-b*x-a)*x^2/b-a^3*exp(-b*x-a)*x^2/b-20*exp(-b*x-a)*x^3-12*a*exp(-
b*x-a)*x^3-3*a^2*exp(-b*x-a)*x^3-5*b*exp(-b*x-a)*x^4-3*a*b*exp(-b*x-a)*x^4-
b^2*exp(-b*x-a)*x^5
```

Rubi [A] (verified)

Time = 0.27 (sec) , antiderivative size = 318, normalized size of antiderivative = 1.00, number of steps used = 20, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used

$= \{2227, 2207, 2225\}$

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = -\frac{2a^3e^{-a-bx}}{b^3} - \frac{2a^3xe^{-a-bx}}{b^2} - \frac{a^3x^2e^{-a-bx}}{b} - \frac{18a^2e^{-a-bx}}{b^3} - \frac{18a^2xe^{-a-bx}}{b^2} - 3a^2x^3e^{-a-bx} - \frac{9a^2x^2e^{-a-bx}}{b} - \frac{72ae^{-a-bx}}{b^3} - \frac{120e^{-a-bx}}{b^3} - b^2x^5e^{-a-bx} - \frac{72axe^{-a-bx}}{b^2} - \frac{120xe^{-a-bx}}{b^2} - 3abx^4e^{-a-bx} - 5bx^4e^{-a-bx} - 12ax^3e^{-a-bx} - 20x^3e^{-a-bx} - \frac{36ax^2e^{-a-bx}}{b} - \frac{60x^2e^{-a-bx}}{b}$$

```
[In] Int[E^(-a - b*x)*x^2*(a + b*x)^3,x]
```

```
[Out] (-120*E^(-a - b*x))/b^3 - (72*a*E^(-a - b*x))/b^3 - (18*a^2*E^(-a - b*x))/b
^3 - (2*a^3*E^(-a - b*x))/b^3 - (120*E^(-a - b*x)*x)/b^2 - (72*a*E^(-a - b*
x)*x)/b^2 - (18*a^2*E^(-a - b*x)*x)/b^2 - (2*a^3*E^(-a - b*x)*x)/b^2 - (60*
E^(-a - b*x)*x^2)/b - (36*a*E^(-a - b*x)*x^2)/b - (9*a^2*E^(-a - b*x)*x^2)/
b - (a^3*E^(-a - b*x)*x^2)/b - 20*E^(-a - b*x)*x^3 - 12*a*E^(-a - b*x)*x^3
- 3*a^2*E^(-a - b*x)*x^3 - 5*b*E^(-a - b*x)*x^4 - 3*a*b*E^(-a - b*x)*x^4 -
b^2*E^(-a - b*x)*x^5
```

Rule 2207

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

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(a^3e^{-a-bx}x^2 + 3a^2be^{-a-bx}x^3 + 3ab^2e^{-a-bx}x^4 + b^3e^{-a-bx}x^5\right)\,dx$$

$$= a^3 \int e^{-a-bx} x^2\, dx + \left(3a^2 b\right) \int e^{-a-bx} x^3\, dx + \left(3ab^2\right) \int e^{-a-bx} x^4\, dx + b^3 \int e^{-a-bx} x^5\, dx$$

$$= -\frac{a^3 e^{-a-bx} x^2}{b} - 3a^2 e^{-a-bx} x^3 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5 + \left(9a^2\right) \int e^{-a-bx} x^2\, dx + \frac{(2a^3) \int e^{-a-bx} x\, dx}{b} + (12ab) \int e^{-a-bx} x^3\, dx + \left(5b^2\right) \int e^{-a-bx} x^4\, dx$$

$$= -\frac{2a^3 e^{-a-bx} x}{b^2} - \frac{9a^2 e^{-a-bx} x^2}{b} - \frac{a^3 e^{-a-bx} x^2}{b} - 12ae^{-a-bx} x^3 - 3a^2 e^{-a-bx} x^3 - 5be^{-a-bx} x^4 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5 + (36a) \int e^{-a-bx} x^2\, dx + \frac{(2a^3) \int e^{-a-bx}\, dx}{b^2} + \frac{(18a^2) \int e^{-a-bx} x\, dx}{b} + (20b) \int e^{-a-bx} x^3\, dx$$

$$= -\frac{2a^3 e^{-a-bx}}{b^3} - \frac{18a^2 e^{-a-bx} x}{b^2} - \frac{2a^3 e^{-a-bx} x}{b^2} - \frac{36ae^{-a-bx} x^2}{b} - \frac{9a^2 e^{-a-bx} x^2}{b} - \frac{a^3 e^{-a-bx} x^2}{b} - 20e^{-a-bx} x^3 - 12ae^{-a-bx} x^3 - 3a^2 e^{-a-bx} x^3 - 5be^{-a-bx} x^4 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5 + 60 \int e^{-a-bx} x^2\, dx + \frac{(18a^2) \int e^{-a-bx}\, dx}{b^2} + \frac{(72a) \int e^{-a-bx} x\, dx}{b}$$

$$= -\frac{18a^2 e^{-a-bx}}{b^3} - \frac{2a^3 e^{-a-bx}}{b^3} - \frac{72ae^{-a-bx} x}{b^2} - \frac{18a^2 e^{-a-bx} x}{b^2} - \frac{2a^3 e^{-a-bx} x}{b^2} - \frac{60e^{-a-bx} x^2}{b} - \frac{36ae^{-a-bx} x^2}{b} - \frac{9a^2 e^{-a-bx} x^2}{b} - \frac{a^3 e^{-a-bx} x^2}{b} - 20e^{-a-bx} x^3 - 12ae^{-a-bx} x^3 - 3a^2 e^{-a-bx} x^3 - 5be^{-a-bx} x^4 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5 + \frac{(72a) \int e^{-a-bx}\, dx}{b^2} + \frac{120 \int e^{-a-bx} x\, dx}{b}$$

$$= -\frac{72ae^{-a-bx}}{b^3} - \frac{18a^2 e^{-a-bx}}{b^3} - \frac{2a^3 e^{-a-bx}}{b^3} - \frac{120e^{-a-bx} x}{b^2} - \frac{72ae^{-a-bx} x}{b^2} - \frac{18a^2 e^{-a-bx} x}{b^2} - \frac{2a^3 e^{-a-bx} x}{b^2} - \frac{60e^{-a-bx} x^2}{b} - \frac{36ae^{-a-bx} x^2}{b} - \frac{9a^2 e^{-a-bx} x^2}{b} - \frac{a^3 e^{-a-bx} x^2}{b} - 20e^{-a-bx} x^3 - 12ae^{-a-bx} x^3 - 3a^2 e^{-a-bx} x^3 - 5be^{-a-bx} x^4 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5 + \frac{120 \int e^{-a-bx}\, dx}{b^2}$$

$$= -\frac{120e^{-a-bx}}{b^3} - \frac{72ae^{-a-bx}}{b^3} - \frac{18a^2 e^{-a-bx}}{b^3} - \frac{2a^3 e^{-a-bx}}{b^3} - \frac{120e^{-a-bx} x}{b^2} - \frac{72ae^{-a-bx} x}{b^2} - \frac{18a^2 e^{-a-bx} x}{b^2} - \frac{2a^3 e^{-a-bx} x}{b^2} - \frac{60e^{-a-bx} x^2}{b} - \frac{36ae^{-a-bx} x^2}{b} - \frac{9a^2 e^{-a-bx} x^2}{b} - \frac{a^3 e^{-a-bx} x^2}{b} - 20e^{-a-bx} x^3 - 12ae^{-a-bx} x^3 - 3a^2 e^{-a-bx} x^3 - 5be^{-a-bx} x^4 - 3abe^{-a-bx} x^4 - b^2 e^{-a-bx} x^5$$

Mathematica [A] (verified)

Time = 0.22 (sec) , antiderivative size = 130, normalized size of antiderivative = 0.41

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = e^{-bx}\left(-\frac{2(60+36a+9a^2+a^3)\,e^{-a}}{b^3} - \frac{2(60+36a+9a^2+a^3)\,e^{-a}x}{b^2} - \frac{(60+36a+9a^2+a^3)\,e^{-a}x^2}{b} - (20+12a+3a^2)\,e^{-a}x^3 - (5+3a)be^{-a}x^4 - b^2e^{-a}x^5\right)$$

```
[In] Integrate[E^(-a - b*x)*x^2*(a + b*x)^3,x]
```

```
[Out] ((-2*(60 + 36*a + 9*a^2 + a^3))/(b^3*E^a) - (2*(60 + 36*a + 9*a^2 + a^3)*x)
/(b^2*E^a) - ((60 + 36*a + 9*a^2 + a^3)*x^2)/(b*E^a) - ((20 + 12*a + 3*a^2)
*x^3)/E^a - ((5 + 3*a)*b*x^4)/E^a - (b^2*x^5)/E^a)/E^(b*x)
```

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 143, normalized size of antiderivative = 0.45

method	result
gosper	$-\frac{(b^5x^5+3ab^4x^4+3a^2b^3x^3+5b^4x^4+a^3b^2x^2+12ab^3x^3+9a^2b^2x^2+20b^3x^3+2a^3bx+36ab^2x^2+18a^2bx+60b^2x^2+2a^3+72ab}{b^3}$
risch	$-\frac{(b^5x^5+3ab^4x^4+3a^2b^3x^3+5b^4x^4+a^3b^2x^2+12ab^3x^3+9a^2b^2x^2+20b^3x^3+2a^3bx+36ab^2x^2+18a^2bx+60b^2x^2+2a^3+72ab}{b^3}$
norman	$(-3ab-5b)\,x^4e^{-bx-a}+(-3a^2-12a-20)\,x^3e^{-bx-a}-b^2e^{-bx-a}x^5-\frac{2(a^3+9a^2+36a+60)e^{-bx-}}{b^3}$
meijerg	$\frac{e^{-a}\left(120-\frac{(6b^5x^5+30b^4x^4+120b^3x^3+360b^2x^2+720bx+720)e^{-bx}}{6}\right)}{b^3}+\frac{3e^{-a}a\left(24-\frac{(5b^4x^4+20b^3x^3+60b^2x^2+120bx+120)e^{-bx}}{5}\right.}{b^3}$
derivativedivides	$\frac{(-bx-a)^5e^{-bx-a}-5(-bx-a)^4e^{-bx-a}+20e^{-bx-a}(-bx-a)^3-60(-bx-a)^2e^{-bx-a}+120(-bx-a)e^{-bx-a}-120e^{-bx-a}+a}{}$
default	$\frac{(-bx-a)^5e^{-bx-a}-5(-bx-a)^4e^{-bx-a}+20e^{-bx-a}(-bx-a)^3-60(-bx-a)^2e^{-bx-a}+120(-bx-a)e^{-bx-a}-120e^{-bx-a}+a}{}$
parallelrisch	$-\frac{b^5e^{-bx-a}x^5+3x^4e^{-bx-a}ab^4+5e^{-bx-a}b^4x^4+3x^3e^{-bx-a}a^2b^3+12e^{-bx-a}ab^3x^3+x^2e^{-bx-a}a^3b^2+20e^{-bx-a}x^3b^3+9e}{}$
parts	$-b^2e^{-bx-a}x^5-3ab\,e^{-bx-a}x^4-3a^2e^{-bx-a}x^3-\frac{a^3e^{-bx-a}x^2}{b}-\frac{5(-bx-a)^4e^{-bx-a}-20e^{-bx-a}(-bx-a)^3+}{}$

```
[In] int(exp(-b*x-a)*x^2*(b*x+a)^3,x,method=_RETURNVERBOSE)
```

```
[Out] -(b^5*x^5+3*a*b^4*x^4+3*a^2*b^3*x^3+5*b^4*x^4+a^3*b^2*x^2+12*a*b^3*x^3+9*a^
2*b^2*x^2+20*b^3*x^3+2*a^3*b*x+36*a*b^2*x^2+18*a^2*b*x+60*b^2*x^2+2*a^3+72*
a*b*x+18*a^2+120*b*x+72*a+120)*exp(-b*x-a)/b^3
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 102, normalized size of antiderivative = 0.32

$$\int e^{-a-bx}x^2(a+bx)^3\,dx =$$
$$-\frac{(b^5x^5+(3\,a+5)b^4x^4+(3\,a^2+12\,a+20)b^3x^3+(a^3+9\,a^2+36\,a+60)b^2x^2+2\,a^3+2\,(a^3+9\,a^2+36}{b^3}$$

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^5*x^5 + (3*a + 5)*b^4*x^4 + (3*a^2 + 12*a + 20)*b^3*x^3 + (a^3 + 9*a^2
+ 36*a + 60)*b^2*x^2 + 2*a^3 + 2*(a^3 + 9*a^2 + 36*a + 60)*b*x + 18*a^2 + 7
2*a + 120)*e^(-b*x - a)/b^3
```

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 196, normalized size of antiderivative = 0.62

$$\int e^{-a-bx}x^2(a+bx)^3\,dx$$
$$=\begin{cases}\frac{(-a^3b^2x^2-2a^3bx-2a^3-3a^2b^3x^3-9a^2b^2x^2-18a^2bx-18a^2-3ab^4x^4-12ab^3x^3-36ab^2x^2-72abx-72a-b^5x^5-5b^4x^4-20b^3x^3-60b^2x^2-120bx-}{b^3} \\ \frac{a^3x^3}{3}+\frac{3a^2bx^4}{4}+\frac{3ab^2x^5}{5}+\frac{b^3x^6}{6}\end{cases}$$

```
[In] integrate(exp(-b*x-a)*x**2*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3*b**2*x**2 - 2*a**3*b*x - 2*a**3 - 3*a**2*b**3*x**3 - 9*a*
*2*b**2*x**2 - 18*a**2*b*x - 18*a**2 - 3*a*b**4*x**4 - 12*a*b**3*x**3 - 36*
a*b**2*x**2 - 72*a*b*x - 72*a - b**5*x**5 - 5*b**4*x**4 - 20*b**3*x**3 - 60
*b**2*x**2 - 120*b*x - 120)*exp(-a - b*x)/b**3, Ne(b**3, 0)), (a**3*x**3/3
+ 3*a**2*b*x**4/4 + 3*a*b**2*x**5/5 + b**3*x**6/6, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 164, normalized size of antiderivative = 0.52

$$\begin{aligned}\int e^{-a-bx}x^2(a+bx)^3\,dx = &-\frac{(b^2x^2+2\,bx+2)a^3e^{(-bx-a)}}{b^3}\\ &-\frac{3\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^2e^{(-bx-a)}}{b^3}\\ &-\frac{3\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)ae^{(-bx-a)}}{b^3}\\ &-\frac{(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)e^{(-bx-a)}}{b^3}\end{aligned}$$

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b^2*x^2 + 2*b*x + 2)*a^3*e^(-b*x - a)/b^3 - 3*(b^3*x^3 + 3*b^2*x^2 + 6*b*
x + 6)*a^2*e^(-b*x - a)/b^3 - 3*(b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x
+ 24)*a*e^(-b*x - a)/b^3 - (b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 +
 120*b*x + 120)*e^(-b*x - a)/b^3
```

Giac [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 163, normalized size of antiderivative = 0.51

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = -\frac{(b^8x^5+3\,ab^7x^4+3\,a^2b^6x^3+5\,b^7x^4+a^3b^5x^2+12\,ab^6x^3+9\,a^2b^5x^2+20\,b^6x^3+2\,a^3b^4x+36\,ab^5x^2+18\,a}{b^6}$$

```
[In] integrate(exp(-b*x-a)*x^2*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^8*x^5 + 3*a*b^7*x^4 + 3*a^2*b^6*x^3 + 5*b^7*x^4 + a^3*b^5*x^2 + 12*a*b^
6*x^3 + 9*a^2*b^5*x^2 + 20*b^6*x^3 + 2*a^3*b^4*x + 36*a*b^5*x^2 + 18*a^2*b^
4*x + 60*b^5*x^2 + 2*a^3*b^3 + 72*a*b^4*x + 18*a^2*b^3 + 120*b^4*x + 72*a*b
^3 + 120*b^3)*e^(-b*x - a)/b^6
```

Mupad [B] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 126, normalized size of antiderivative = 0.40

$$\int e^{-a-bx}x^2(a+bx)^3\,dx = -x^3\,\mathrm{e}^{-a-b\,x}\,\left(3\,a^2+3\,a\,b\,x+12\,a+b^2\,x^2+5\,b\,x+20\right) - \frac{2\,\mathrm{e}^{-a-b\,x}\,\left(a^3+9\,a^2+36\,a+60\right)}{b^3} - \frac{2\,x\,\mathrm{e}^{-a-b\,x}\,\left(a^3+9\,a^2+36\,a+60\right)}{b^2} - \frac{x^2\,\mathrm{e}^{-a-b\,x}\,\left(a^3+9\,a^2+36\,a+60\right)}{b}$$

```
[In] int(x^2*exp(- a - b*x)*(a + b*x)^3,x)
```

```
[Out] - x^3*exp(- a - b*x)*(12*a + 5*b*x + 3*a^2 + b^2*x^2 + 3*a*b*x + 20) - (2*e
xp(- a - b*x)*(36*a + 9*a^2 + a^3 + 60))/b^3 - (2*x*exp(- a - b*x)*(36*a +
9*a^2 + a^3 + 60))/b^2 - (x^2*exp(- a - b*x)*(36*a + 9*a^2 + a^3 + 60))/b
```

3.58 $\int e^{-a-bx}x(a+bx)^3\,dx$

Optimal result

Integrand size = 19, antiderivative size = 184

$$\begin{aligned}\int e^{-a-bx}x(a+bx)^3\,dx = &-\frac{24e^{-a-bx}}{b^2}+\frac{6ae^{-a-bx}}{b^2}-\frac{24e^{-a-bx}(a+bx)}{b^2}\\&+\frac{6ae^{-a-bx}(a+bx)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}\\&-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{e^{-a-bx}(a+bx)^4}{b^2}\end{aligned}$$

```
[Out] -24*exp(-b*x-a)/b^2+6*a*exp(-b*x-a)/b^2-24*exp(-b*x-a)*(b*x+a)/b^2+6*a*exp(
-b*x-a)*(b*x+a)/b^2-12*exp(-b*x-a)*(b*x+a)^2/b^2+3*a*exp(-b*x-a)*(b*x+a)^2/
b^2-4*exp(-b*x-a)*(b*x+a)^3/b^2+a*exp(-b*x-a)*(b*x+a)^3/b^2-exp(-b*x-a)*(b*
x+a)^4/b^2
```

Rubi [A] (verified)

Time = 0.17 (sec) , antiderivative size = 184, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2227, 2207, 2225}

$$\begin{aligned}\int e^{-a-bx}x(a+bx)^3\,dx = &-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}\\&+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{6ae^{-a-bx}(a+bx)}{b^2}\\&-\frac{24e^{-a-bx}(a+bx)}{b^2}+\frac{6ae^{-a-bx}}{b^2}-\frac{24e^{-a-bx}}{b^2}\end{aligned}$$

```
[In] Int[E^(-a - b*x)*x*(a + b*x)^3,x]
```

```
[Out] (-24*E^(-a - b*x))/b^2 + (6*a*E^(-a - b*x))/b^2 - (24*E^(-a - b*x)*(a + b*x
))/b^2 + (6*a*E^(-a - b*x)*(a + b*x))/b^2 - (12*E^(-a - b*x)*(a + b*x)^2)/b
^2 + (3*a*E^(-a - b*x)*(a + b*x)^2)/b^2 - (4*E^(-a - b*x)*(a + b*x)^3)/b^2
+ (a*E^(-a - b*x)*(a + b*x)^3)/b^2 - (E^(-a - b*x)*(a + b*x)^4)/b^2
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(-\frac{ae^{-a-bx}(a+bx)^3}{b}+\frac{e^{-a-bx}(a+bx)^4}{b}\right) dx \\
&= \frac{\int e^{-a-bx}(a+bx)^4\,dx}{b}-\frac{a\int e^{-a-bx}(a+bx)^3\,dx}{b} \\
&= \frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{4\int e^{-a-bx}(a+bx)^3\,dx}{b}-\frac{(3a)\int e^{-a-bx}(a+bx)^2\,dx}{b} \\
&= \frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2}+\frac{ae^{-a-bx}(a+bx)^3}{b^2} \\
&\quad -\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{12\int e^{-a-bx}(a+bx)^2\,dx}{b}-\frac{(6a)\int e^{-a-bx}(a+bx)\,dx}{b} \\
&= \frac{6ae^{-a-bx}(a+bx)}{b^2}-\frac{12e^{-a-bx}(a+bx)^2}{b^2}+\frac{3ae^{-a-bx}(a+bx)^2}{b^2}-\frac{4e^{-a-bx}(a+bx)^3}{b^2} \\
&\quad +\frac{ae^{-a-bx}(a+bx)^3}{b^2}-\frac{e^{-a-bx}(a+bx)^4}{b^2}+\frac{24\int e^{-a-bx}(a+bx)\,dx}{b}-\frac{(6a)\int e^{-a-bx}\,dx}{b}
\end{aligned}$$

$$
\begin{aligned}
&= \frac{6ae^{-a-bx}}{b^2} - \frac{24e^{-a-bx}(a+bx)}{b^2} + \frac{6ae^{-a-bx}(a+bx)}{b^2} - \frac{12e^{-a-bx}(a+bx)^2}{b^2} \\
&\quad + \frac{3ae^{-a-bx}(a+bx)^2}{b^2} - \frac{4e^{-a-bx}(a+bx)^3}{b^2} + \frac{ae^{-a-bx}(a+bx)^3}{b^2} - \frac{e^{-a-bx}(a+bx)^4}{b^2} \\
&\quad + \frac{24\int e^{-a-bx}\,dx}{b} \\
&= -\frac{24e^{-a-bx}}{b^2} + \frac{6ae^{-a-bx}}{b^2} - \frac{24e^{-a-bx}(a+bx)}{b^2} + \frac{6ae^{-a-bx}(a+bx)}{b^2} - \frac{12e^{-a-bx}(a+bx)^2}{b^2} \\
&\quad + \frac{3ae^{-a-bx}(a+bx)^2}{b^2} - \frac{4e^{-a-bx}(a+bx)^3}{b^2} + \frac{ae^{-a-bx}(a+bx)^3}{b^2} - \frac{e^{-a-bx}(a+bx)^4}{b^2}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.17 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.52

$$
\int e^{-a-bx}x(a+bx)^3\,dx
$$
$$
= \frac{e^{-a-bx}(-24-24bx-12b^2x^2-4b^3x^3-b^4x^4-a^3(1+bx)-3a^2(2+2bx+b^2x^2)-3a(6+6bx+3b^2x^2+}{b^2}
$$

```
[In] Integrate[E^(-a - b*x)*x*(a + b*x)^3,x]
```

```
[Out] (E^(-a - b*x)*(-24 - 24*b*x - 12*b^2*x^2 - 4*b^3*x^3 - b^4*x^4 - a^3*(1 + b
*x) - 3*a^2*(2 + 2*b*x + b^2*x^2) - 3*a*(6 + 6*b*x + 3*b^2*x^2 + b^3*x^3)))
/b^2
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 102, normalized size of antiderivative = 0.55

method	result
gosper	$-\frac{\left(b^4x^4+3a\,b^3x^3+3a^2b^2x^2+4b^3x^3+a^3bx+9a\,b^2x^2+6a^2bx+12b^2x^2+a^3+18abx+6a^2+24bx+18a+24\right)\mathrm{e}^{-bx-a}}{b^2}$
risch	$-\frac{\left(b^4x^4+3a\,b^3x^3+3a^2b^2x^2+4b^3x^3+a^3bx+9a\,b^2x^2+6a^2bx+12b^2x^2+a^3+18abx+6a^2+24bx+18a+24\right)\mathrm{e}^{-bx-a}}{b^2}$
norman	$(-3ab-4b)\,x^3\mathrm{e}^{-bx-a}+(-3a^2-9a-12)\,x^2\mathrm{e}^{-bx-a}-b^2x^4\mathrm{e}^{-bx-a}-\frac{(a^3+6a^2+18a+24)\mathrm{e}^{-bx-a}}{b^2}$
meijerg	$\frac{\mathrm{e}^{-a}\left(24-\frac{\left(5b^4x^4+20b^3x^3+60b^2x^2+120bx+120\right)\mathrm{e}^{-bx}}{5}\right)}{b^2}+\frac{3\,\mathrm{e}^{-a}a\left(6-\frac{\left(4b^3x^3+12b^2x^2+24bx+24\right)\mathrm{e}^{-bx}}{4}\right)}{b^2}+\frac{3\,\mathrm{e}^{-a}a^2\left(2-\frac{(3b}{}\right.}{}$
derivativedivides	$-\frac{(-bx-a)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}(-bx-a)^3+12(-bx-a)^2\mathrm{e}^{-bx-a}-24(-bx-a)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}+a\left(\mathrm{e}^{-bx-a}(-bx-a)^3-\right.}{b^2}$
default	$-\frac{(-bx-a)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}(-bx-a)^3+12(-bx-a)^2\mathrm{e}^{-bx-a}-24(-bx-a)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}+a\left(\mathrm{e}^{-bx-a}(-bx-a)^3-\right.}{b^2}$
parts	$-b^2x^4\mathrm{e}^{-bx-a}-3\,\mathrm{e}^{-bx-a}b\,x^3a-3\,\mathrm{e}^{-bx-a}x^2a^2-\frac{\mathrm{e}^{-bx-a}x\,a^3}{b}-\frac{-4\,\mathrm{e}^{-bx-a}(-bx-a)^3+12(-bx-a)^2\mathrm{e}^{-bx}}{}$
parallelrisch	$-\frac{\mathrm{e}^{-bx-a}b^4x^4+3\,\mathrm{e}^{-bx-a}a\,b^3x^3+4\,\mathrm{e}^{-bx-a}x^3b^3+3\,\mathrm{e}^{-bx-a}a^2b^2x^2+9x^2\mathrm{e}^{-bx-a}a\,b^2+\mathrm{e}^{-bx-a}a^3bx+12b^2\mathrm{e}^{-bx-a}x^2+6x\,\mathrm{e}^{-b}}{b^2}$

```
[In] int(exp(-b*x-a)*x*(b*x+a)^3,x,method=_RETURNVERBOSE)
```

```
[Out] -(b^4*x^4+3*a*b^3*x^3+3*a^2*b^2*x^2+4*b^3*x^3+a^3*b*x+9*a*b^2*x^2+6*a^2*b*x
+12*b^2*x^2+a^3+18*a*b*x+6*a^2+24*b*x+18*a+24)*exp(-b*x-a)/b^2
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.42

$$\int e^{-a-bx}x(a+bx)^3\,dx = -\frac{(b^4x^4+(3\,a+4)b^3x^3+3\,(a^2+3\,a+4)b^2x^2+a^3+(a^3+6\,a^2+18\,a+24)bx+6\,a^2+18\,a+24)e^{(-bx-a)}}{b^2}$$

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="fricas")
```

```
[Out] -(b^4*x^4 + (3*a + 4)*b^3*x^3 + 3*(a^2 + 3*a + 4)*b^2*x^2 + a^3 + (a^3 + 6*
a^2 + 18*a + 24)*b*x + 6*a^2 + 18*a + 24)*e^(-b*x - a)/b^2
```

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 148, normalized size of antiderivative = 0.80

$$\int e^{-a-bx}x(a+bx)^3\,dx$$
$$=\begin{cases} \frac{(-a^3bx-a^3-3a^2b^2x^2-6a^2bx-6a^2-3ab^3x^3-9ab^2x^2-18abx-18a-b^4x^4-4b^3x^3-12b^2x^2-24bx-24)e^{-a-bx}}{b^2} & \text{for } b^2\neq 0 \\ \frac{a^3x^2}{2}+a^2bx^3+\frac{3ab^2x^4}{4}+\frac{b^3x^5}{5} & \text{otherwise} \end{cases}$$

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)**3,x)
```

```
[Out] Piecewise((((-a**3*b*x - a**3 - 3*a**2*b**2*x**2 - 6*a**2*b*x - 6*a**2 - 3*a
*b**3*x**3 - 9*a*b**2*x**2 - 18*a*b*x - 18*a - b**4*x**4 - 4*b**3*x**3 - 12
*b**2*x**2 - 24*b*x - 24)*exp(-a - b*x)/b**2, Ne(b**2, 0)), (a**3*x**2/2 +
a**2*b*x**3 + 3*a*b**2*x**4/4 + b**3*x**5/5, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 132, normalized size of antiderivative = 0.72

$$\int e^{-a-bx}x(a+bx)^3\,dx=-\frac{(bx+1)a^3e^{(-bx-a)}}{b^2}-\frac{3\,(b^2x^2+2\,bx+2)a^2e^{(-bx-a)}}{b^2}-\frac{3\,(b^3x^3+3\,b^2x^2+6\,bx+6)ae^{(-bx-a)}}{b^2}-\frac{(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)e^{(-bx-a)}}{b^2}$$

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -(b*x + 1)*a^3*e^(-b*x - a)/b^2 - 3*(b^2*x^2 + 2*b*x + 2)*a^2*e^(-b*x - a)/
b^2 - 3*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*e^(-b*x - a)/b^2 - (b^4*x^4 + 4
*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*e^(-b*x - a)/b^2
```

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 123, normalized size of antiderivative = 0.67

$$\int e^{-a-bx}x(a+bx)^3\,dx=$$
$$-\frac{(b^7x^4+3\,ab^6x^3+3\,a^2b^5x^2+4\,b^6x^3+a^3b^4x+9\,ab^5x^2+6\,a^2b^4x+12\,b^5x^2+a^3b^3+18\,ab^4x+6\,a^2b^3+2}{b^5}$$

```
[In] integrate(exp(-b*x-a)*x*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^7*x^4 + 3*a*b^6*x^3 + 3*a^2*b^5*x^2 + 4*b^6*x^3 + a^3*b^4*x + 9*a*b^5*x
^2 + 6*a^2*b^4*x + 12*b^5*x^2 + a^3*b^3 + 18*a*b^4*x + 6*a^2*b^3 + 24*b^4*x
 + 18*a*b^3 + 24*b^3)*e^(-b*x - a)/b^5
```

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 117, normalized size of antiderivative = 0.64

$$\int e^{-a-bx}x(a+bx)^3\,dx = -x^2\,\mathrm{e}^{-a-b\,x}\,\left(3\,a^2+9\,a+12\right)-b^2\,x^4\,\mathrm{e}^{-a-b\,x} - \frac{\mathrm{e}^{-a-b\,x}\,\left(a^3+6\,a^2+18\,a+24\right)}{b^2} - \frac{x\,\mathrm{e}^{-a-b\,x}\,\left(a^3+6\,a^2+18\,a+24\right)}{b}-b\,x^3\,\mathrm{e}^{-a-b\,x}\,\left(3\,a+4\right)$$

```
[In] int(x*exp(- a - b*x)*(a + b*x)^3,x)
```

```
[Out] - x^2*exp(- a - b*x)*(9*a + 3*a^2 + 12) - b^2*x^4*exp(- a - b*x) - (exp(- a
 - b*x)*(18*a + 6*a^2 + a^3 + 24))/b^2 - (x*exp(- a - b*x)*(18*a + 6*a^2 +
a^3 + 24))/b - b*x^3*exp(- a - b*x)*(3*a + 4)
```

3.59 $\int e^{-a-bx}(a+bx)^3\,dx$

Optimal result

Integrand size = 18, antiderivative size = 80

$$\int e^{-a-bx}(a+bx)^3\,dx=-\frac{6e^{-a-bx}}{b}-\frac{6e^{-a-bx}(a+bx)}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{e^{-a-bx}(a+bx)^3}{b}$$

```
[Out] -6*exp(-b*x-a)/b-6*exp(-b*x-a)*(b*x+a)/b-3*exp(-b*x-a)*(b*x+a)^2/b-exp(-b*x
-a)*(b*x+a)^3/b
```

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 80, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2207, 2225}

$$\int e^{-a-bx}(a+bx)^3\,dx=-\frac{e^{-a-bx}(a+bx)^3}{b}-\frac{3e^{-a-bx}(a+bx)^2}{b}-\frac{6e^{-a-bx}(a+bx)}{b}-\frac{6e^{-a-bx}}{b}$$

```
[In] Int[E^(-a - b*x)*(a + b*x)^3,x]
```

```
[Out] (-6*E^(-a - b*x))/b - (6*E^(-a - b*x)*(a + b*x))/b - (3*E^(-a - b*x)*(a + b
*x)^2)/b - (E^(-a - b*x)*(a + b*x)^3)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{e^{-a-bx}(a+bx)^3}{b} + 3\int e^{-a-bx}(a+bx)^2\,dx \\
&= -\frac{3e^{-a-bx}(a+bx)^2}{b} - \frac{e^{-a-bx}(a+bx)^3}{b} + 6\int e^{-a-bx}(a+bx)\,dx \\
&= -\frac{6e^{-a-bx}(a+bx)}{b} - \frac{3e^{-a-bx}(a+bx)^2}{b} - \frac{e^{-a-bx}(a+bx)^3}{b} + 6\int e^{-a-bx}\,dx \\
&= -\frac{6e^{-a-bx}}{b} - \frac{6e^{-a-bx}(a+bx)}{b} - \frac{3e^{-a-bx}(a+bx)^2}{b} - \frac{e^{-a-bx}(a+bx)^3}{b}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.17 (sec) , antiderivative size = 41, normalized size of antiderivative = 0.51

$$\int e^{-a-bx}(a+bx)^3\,dx = \frac{e^{-a-bx}(-6-6(a+bx)-3(a+bx)^2-(a+bx)^3)}{b}$$

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^3,x]
[Out] (E^(-a - b*x)*(-6 - 6*(a + b*x) - 3*(a + b*x)^2 - (a + b*x)^3))/b
```

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 68, normalized size of antiderivative = 0.85

method	result
gosper	$-\frac{\left(b^{3} x^{3}+3 a \,b^{2} x^{2}+3 a^{2} b x+3 b^{2} x^{2}+a^{3}+6 a b x+3 a^{2}+6 b x+6 a+6\right) {\mathrm e}^{-b x -a}}{b}$
risch	$-\frac{\left(b^{3} x^{3}+3 a \,b^{2} x^{2}+3 a^{2} b x+3 b^{2} x^{2}+a^{3}+6 a b x+3 a^{2}+6 b x+6 a+6\right) {\mathrm e}^{-b x -a}}{b}$
derivativedivides	$\frac{{\mathrm e}^{-b x -a} \left(-b x -a \right)^{3}-3 \left(-b x -a \right)^{2} {\mathrm e}^{-b x -a}+6 \left(-b x -a \right) {\mathrm e}^{-b x -a}-6 \,{\mathrm e}^{-b x -a}}{b}$
default	$\frac{{\mathrm e}^{-b x -a} \left(-b x -a \right)^{3}-3 \left(-b x -a \right)^{2} {\mathrm e}^{-b x -a}+6 \left(-b x -a \right) {\mathrm e}^{-b x -a}-6 \,{\mathrm e}^{-b x -a}}{b}$
norman	$\left(-3 a b -3 b \right) x^{2} {\mathrm e}^{-b x -a}+\left(-3 a^{2}-6 a -6\right) x \,{\mathrm e}^{-b x -a}-b^{2} x^{3} {\mathrm e}^{-b x -a}-\frac{\left(a^{3}+3 a^{2}+6 a +6\right) {\mathrm e}^{-b x -a}}{b}$
meijerg	$\frac{{\mathrm e}^{-a} \left(6-\frac{\left(4 b^{3} x^{3}+12 b^{2} x^{2}+24 b x +24\right) {\mathrm e}^{-b x}}{4}\right)}{b}+\frac{3 \,{\mathrm e}^{-a} a \left(2-\frac{\left(3 b^{2} x^{2}+6 b x +6\right) {\mathrm e}^{-b x}}{3}\right)}{b}+\frac{3 \,{\mathrm e}^{-a} a^{2} \left(1-\frac{\left(2 b x +2\right) {\mathrm e}^{-b x}}{2}\right)}{b}+\frac{{\mathrm e}^{-a}}{}$
parts	$-b^{2} x^{3} {\mathrm e}^{-b x -a}-3 \,{\mathrm e}^{-b x -a} b a \,x^{2}-3 \,{\mathrm e}^{-b x -a} a^{2} x -\frac{{\mathrm e}^{-b x -a} a^{3}}{b}-\frac{3 \left(\left(-b x -a \right)^{2} {\mathrm e}^{-b x -a}-2 \left(-b x -a \right) {\mathrm e}^{-b x -a}+\right.}{b}$
parallelrisch	$-\frac{{\mathrm e}^{-b x -a} x^{3} b^{3}+3 x^{2} {\mathrm e}^{-b x -a} a \,b^{2}+3 b^{2} {\mathrm e}^{-b x -a} x^{2}+3 x \,{\mathrm e}^{-b x -a} a^{2} b +6 a b \,{\mathrm e}^{-b x -a} x +{\mathrm e}^{-b x -a} a^{3}+6 b \,{\mathrm e}^{-b x -a} x +3 a^{2} {\mathrm e}^{-b x -a}+6 a}{b}$

[In] int(exp(-b*x-a)*(b*x+a)^3,x,method=_RETURNVERBOSE)

[Out] -(b^3*x^3+3*a*b^2*x^2+3*a^2*b*x+3*b^2*x^2+a^3+6*a*b*x+3*a^2+6*b*x+6*a+6)*ex
p(-b*x-a)/b

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 57, normalized size of antiderivative = 0.71

$$\int e^{-a-bx}(a+bx)^3\,dx = -\frac{(b^3x^3+3\,(a+1)b^2x^2+a^3+3\,(a^2+2\,a+2)bx+3\,a^2+6\,a+6)e^{(-bx-a)}}{b}$$

[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="fricas")

[Out] -(b^3*x^3 + 3*(a + 1)*b^2*x^2 + a^3 + 3*(a^2 + 2*a + 2)*b*x + 3*a^2 + 6*a +
 6)*e^(-b*x - a)/b

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 104, normalized size of antiderivative = 1.30

$$\int e^{-a-bx}(a+bx)^3\,dx = \begin{cases} \frac{(-a^3-3a^2bx-3a^2-3ab^2x^2-6abx-6a-b^3x^3-3b^2x^2-6bx-6)e^{-a-bx}}{b} & \text{for } b\neq 0 \\ a^3x+\frac{3a^2bx^2}{2}+ab^2x^3+\frac{b^3x^4}{4} & \text{otherwise} \end{cases}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3,x)
```

```
[Out] Piecewise(((-a**3 - 3*a**2*b*x - 3*a**2 - 3*a*b**2*x**2 - 6*a*b*x - 6*a - b
**3*x**3 - 3*b**2*x**2 - 6*b*x - 6)*exp(-a - b*x)/b, Ne(b, 0)), (a**3*x + 3
*a**2*b*x**2/2 + a*b**2*x**3 + b**3*x**4/4, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 103, normalized size of antiderivative = 1.29

$$\int e^{-a-bx}(a+bx)^3\,dx = -\frac{3\,(bx+1)a^2e^{(-bx-a)}}{b}-\frac{a^3e^{(-bx-a)}}{b}-\frac{3\,(b^2x^2+2\,bx+2)ae^{(-bx-a)}}{b} -\frac{(b^3x^3+3\,b^2x^2+6\,bx+6)e^{(-bx-a)}}{b}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="maxima")
```

```
[Out] -3*(b*x + 1)*a^2*e^(-b*x - a)/b - a^3*e^(-b*x - a)/b - 3*(b^2*x^2 + 2*b*x +
 2)*a*e^(-b*x - a)/b - (b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*e^(-b*x - a)/b
```

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 87, normalized size of antiderivative = 1.09

$$\int e^{-a-bx}(a+bx)^3\,dx = -\frac{(b^6x^3+3\,ab^5x^2+3\,a^2b^4x+3\,b^5x^2+a^3b^3+6\,ab^4x+3\,a^2b^3+6\,b^4x+6\,ab^3+6\,b^3)e^{(-bx-a)}}{b^4}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3,x, algorithm="giac")
```

```
[Out] -(b^6*x^3 + 3*a*b^5*x^2 + 3*a^2*b^4*x + 3*b^5*x^2 + a^3*b^3 + 6*a*b^4*x + 3
*a^2*b^3 + 6*b^4*x + 6*a*b^3 + 6*b^3)*e^(-b*x - a)/b^4
```

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 66, normalized size of antiderivative = 0.82

$$\int e^{-a-bx}(a+bx)^3\,dx = -x\,\mathrm{e}^{-a-b\,x}\,\left(3\,a^2+3\,a\,b\,x+6\,a+b^2\,x^2+3\,b\,x+6\right) - \frac{\mathrm{e}^{-a-b\,x}\,\left(a^3+3\,a^2+6\,a+6\right)}{b}$$

```
[In] int(exp(- a - b*x)*(a + b*x)^3,x)
[Out] - x*exp(- a - b*x)*(6*a + 3*b*x + 3*a^2 + b^2*x^2 + 3*a*b*x + 6) - (exp(- a
 - b*x)*(6*a + 3*a^2 + a^3 + 6))/b
```

3.60 $\int \frac{e^{-a-bx}(a+bx)^3}{x} dx$

Optimal result

Integrand size = 21, antiderivative size = 102

$$\int \frac{e^{-a-bx}(a+bx)^3}{x} dx = -2e^{-a-bx} - 3ae^{-a-bx} - 3a^2e^{-a-bx} - 2be^{-a-bx}x - 3abe^{-a-bx}x - b^2e^{-a-bx}x^2 + a^3e^{-a}\,\mathrm{ExpIntegralEi}(-bx)$$

```
[Out] -2*exp(-b*x-a)-3*a*exp(-b*x-a)-3*a^2*exp(-b*x-a)-2*b*exp(-b*x-a)*x-3*a*b*ex
p(-b*x-a)*x-b^2*exp(-b*x-a)*x^2+a^3*Ei(-b*x)/exp(a)
```

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 102, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.190, Rules used = {2230, 2225, 2209, 2207}

$$\int \frac{e^{-a-bx}(a+bx)^3}{x} dx = e^{-a}a^3\,\mathrm{ExpIntegralEi}(-bx) - 3a^2e^{-a-bx} - b^2x^2e^{-a-bx} - 3ae^{-a-bx} - 3abxe^{-a-bx} - 2e^{-a-bx} - 2bxe^{-a-bx}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x,x]
```

```
[Out] -2*E^(-a - b*x) - 3*a*E^(-a - b*x) - 3*a^2*E^(-a - b*x) - 2*b*E^(-a - b*x)*
x - 3*a*b*E^(-a - b*x)*x - b^2*E^(-a - b*x)*x^2 + (a^3*ExpIntegralEi[-(b*x)
])/E^a
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
```

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(3a^2be^{-a-bx}+\frac{a^3e^{-a-bx}}{x}+3ab^2e^{-a-bx}x+b^3e^{-a-bx}x^2\right)\,dx\\
&= a^3\int \frac{e^{-a-bx}}{x}\,dx+\left(3a^2b\right)\int e^{-a-bx}\,dx+\left(3ab^2\right)\int e^{-a-bx}x\,dx+b^3\int e^{-a-bx}x^2\,dx\\
&= -3a^2e^{-a-bx}-3abe^{-a-bx}x-b^2e^{-a-bx}x^2+a^3e^{-a}\text{Ei}(-bx)\\
&\quad +(3ab)\int e^{-a-bx}\,dx+\left(2b^2\right)\int e^{-a-bx}x\,dx\\
&= -3ae^{-a-bx}-3a^2e^{-a-bx}-2be^{-a-bx}x-3abe^{-a-bx}x\\
&\quad -b^2e^{-a-bx}x^2+a^3e^{-a}\text{Ei}(-bx)+(2b)\int e^{-a-bx}\,dx\\
&= -2e^{-a-bx}-3ae^{-a-bx}-3a^2e^{-a-bx}-2be^{-a-bx}x-3abe^{-a-bx}x-b^2e^{-a-bx}x^2+a^3e^{-a}\text{Ei}(-bx)
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 52, normalized size of antiderivative = 0.51

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = e^{-a-bx}\big(-2-3a^2-2bx-b^2x^2-3a(1+bx) + a^3e^{bx}\,\text{ExpIntegralEi}(-bx)\big)$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x,x]
```

```
[Out] E^(-a - b*x)*(-2 - 3*a^2 - 2*b*x - b^2*x^2 - 3*a*(1 + b*x) + a^3*E^(b*x)*Ex
pIntegralEi[-(b*x)])
```

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.94

method	result
meijerg	$\mathrm{e}^{-a}\left(2-\frac{(3b^2x^2+6bx+6)\,\mathrm{e}^{-bx}}{3}\right)+3\,\mathrm{e}^{-a}a\left(1-\frac{(2bx+2)\,\mathrm{e}^{-bx}}{2}\right)+3\,\mathrm{e}^{-a}a^2\left(1-\mathrm{e}^{-bx}\right)+\mathrm{e}^{-a}a^3(\ln(x)$
risch	$-b^2\mathrm{e}^{-bx-a}x^2-a^3\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-3ab\,\mathrm{e}^{-bx-a}x-3a^2\mathrm{e}^{-bx-a}-2b\,\mathrm{e}^{-bx-a}x-3a\,\mathrm{e}^{-bx-a}-2\,\mathrm{e}$
derivativedivides	$-a^2\mathrm{e}^{-bx-a}+a\left((-bx-a)\,\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}\right)-(-bx-a)^2\,\mathrm{e}^{-bx-a}+2(-bx-a)\,\mathrm{e}^{-bx-a}-$
default	$-a^2\mathrm{e}^{-bx-a}+a\left((-bx-a)\,\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}\right)-(-bx-a)^2\,\mathrm{e}^{-bx-a}+2(-bx-a)\,\mathrm{e}^{-bx-a}-$

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x,x,method=_RETURNVERBOSE)
```

```
[Out] exp(-a)*(2-1/3*(3*b^2*x^2+6*b*x+6)*exp(-b*x))+3*exp(-a)*a*(1-1/2*(2*b*x+2)*
exp(-b*x))+3*exp(-a)*a^2*(1-exp(-b*x))+exp(-a)*a^3*(ln(x)+ln(b)-ln(b*x)-Ei(
1,b*x))
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 50, normalized size of antiderivative = 0.49

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = a^3\mathrm{Ei}(-bx)\,e^{(-a)} - \left(b^2x^2 + (3\,a+2)bx + 3\,a^2 + 3\,a + 2\right)e^{(-bx-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="fricas")
```

```
[Out] a^3*Ei(-b*x)*e^(-a) - (b^2*x^2 + (3*a + 2)*b*x + 3*a^2 + 3*a + 2)*e^(-b*x -
 a)
```

Sympy [A] (verification not implemented)

Time = 3.43 (sec) , antiderivative size = 70, normalized size of antiderivative = 0.69

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = \left(a^3\operatorname{Ei}\left(-bx\right) - 3a^2e^{-bx} - 3a\left(bxe^{-bx} + e^{-bx}\right) - b^2x^2e^{-bx} - 2bxe^{-bx} - 2e^{-bx}\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x,x)
```

```
[Out] (a**3*Ei(-b*x) - 3*a**2*exp(-b*x) - 3*a*(b*x*exp(-b*x) + exp(-b*x)) - b**2*
x**2*exp(-b*x) - 2*b*x*exp(-b*x) - 2*exp(-b*x))*exp(-a)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 69, normalized size of antiderivative = 0.68

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = a^3\mathrm{Ei}(-bx)\,e^{(-a)} - 3\,(bx+1)ae^{(-bx-a)} - 3\,a^2e^{(-bx-a)} - \left(b^2x^2 + 2\,bx + 2\right)e^{(-bx-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="maxima")
```

```
[Out] a^3*Ei(-b*x)*e^(-a) - 3*(b*x + 1)*a*e^(-b*x - a) - 3*a^2*e^(-b*x - a) - (b^
2*x^2 + 2*b*x + 2)*e^(-b*x - a)
```

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 95, normalized size of antiderivative = 0.93

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = -b^2x^2e^{(-bx-a)} + a^3\mathrm{Ei}(-bx)\,e^{(-a)} - 3\,abxe^{(-bx-a)} - 3\,a^2e^{(-bx-a)} - 2\,bxe^{(-bx-a)} - 3\,ae^{(-bx-a)} - 2\,e^{(-bx-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x,x, algorithm="giac")
```

```
[Out] -b^2*x^2*e^(-b*x - a) + a^3*Ei(-b*x)*e^(-a) - 3*a*b*x*e^(-b*x - a) - 3*a^2*
e^(-b*x - a) - 2*b*x*e^(-b*x - a) - 3*a*e^(-b*x - a) - 2*e^(-b*x - a)
```

Mupad [B] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 69, normalized size of antiderivative = 0.68

$$\int \frac{e^{-a-bx}(a+bx)^3}{x}\,dx = -\mathrm{e}^{-a-b\,x}\,\left(b^2\,x^2+2\,b\,x+2\right)-3\,a^2\,\mathrm{e}^{-a-b\,x} - 3\,a\,\mathrm{e}^{-a-b\,x}\,(b\,x+1)-a^3\,\mathrm{e}^{-a}\,\mathrm{expint}(b\,x)$$

```
[In] int((exp(- a - b*x)*(a + b*x)^3)/x,x)
```

```
[Out] - exp(- a - b*x)*(2*b*x + b^2*x^2 + 2) - 3*a^2*exp(- a - b*x) - 3*a*exp(- a
 - b*x)*(b*x + 1) - a^3*exp(-a)*expint(b*x)
```

3.61 $\int \frac{e^{-a-bx}(a+bx)^3}{x^2} dx$

Optimal result

Integrand size = 21, antiderivative size = 94

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2} dx = -be^{-a-bx} - 3abe^{-a-bx} - \frac{a^3e^{-a-bx}}{x} - b^2e^{-a-bx}x + 3a^2be^{-a}\,\text{ExpIntegralEi}(-bx) - a^3be^{-a}\,\text{ExpIntegralEi}(-bx)$$

```
[Out] -b*exp(-b*x-a)-3*a*b*exp(-b*x-a)-a^3*exp(-b*x-a)/x-b^2*exp(-b*x-a)*x+3*a^2*
b*Ei(-b*x)/exp(a)-a^3*b*Ei(-b*x)/exp(a)
```

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 94, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.238, Rules used = {2230, 2225, 2208, 2209, 2207}

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2} dx = e^{-a}a^3(-b)\,\text{ExpIntegralEi}(-bx) - \frac{a^3e^{-a-bx}}{x} + 3e^{-a}a^2b\,\text{ExpIntegralEi}(-bx) - b^2xe^{-a-bx} - 3abe^{-a-bx} - be^{-a-bx}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^2,x]
```

```
[Out] -(b*E^(-a - b*x)) - 3*a*b*E^(-a - b*x) - (a^3*E^(-a - b*x))/x - b^2*E^(-a -
 b*x)*x + (3*a^2*b*ExpIntegralEi[-(b*x)])/E^a - (a^3*b*ExpIntegralEi[-(b*x)
])/E^a
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
```

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(3ab^2e^{-a-bx}+\frac{a^3e^{-a-bx}}{x^2}+\frac{3a^2be^{-a-bx}}{x}+b^3e^{-a-bx}x\right)\,dx\\
&= a^3\int \frac{e^{-a-bx}}{x^2}\,dx+\left(3a^2b\right)\int \frac{e^{-a-bx}}{x}\,dx+\left(3ab^2\right)\int e^{-a-bx}\,dx+b^3\int e^{-a-bx}x\,dx\\
&= -3abe^{-a-bx}-\frac{a^3e^{-a-bx}}{x}-b^2e^{-a-bx}x+3a^2be^{-a}\text{Ei}(-bx)-\left(a^3b\right)\int \frac{e^{-a-bx}}{x}\,dx+b^2\int e^{-a-bx}\,dx\\
&= -be^{-a-bx}-3abe^{-a-bx}-\frac{a^3e^{-a-bx}}{x}-b^2e^{-a-bx}x+3a^2be^{-a}\text{Ei}(-bx)-a^3be^{-a}\text{Ei}(-bx)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.19 (sec) , antiderivative size = 54, normalized size of antiderivative = 0.57

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = \frac{e^{-a-bx}\left(-a^3-3abx-bx(1+bx)-(-3+a)a^2be^{bx}x\,\text{ExpIntegralEi}(-bx)\right)}{x}$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^2,x]
```

```
[Out] (E^(-a - b*x)*(-a^3 - 3*a*b*x - b*x*(1 + b*x) - (-3 + a)*a^2*b*E^(b*x)*x*Ex
pIntegralEi[-(b*x)]))/x
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 88, normalized size of antiderivative = 0.94

method	result
risch	$-3ab\,\mathrm{e}^{-bx-a}-b^2\mathrm{e}^{-bx-a}x-b\,\mathrm{e}^{-bx-a}-\frac{a^3\mathrm{e}^{-bx-a}}{x}+b\,a^3\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-3b\,a^2\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)$
derivativedivides	$b\Big(-2a\,\mathrm{e}^{-bx-a}+(-bx-a)\,\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}-a^3\Big(\frac{\mathrm{e}^{-bx-a}}{bx}-\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)\Big)-3a^2\mathrm{e}^{-a}\,\mathrm{Ei}_1\,($
default	$b\Big(-2a\,\mathrm{e}^{-bx-a}+(-bx-a)\,\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}-a^3\Big(\frac{\mathrm{e}^{-bx-a}}{bx}-\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)\Big)-3a^2\mathrm{e}^{-a}\,\mathrm{Ei}_1\,($
meijerg	$b\,\mathrm{e}^{-a}\Big(1-\frac{(2bx+2)\mathrm{e}^{-bx}}{2}\Big)+3\,\mathrm{e}^{-a}ba\big(1-\mathrm{e}^{-bx}\big)+3b\,\mathrm{e}^{-a}a^2(\ln(x)+\ln(b)-\ln(bx)-\mathrm{Ei}_1\,($

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^2,x,method=_RETURNVERBOSE)
```

```
[Out] -3*a*b*exp(-b*x-a)-b^2*exp(-b*x-a)*x-b*exp(-b*x-a)-a^3*exp(-b*x-a)/x+b*a^3*
exp(-a)*Ei(1,b*x)-3*b*a^2*exp(-a)*Ei(1,b*x)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.60

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = -\frac{(a^3-3\,a^2)bx\mathrm{Ei}(-bx)\,e^{(-a)}+(b^2x^2+a^3+(3\,a+1)bx)e^{(-bx-a)}}{x}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="fricas")
```

```
[Out] -((a^3 - 3*a^2)*b*x*Ei(-b*x)*e^(-a) + (b^2*x^2 + a^3 + (3*a + 1)*b*x)*e^(-b
*x - a))/x
```

Sympy [A] (verification not implemented)

Time = 1.47 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.05

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = -\frac{a^3e^{-a}\operatorname{E}_2(bx)}{x} + 3a^2be^{-a}\operatorname{Ei}(-bx) + 3ab^2\left(\begin{cases} x & \text{for } b=0 \\ -\frac{e^{-bx}}{b} & \text{otherwise}\end{cases}\right)e^{-a} + b^3x\left(\begin{cases} x & \text{for } b=0 \\ -\frac{e^{-bx}}{b} & \text{otherwise}\end{cases}\right)e^{-a} - b^3\left(\begin{cases} \frac{x^2}{2} & \text{for } b=0 \\ -\frac{\begin{cases} -\frac{e^{-bx}}{b} & \text{for } b\neq 0 \\ x & \text{otherwise}\end{cases}}{b} & \text{otherwise}\end{cases}\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**2,x)
```

```
[Out] -a**3*exp(-a)*expint(2, b*x)/x + 3*a**2*b*exp(-a)*Ei(-b*x) + 3*a*b**2*Piece
wise((x, Eq(b, 0)), (-exp(-b*x)/b, True))*exp(-a) + b**3*x*Piecewise((x, Eq
(b, 0)), (-exp(-b*x)/b, True))*exp(-a) - b**3*Piecewise((x**2/2, Eq(b, 0)),
 (-Piecewise((-exp(-b*x)/b, Ne(b, 0)), (x, True))/b, True))*exp(-a)
```

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.65

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = -a^3be^{(-a)}\Gamma(-1,bx) + 3\,a^2b\operatorname{Ei}(-bx)\,e^{(-a)} - (bx+1)be^{(-bx-a)} - 3\,abe^{(-bx-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="maxima")
```

```
[Out] -a^3*b*e^(-a)*gamma(-1, b*x) + 3*a^2*b*Ei(-b*x)*e^(-a) - (b*x + 1)*b*e^(-b*
x - a) - 3*a*b*e^(-b*x - a)
```

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 92, normalized size of antiderivative = 0.98

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = -\frac{a^3bx\mathrm{Ei}(-bx)\,e^{(-a)} - 3\,a^2bx\mathrm{Ei}(-bx)\,e^{(-a)} + b^2x^2e^{(-bx-a)} + a^3e^{(-bx-a)} + 3\,abxe^{(-bx-a)} + bxe^{(-bx-a)}}{x}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^2,x, algorithm="giac")
```

```
[Out] -(a^3*b*x*Ei(-b*x)*e^(-a) - 3*a^2*b*x*Ei(-b*x)*e^(-a) + b^2*x^2*e^(-b*x - a
) + a^3*e^(-b*x - a) + 3*a*b*x*e^(-b*x - a) + b*x*e^(-b*x - a))/x
```

Mupad [B] (verification not implemented)

Time = 0.24 (sec) , antiderivative size = 72, normalized size of antiderivative = 0.77

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^2}\,dx = a^3\,b\,\mathrm{e}^{-a}\left(\mathrm{expint}(b\,x) - \frac{\mathrm{e}^{-b\,x}}{b\,x}\right) - 3\,a\,b\,\mathrm{e}^{-a-b\,x} - b\,\mathrm{e}^{-a-b\,x}\,(b\,x+1) - 3\,a^2\,b\,\mathrm{e}^{-a}\,\mathrm{expint}(b\,x)$$

```
[In] int((exp(- a - b*x)*(a + b*x)^3)/x^2,x)
```

```
[Out] a^3*b*exp(-a)*(expint(b*x) - exp(-b*x)/(b*x)) - 3*a*b*exp(- a - b*x) - b*ex
p(- a - b*x)*(b*x + 1) - 3*a^2*b*exp(-a)*expint(b*x)
```

3.62 $\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx$

Optimal result

Integrand size = 21, antiderivative size = 130

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = -b^2e^{-a-bx}-\frac{a^3e^{-a-bx}}{2x^2}-\frac{3a^2be^{-a-bx}}{x}+\frac{a^3be^{-a-bx}}{2x}+3ab^2e^{-a}\,\text{ExpIntegralEi}(-bx)-3a^2b^2e^{-a}\,\text{ExpIntegralEi}(-bx)+\frac{1}{2}a^3b^2e^{-a}\,\text{ExpIntegralEi}(-bx)$$

```
[Out] -b^2*exp(-b*x-a)-1/2*a^3*exp(-b*x-a)/x^2-3*a^2*b*exp(-b*x-a)/x+1/2*a^3*b*ex
p(-b*x-a)/x+3*a*b^2*Ei(-b*x)/exp(a)-3*a^2*b^2*Ei(-b*x)/exp(a)+1/2*a^3*b^2*E
i(-b*x)/exp(a)
```

Rubi [A] (verified)

Time = 0.13 (sec) , antiderivative size = 130, normalized size of antiderivative = 1.00, number of steps used = 9, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.190, Rules used = {2230, 2225, 2208, 2209}

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \frac{1}{2}e^{-a}a^3b^2\,\text{ExpIntegralEi}(-bx)-\frac{a^3e^{-a-bx}}{2x^2}+\frac{a^3be^{-a-bx}}{2x}-3e^{-a}a^2b^2\,\text{ExpIntegralEi}(-bx)-\frac{3a^2be^{-a-bx}}{x}+3e^{-a}ab^2\,\text{ExpIntegralEi}(-bx)-b^2e^{-a-bx}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^3,x]
```

```
[Out] -(b^2*E^(-a - b*x)) - (a^3*E^(-a - b*x))/(2*x^2) - (3*a^2*b*E^(-a - b*x))/x
 + (a^3*b*E^(-a - b*x))/(2*x) + (3*a*b^2*ExpIntegralEi[-(b*x)])/E^a - (3*a^
2*b^2*ExpIntegralEi[-(b*x)])/E^a + (a^3*b^2*ExpIntegralEi[-(b*x)])/(2*E^a)
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(b^3 e^{-a-bx} + \frac{a^3 e^{-a-bx}}{x^3} + \frac{3a^2 b e^{-a-bx}}{x^2} + \frac{3ab^2 e^{-a-bx}}{x}\right) dx \\
&= a^3 \int \frac{e^{-a-bx}}{x^3}\, dx + \left(3a^2 b\right) \int \frac{e^{-a-bx}}{x^2}\, dx + \left(3ab^2\right) \int \frac{e^{-a-bx}}{x}\, dx + b^3 \int e^{-a-bx}\, dx \\
&= -b^2 e^{-a-bx} - \frac{a^3 e^{-a-bx}}{2x^2} - \frac{3a^2 b e^{-a-bx}}{x} + 3ab^2 e^{-a} \text{Ei}(-bx) \\
&\quad - \frac{1}{2}\left(a^3 b\right) \int \frac{e^{-a-bx}}{x^2}\, dx - \left(3a^2 b^2\right) \int \frac{e^{-a-bx}}{x}\, dx \\
&= -b^2 e^{-a-bx} - \frac{a^3 e^{-a-bx}}{2x^2} - \frac{3a^2 b e^{-a-bx}}{x} + \frac{a^3 b e^{-a-bx}}{2x} \\
&\quad + 3ab^2 e^{-a} \text{Ei}(-bx) - 3a^2 b^2 e^{-a} \text{Ei}(-bx) + \frac{1}{2}\left(a^3 b^2\right) \int \frac{e^{-a-bx}}{x}\, dx \\
&= -b^2 e^{-a-bx} - \frac{a^3 e^{-a-bx}}{2x^2} - \frac{3a^2 b e^{-a-bx}}{x} + \frac{a^3 b e^{-a-bx}}{2x} \\
&\quad + 3ab^2 e^{-a} \text{Ei}(-bx) - 3a^2 b^2 e^{-a} \text{Ei}(-bx) + \frac{1}{2} a^3 b^2 e^{-a} \text{Ei}(-bx)
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.17 (sec) , antiderivative size = 68, normalized size of antiderivative = 0.52

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \frac{e^{-a-bx}\left(-6a^2bx-2b^2x^2+a^3(-1+bx)+a(6-6a+a^2)\,b^2e^{bx}x^2\,\mathrm{ExpIntegralEi}(-bx)\right)}{2x^2}$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^3,x]
```

```
[Out] (E^(-a - b*x)*(-6*a^2*b*x - 2*b^2*x^2 + a^3*(-1 + b*x) + a*(6 - 6*a + a^2)*
b^2*E^(b*x)*x^2*ExpIntegralEi[-(b*x)]))/(2*x^2)
```

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 112, normalized size of antiderivative = 0.86

method	result
derivativedivides	$-b^2\left(\mathrm{e}^{-bx-a}+3a^2\left(\frac{\mathrm{e}^{-bx-a}}{bx}-\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)\right)+3a\,\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-a^3\left(-\frac{\mathrm{e}^{-bx-a}}{2b^2x^2}+\frac{\mathrm{e}^{-bx-a}}{2bx}-\frac{\mathrm{e}^{-a}}{\cdots}\right.\right.$
default	$-b^2\left(\mathrm{e}^{-bx-a}+3a^2\left(\frac{\mathrm{e}^{-bx-a}}{bx}-\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)\right)+3a\,\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-a^3\left(-\frac{\mathrm{e}^{-bx-a}}{2b^2x^2}+\frac{\mathrm{e}^{-bx-a}}{2bx}-\frac{\mathrm{e}^{-a}}{\cdots}\right.\right.$
risch	$-b^2\mathrm{e}^{-bx-a}-\frac{3a^2b\,\mathrm{e}^{-bx-a}}{x}+3b^2a^2\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-3b^2a\,\mathrm{e}^{-a}\,\mathrm{Ei}_1(bx)-\frac{a^3\mathrm{e}^{-bx-a}}{2x^2}+\frac{a^3b\,\mathrm{e}^{-bx-a}}{2x}-\cdots$
meijerg	$\mathrm{e}^{-a}b^2\left(1-\mathrm{e}^{-bx}\right)+3b^2\mathrm{e}^{-a}a(\ln(x)+\ln(b)-\ln(bx)-\mathrm{Ei}_1(bx))+3b^2\mathrm{e}^{-a}a^2\left(-\frac{1}{bx}+1-\ln\cdots\right.$

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^3,x,method=_RETURNVERBOSE)
```

```
[Out] -b^2*(exp(-b*x-a)+3*a^2*(exp(-b*x-a)/b/x-exp(-a)*Ei(1,b*x))+3*a*exp(-a)*Ei(
1,b*x)-a^3*(-1/2*exp(-b*x-a)/b^2/x^2+1/2*exp(-b*x-a)/b/x-1/2*exp(-a)*Ei(1,b
*x)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 70, normalized size of antiderivative = 0.54

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \frac{(a^3-6\,a^2+6\,a)b^2x^2\mathrm{Ei}(-bx)\,e^{(-a)}-(2\,b^2x^2+a^3-(a^3-6\,a^2)bx)e^{(-bx-a)}}{2\,x^2}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="fricas")
```

```
[Out] 1/2*((a^3 - 6*a^2 + 6*a)*b^2*x^2*Ei(-b*x)*e^(-a) - (2*b^2*x^2 + a^3 - (a^3
- 6*a^2)*b*x)*e^(-b*x - a))/x^2
```

Sympy [A] (verification not implemented)

Time = 1.26 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.43

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \left(-\frac{a^3\,\mathrm{E}_3\left(bx\right)}{x^2} - \frac{3a^2b\,\mathrm{E}_2\left(bx\right)}{x} + 3ab^2\,\mathrm{Ei}\left(-bx\right) + b^3\left(\begin{cases} x & \text{for } b = 0 \\ -\frac{e^{-bx}}{b} & \text{otherwise} \end{cases}\right)\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**3,x)
[Out] (-a**3*expint(3, b*x)/x**2 - 3*a**2*b*expint(2, b*x)/x + 3*a*b**2*Ei(-b*x)
+ b**3*Piecewise((x, Eq(b, 0)), (-exp(-b*x)/b, True)))*exp(-a)
```

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 64, normalized size of antiderivative = 0.49

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = -a^3b^2e^{(-a)}\Gamma(-2,bx) - 3\,a^2b^2e^{(-a)}\Gamma(-1,bx) + 3\,ab^2\mathrm{Ei}(-bx)\,e^{(-a)} - b^2e^{(-bx-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="maxima")
[Out] -a^3*b^2*e^(-a)*gamma(-2, b*x) - 3*a^2*b^2*e^(-a)*gamma(-1, b*x) + 3*a*b^2*
Ei(-b*x)*e^(-a) - b^2*e^(-b*x - a)
```

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 125, normalized size of antiderivative = 0.96

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = \frac{a^3b^2x^2\mathrm{Ei}(-bx)\,e^{(-a)} - 6\,a^2b^2x^2\mathrm{Ei}(-bx)\,e^{(-a)} + 6\,ab^2x^2\mathrm{Ei}(-bx)\,e^{(-a)} + a^3bxe^{(-bx-a)} - 6\,a^2bxe^{(-bx-a)} - 2\,b}{2\,x^2}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^3,x, algorithm="giac")
[Out] 1/2*(a^3*b^2*x^2*Ei(-b*x)*e^(-a) - 6*a^2*b^2*x^2*Ei(-b*x)*e^(-a) + 6*a*b^2*
x^2*Ei(-b*x)*e^(-a) + a^3*b*x*e^(-b*x - a) - 6*a^2*b*x*e^(-b*x - a) - 2*b^2
*x^2*e^(-b*x - a) - a^3*e^(-b*x - a))/x^2
```

Mupad [B] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 100, normalized size of antiderivative = 0.77

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^3}\,dx = 3\,a^2\,b^2\,\mathrm{e}^{-a}\left(\mathrm{expint}(b\,x)-\frac{\mathrm{e}^{-b\,x}}{b\,x}\right)-3\,a\,b^2\,\mathrm{e}^{-a}\,\mathrm{expint}(b\,x) - b^2\,\mathrm{e}^{-a-b\,x}+a^3\,b^2\,\mathrm{e}^{-a}\left(\mathrm{e}^{-b\,x}\left(\frac{1}{2\,b\,x}-\frac{1}{2\,b^2\,x^2}\right)-\frac{\mathrm{expint}(b\,x)}{2}\right)$$

```
[In] int((exp(- a - b*x)*(a + b*x)^3)/x^3,x)
```

```
[Out] 3*a^2*b^2*exp(-a)*(expint(b*x) - exp(-b*x)/(b*x)) - 3*a*b^2*exp(-a)*expint(
b*x) - b^2*exp(- a - b*x) + a^3*b^2*exp(-a)*(exp(-b*x)*(1/(2*b*x) - 1/(2*b^
2*x^2)) - expint(b*x)/2)
```

3.63 $\int \frac{e^{-a-bx}(a+bx)^3}{x^4} \, dx$

Optimal result

Integrand size = 21, antiderivative size = 198

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4} \, dx = -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{a^3b^2e^{-a-bx}}{6x} + b^3e^{-a}\,\text{ExpIntegralEi}(-bx) - 3ab^3e^{-a}\,\text{ExpIntegralEi}(-bx) + \frac{3}{2}a^2b^3e^{-a}\,\text{ExpIntegralEi}(-bx) - \frac{1}{6}a^3b^3e^{-a}\,\text{ExpIntegralEi}(-bx)$$

```
[Out] -1/3*a^3*exp(-b*x-a)/x^3-3/2*a^2*b*exp(-b*x-a)/x^2+1/6*a^3*b*exp(-b*x-a)/x^
2-3*a*b^2*exp(-b*x-a)/x+3/2*a^2*b^2*exp(-b*x-a)/x-1/6*a^3*b^2*exp(-b*x-a)/x
+b^3*Ei(-b*x)/exp(a)-3*a*b^3*Ei(-b*x)/exp(a)+3/2*a^2*b^3*Ei(-b*x)/exp(a)-1/
6*a^3*b^3*Ei(-b*x)/exp(a)
```

Rubi [A] (verified)

Time = 0.21 (sec) , antiderivative size = 198, normalized size of antiderivative = 1.00, number of steps used = 12, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {2230, 2208, 2209}

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4} \, dx = -\frac{1}{6}e^{-a}a^3b^3\,\text{ExpIntegralEi}(-bx) - \frac{a^3b^2e^{-a-bx}}{6x} - \frac{a^3e^{-a-bx}}{3x^3} + \frac{a^3be^{-a-bx}}{6x^2} + \frac{3}{2}e^{-a}a^2b^3\,\text{ExpIntegralEi}(-bx) + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{3a^2be^{-a-bx}}{2x^2} - 3e^{-a}ab^3\,\text{ExpIntegralEi}(-bx) + e^{-a}b^3\,\text{ExpIntegralEi}(-bx) - \frac{3ab^2e^{-a-bx}}{x}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^3)/x^4,x]
```

```
[Out] -1/3*(a^3*E^(-a - b*x))/x^3 - (3*a^2*b*E^(-a - b*x))/(2*x^2) + (a^3*b*E^(-a
 - b*x))/(6*x^2) - (3*a*b^2*E^(-a - b*x))/x + (3*a^2*b^2*E^(-a - b*x))/(2*x
) - (a^3*b^2*E^(-a - b*x))/(6*x) + (b^3*ExpIntegralEi[-(b*x)])/E^a - (3*a*b
^3*ExpIntegralEi[-(b*x)])/E^a + (3*a^2*b^3*ExpIntegralEi[-(b*x)])/(2*E^a) -
 (a^3*b^3*ExpIntegralEi[-(b*x)])/(6*E^a)
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(\frac{a^3 e^{-a-bx}}{x^4}+\frac{3a^2 b e^{-a-bx}}{x^3}+\frac{3ab^2 e^{-a-bx}}{x^2}+\frac{b^3 e^{-a-bx}}{x}\right) dx \\
&= a^3 \int \frac{e^{-a-bx}}{x^4}\,dx+\left(3a^2 b\right)\int \frac{e^{-a-bx}}{x^3}\,dx+\left(3ab^2\right)\int \frac{e^{-a-bx}}{x^2}\,dx+b^3\int \frac{e^{-a-bx}}{x}\,dx \\
&= -\frac{a^3 e^{-a-bx}}{3x^3}-\frac{3a^2 b e^{-a-bx}}{2x^2}-\frac{3ab^2 e^{-a-bx}}{x}+b^3 e^{-a}\text{Ei}(-bx) \\
&\quad -\frac{1}{3}\left(a^3 b\right)\int \frac{e^{-a-bx}}{x^3}\,dx-\frac{1}{2}\left(3a^2 b^2\right)\int \frac{e^{-a-bx}}{x^2}\,dx-\left(3ab^3\right)\int \frac{e^{-a-bx}}{x}\,dx \\
&= -\frac{a^3 e^{-a-bx}}{3x^3}-\frac{3a^2 b e^{-a-bx}}{2x^2}+\frac{a^3 b e^{-a-bx}}{6x^2}-\frac{3ab^2 e^{-a-bx}}{x}+\frac{3a^2 b^2 e^{-a-bx}}{2x}+b^3 e^{-a}\text{Ei}(-bx) \\
&\quad -3ab^3 e^{-a}\text{Ei}(-bx)+\frac{1}{6}\left(a^3 b^2\right)\int \frac{e^{-a-bx}}{x^2}\,dx+\frac{1}{2}\left(3a^2 b^3\right)\int \frac{e^{-a-bx}}{x}\,dx
\end{aligned}
$$

$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{a^3b^2e^{-a-bx}}{6x} + b^3e^{-a}\text{Ei}(-bx) - 3ab^3e^{-a}\text{Ei}(-bx) + \frac{3}{2}a^2b^3e^{-a}\text{Ei}(-bx) - \frac{1}{6}(a^3b^3)\int \frac{e^{-a-bx}}{x}\,dx$$

$$= -\frac{a^3e^{-a-bx}}{3x^3} - \frac{3a^2be^{-a-bx}}{2x^2} + \frac{a^3be^{-a-bx}}{6x^2} - \frac{3ab^2e^{-a-bx}}{x} + \frac{3a^2b^2e^{-a-bx}}{2x} - \frac{a^3b^2e^{-a-bx}}{6x} + b^3e^{-a}\text{Ei}(-bx) - 3ab^3e^{-a}\text{Ei}(-bx) + \frac{3}{2}a^2b^3e^{-a}\text{Ei}(-bx) - \frac{1}{6}a^3b^3e^{-a}\text{Ei}(-bx)$$

Mathematica [A] (verified)

Time = 0.20 (sec) , antiderivative size = 81, normalized size of antiderivative = 0.41

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = \frac{1}{6}e^{-a}\left(-\frac{ae^{-bx}(18b^2x^2 - 9abx(-1+bx) + a^2(2-bx+b^2x^2))}{x^3} - (-6+18a-9a^2+a^3)\,b^3\,\text{ExpIntegralEi}(-bx)\right)$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^3)/x^4,x]
```

```
[Out] (-((a*(18*b^2*x^2 - 9*a*b*x*(-1 + b*x) + a^2*(2 - b*x + b^2*x^2)))/(E^(b*x)
*x^3)) - (-6 + 18*a - 9*a^2 + a^3)*b^3*ExpIntegralEi[-(b*x)])/(6*E^a)
```

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 167, normalized size of antiderivative = 0.84

method	result
derivativedivides	$b^3\left(-3a\left(\frac{e^{-bx-a}}{bx} - e^{-a}\,\text{Ei}_1(bx)\right) - a^3\left(\frac{e^{-bx-a}}{3b^3x^3} - \frac{e^{-bx-a}}{6b^2x^2} + \frac{e^{-bx-a}}{6bx} - \frac{e^{-a}\,\text{Ei}_1(bx)}{6}\right) - e^{-a}\,\text{Ei}_1(\ldots$
default	$b^3\left(-3a\left(\frac{e^{-bx-a}}{bx} - e^{-a}\,\text{Ei}_1(bx)\right) - a^3\left(\frac{e^{-bx-a}}{3b^3x^3} - \frac{e^{-bx-a}}{6b^2x^2} + \frac{e^{-bx-a}}{6bx} - \frac{e^{-a}\,\text{Ei}_1(bx)}{6}\right) - e^{-a}\,\text{Ei}_1(\ldots$
risch	$-\frac{3a\,b^2e^{-bx-a}}{x} + 3b^3a\,e^{-a}\,\text{Ei}_1(bx) + \frac{b^3a^3e^{-a}\,\text{Ei}_1(bx)}{6} - \frac{a^3b^2e^{-bx-a}}{6x} + \frac{a^3b\,e^{-bx-a}}{6x^2} - \frac{a^3e^{-bx-a}}{3x^3} - b^3e\ldots$
meijerg	$b^3e^{-a}(\ln(x) + \ln(b) - \ln(bx) - \text{Ei}_1(bx)) + 3b^3e^{-a}a\left(-\frac{1}{bx} + 1 - \ln(x) - \ln(b) + \frac{-2bx+\ldots}{2bx}\ldots\right.$

```
[In] int(exp(-b*x-a)*(b*x+a)^3/x^4,x,method=_RETURNVERBOSE)
```

```
[Out] b^3*(-3*a*(exp(-b*x-a)/b/x-exp(-a)*Ei(1,b*x))-a^3*(1/3*exp(-b*x-a)/b^3/x^3-
1/6*exp(-b*x-a)/b^2/x^2+1/6*exp(-b*x-a)/b/x-1/6*exp(-a)*Ei(1,b*x))-exp(-a)*
Ei(1,b*x)+3*a^2*(-1/2*exp(-b*x-a)/b^2/x^2+1/2*exp(-b*x-a)/b/x-1/2*exp(-a)*E
i(1,b*x)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 83, normalized size of antiderivative = 0.42

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = -\frac{(a^3-9\,a^2+18\,a-6)b^3x^3\mathrm{Ei}(-bx)\,e^{(-a)}+((a^3-9\,a^2+18\,a)b^2x^2+2\,a^3-(a^3-9\,a^2)bx)e^{(-bx-a)}}{6\,x^3}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="fricas")
```

```
[Out] -1/6*((a^3 - 9*a^2 + 18*a - 6)*b^3*x^3*Ei(-b*x)*e^(-a) + ((a^3 - 9*a^2 + 18
*a)*b^2*x^2 + 2*a^3 - (a^3 - 9*a^2)*b*x)*e^(-b*x - a))/x^3
```

Sympy [A] (verification not implemented)

Time = 1.17 (sec) , antiderivative size = 53, normalized size of antiderivative = 0.27

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = \left(-\frac{a^3\,\mathrm{E}_4\left(bx\right)}{x^3}-\frac{3a^2b\,\mathrm{E}_3\left(bx\right)}{x^2}-\frac{3ab^2\,\mathrm{E}_2\left(bx\right)}{x}+b^3\,\mathrm{Ei}\left(-bx\right)\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**3/x**4,x)
```

```
[Out] (-a**3*expint(4, b*x)/x**3 - 3*a**2*b*expint(3, b*x)/x**2 - 3*a*b**2*expint
(2, b*x)/x + b**3*Ei(-b*x))*exp(-a)
```

Maxima [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.32

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = -a^3b^3e^{(-a)}\Gamma(-3,bx)-3\,a^2b^3e^{(-a)}\Gamma(-2,bx)-3\,ab^3e^{(-a)}\Gamma(-1,bx)+b^3\mathrm{Ei}(-bx)\,e^{(-a)}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="maxima")
```

```
[Out] -a^3*b^3*e^(-a)*gamma(-3, b*x) - 3*a^2*b^3*e^(-a)*gamma(-2, b*x) - 3*a*b^3*
e^(-a)*gamma(-1, b*x) + b^3*Ei(-b*x)*e^(-a)
```

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 183, normalized size of antiderivative = 0.92

$$\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx = -\frac{a^3b^3x^3\mathrm{Ei}(-bx)\,e^{(-a)} - 9\,a^2b^3x^3\mathrm{Ei}(-bx)\,e^{(-a)} + 18\,ab^3x^3\mathrm{Ei}(-bx)\,e^{(-a)} + a^3b^2x^2e^{(-bx-a)} - 6\,b^3x^3\mathrm{Ei}(-bx)}{6\,x^3}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^3/x^4,x, algorithm="giac")
```

```
[Out] -1/6*(a^3*b^3*x^3*Ei(-b*x)*e^(-a) - 9*a^2*b^3*x^3*Ei(-b*x)*e^(-a) + 18*a*b^
3*x^3*Ei(-b*x)*e^(-a) + a^3*b^2*x^2*e^(-b*x - a) - 6*b^3*x^3*Ei(-b*x)*e^(-a
) - 9*a^2*b^2*x^2*e^(-b*x - a) - a^3*b*x*e^(-b*x - a) + 18*a*b^2*x^2*e^(-b*
x - a) + 9*a^2*b*x*e^(-b*x - a) + 2*a^3*e^(-b*x - a))/x^3
```

Mupad [B] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 142, normalized size of antiderivative = 0.72

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^3}{x^4}\,dx &= 3\,a\,b^3\,\mathrm{e}^{-a}\left(\mathrm{expint}(b\,x)-\frac{\mathrm{e}^{-b\,x}}{b\,x}\right)\\ &\quad - b^3\,\mathrm{e}^{-a}\,\mathrm{expint}(b\,x)+\frac{a^3\,b^3\,\mathrm{e}^{-a}\,\mathrm{expint}(b\,x)}{6}\\ &\quad + 3\,a^2\,b^3\,\mathrm{e}^{-a}\left(\mathrm{e}^{-b\,x}\left(\frac{1}{2\,b\,x}-\frac{1}{2\,b^2\,x^2}\right)-\frac{\mathrm{expint}(b\,x)}{2}\right)\\ &\quad - a^3\,b^3\,\mathrm{e}^{-a-b\,x}\left(\frac{1}{6\,b\,x}-\frac{1}{6\,b^2\,x^2}+\frac{1}{3\,b^3\,x^3}\right)\end{aligned}$$

```
[In] int((exp(- a - b*x)*(a + b*x)^3)/x^4,x)
```

```
[Out] 3*a*b^3*exp(-a)*(expint(b*x) - exp(-b*x)/(b*x)) - b^3*exp(-a)*expint(b*x) +
 (a^3*b^3*exp(-a)*expint(b*x))/6 + 3*a^2*b^3*exp(-a)*(exp(-b*x)*(1/(2*b*x)
- 1/(2*b^2*x^2)) - expint(b*x)/2) - a^3*b^3*exp(- a - b*x)*(1/(6*b*x) - 1/(
6*b^2*x^2) + 1/(3*b^3*x^3))
```

3.64 $\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx$

Optimal result

Integrand size = 22, antiderivative size = 139

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=\frac{f^2F^{a+bc}x^m\Gamma(3+m,-bdx\log(F))(-bdx\log(F))^{-m}}{b^3d^3\log^3(F)}-\frac{2efF^{a+bc}x^m\Gamma(2+m,-bdx\log(F))(-bdx\log(F))^{-m}}{b^2d^2\log^2(F)}+\frac{e^2F^{a+bc}x^m\Gamma(1+m,-bdx\log(F))(-bdx\log(F))^{-m}}{bd\log(F)}$$

```
[Out] f^2*F^(b*c+a)*x^m*GAMMA(3+m,-b*d*x*ln(F))/b^3/d^3/ln(F)^3/((-b*d*x*ln(F))^m
)-2*e*f*F^(b*c+a)*x^m*GAMMA(2+m,-b*d*x*ln(F))/b^2/d^2/ln(F)^2/((-b*d*x*ln(F
))^m)+e^2*F^(b*c+a)*x^m*GAMMA(1+m,-b*d*x*ln(F))/b/d/ln(F)/((-b*d*x*ln(F))^m
)
```

Rubi [A] (verified)

Time = 0.19 (sec) , antiderivative size = 139, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.091, Rules used = {2230, 2212}

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=\frac{f^2x^mF^{a+bc}(-bdx\log(F))^{-m}\Gamma(m+3,-bdx\log(F))}{b^3d^3\log^3(F)}-\frac{2efx^mF^{a+bc}(-bdx\log(F))^{-m}\Gamma(m+2,-bdx\log(F))}{b^2d^2\log^2(F)}+\frac{e^2x^mF^{a+bc}(-bdx\log(F))^{-m}\Gamma(m+1,-bdx\log(F))}{bd\log(F)}$$

```
[In] Int[F^(a + b*(c + d*x))*x^m*(e + f*x)^2,x]
```

```
[Out] (f^2*F^(a + b*c)*x^m*Gamma[3 + m, -(b*d*x*Log[F])])/(b^3*d^3*Log[F]^3*(-(b*
d*x*Log[F]))^m) - (2*e*f*F^(a + b*c)*x^m*Gamma[2 + m, -(b*d*x*Log[F])])/(b^
2*d^2*Log[F]^2*(-(b*d*x*Log[F]))^m) + (e^2*F^(a + b*c)*x^m*Gamma[1 + m, -(b
*d*x*Log[F])])/(b*d*Log[F]*(-(b*d*x*Log[F]))^m)
```

Rule 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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(e^2 F^{a+bc+bdx} x^m + 2ef F^{a+bc+bdx} x^{1+m} + f^2 F^{a+bc+bdx} x^{2+m}\right) dx \\
&= e^2 \int F^{a+bc+bdx} x^m \, dx + (2ef) \int F^{a+bc+bdx} x^{1+m} \, dx + f^2 \int F^{a+bc+bdx} x^{2+m} \, dx \\
&= \frac{f^2 F^{a+bc} x^m \Gamma(3+m, -bdx \log(F)) (-bdx \log(F))^{-m}}{b^3 d^3 \log^3(F)} \\
&\quad - \frac{2ef F^{a+bc} x^m \Gamma(2+m, -bdx \log(F)) (-bdx \log(F))^{-m}}{b^2 d^2 \log^2(F)} \\
&\quad + \frac{e^2 F^{a+bc} x^m \Gamma(1+m, -bdx \log(F)) (-bdx \log(F))^{-m}}{bd \log(F)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.27 (sec) , antiderivative size = 86, normalized size of antiderivative = 0.62

$$\int F^{a+b(c+dx)} x^m (e+fx)^2 \, dx$$
$$= \frac{F^{a+bc} x^m (-bdx \log(F))^{-m} \left(f^2 \Gamma(3+m, -bdx \log(F)) + bde \log(F)(-2f\Gamma(2+m, -bdx \log(F)) + bde\Gamma(1\right.}{b^3 d^3 \log^3(F)}$$

```
[In] Integrate[F^(a + b*(c + d*x))*x^m*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*c)*x^m*(f^2*Gamma[3 + m, -(b*d*x*Log[F])] + b*d*e*Log[F]*(-2*f*Ga
mma[2 + m, -(b*d*x*Log[F])] + b*d*e*Gamma[1 + m, -(b*d*x*Log[F])]*Log[F])))
/(b^3*d^3*Log[F]^3*(-(b*d*x*Log[F]))^m)
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 432 vs. 2(139) = 278.

Time = 0.60 (sec) , antiderivative size = 433, normalized size of antiderivative = 3.12

method	result
meijerg	$-\frac{\ln(F)^{-3-m}(-bd)^{-m}F^{cb+a}f^2\left(x^m(-bd)^m\ln(F)^m m(m^2+3m+2)\Gamma(m)(-bdx\ln(F))^{-m}-x^m(-bd)^m\ln(F)^m\left(b^2d^2x^2\ln(F)^2-mbd\right.\right.}{b^3d^3}$

```
[In] int(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x,method=_RETURNVERBOSE)
```

```
[Out] -1/b^3/d^3*ln(F)^(-3-m)*(-b*d)^(-m)*F^(b*c+a)*f^2*(x^m*(-b*d)^m*ln(F)^m*m*(
m^2+3*m+2)*GAMMA(m)*(-b*d*x*ln(F))^(-m)-x^m*(-b*d)^m*ln(F)^m*(b^2*d^2*x^2*l
n(F)^2-m*b*d*x*ln(F)+m^2-2*b*d*x*ln(F)+3*m+2)*exp(b*d*x*ln(F))-x^m*(-b*d)^m
*ln(F)^m*m*(m^2+3*m+2)*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F)))+2/b^2/d^2
*ln(F)^(-2-m)*(-b*d)^(-m)*F^(b*c+a)*f*e*(x^m*(-b*d)^m*ln(F)^m*(1+m)*m*GAMMA
(m)*(-b*d*x*ln(F))^(-m)+x^m*(-b*d)^m*ln(F)^m*(b*d*x*ln(F)-1-m)*exp(b*d*x*ln
(F))-x^m*(-b*d)^m*ln(F)^m*(1+m)*m*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F))
)-F^(b*c+a)*(-b*d)^(-m)*ln(F)^(-m-1)*e^2/b/d*(x^m*(-b*d)^m*ln(F)^m*m*GAMMA(
m)*(-b*d*x*ln(F))^(-m)-x^m*(-b*d)^m*ln(F)^m*exp(b*d*x*ln(F))-x^m*(-b*d)^m*l
n(F)^m*m*(-b*d*x*ln(F))^(-m)*GAMMA(m,-b*d*x*ln(F)))
```

Fricas [A] (verification not implemented)

none

Time = 0.08 (sec) , antiderivative size = 161, normalized size of antiderivative = 1.16

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx = -\frac{\left((bdf^2m+2\,bdf^2)x\log(F)-\left(b^2d^2f^2x^2+2\,b^2d^2efx\right)\log(F)^2\right)F^{bdx+bc+a}x^m-\left(b^2d^2e^2\log(F)^2+f^2m^2+\right.}{b^3d^3\log(F}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] -((((b*d*f^2*m + 2*b*d*f^2)*x*log(F) - (b^2*d^2*f^2*x^2 + 2*b^2*d^2*e*f*x)*l
og(F)^2)*F^(b*d*x + b*c + a)*x^m - (b^2*d^2*e^2*log(F)^2 + f^2*m^2 + 3*f^2*
m + 2*f^2 - 2*(b*d*e*f*m + b*d*e*f)*log(F))*e^(-m*log(-b*d*log(F)) + (b*c +
 a)*log(F))*gamma(m + 1, -b*d*x*log(F)))/(b^3*d^3*log(F)^3)
```

Sympy [F]

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx$$

[In] integrate(F**(a+b*(d*x+c))*x**m*(f*x+e)**2,x)

[Out] Integral(F**(a + b*(c + d*x))*x**m*(e + f*x)**2, x)

Maxima [A] (verification not implemented)

none

Time = 0.12 (sec) , antiderivative size = 123, normalized size of antiderivative = 0.88

$$\begin{aligned}\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=&-(-bdx\log(F))^{-m-3}F^{bc+a}f^2x^{m+3}\Gamma(m+3,-bdx\log(F))\\&-2(-bdx\log(F))^{-m-2}F^{bc+a}efx^{m+2}\Gamma(m+2,-bdx\log(F))\\&-(-bdx\log(F))^{-m-1}F^{bc+a}e^2x^{m+1}\Gamma(m+1,-bdx\log(F))\end{aligned}$$

[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="maxima")

[Out] -(-b*d*x*log(F))^(-m - 3)*F^(b*c + a)*f^2*x^(m + 3)*gamma(m + 3, -b*d*x*log(F)) - 2*(-b*d*x*log(F))^(-m - 2)*F^(b*c + a)*e*f*x^(m + 2)*gamma(m + 2, -b*d*x*log(F)) - (-b*d*x*log(F))^(-m - 1)*F^(b*c + a)*e^2*x^(m + 1)*gamma(m + 1, -b*d*x*log(F))

Giac [F]

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=\int (fx+e)^2F^{(dx+c)b+a}x^m\,dx$$

[In] integrate(F^(a+b*(d*x+c))*x^m*(f*x+e)^2,x, algorithm="giac")

[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)*x^m, x)

Mupad [F(-1)]

Timed out.

$$\int F^{a+b(c+dx)}x^m(e+fx)^2\,dx=\int F^{a+b\,(c+d\,x)}\,x^m\,{\left(e+f\,x\right)}^2\,dx$$

```
[In] int(F^(a + b*(c + d*x))*x^m*(e + f*x)^2,x)
[Out] int(F^(a + b*(c + d*x))*x^m*(e + f*x)^2, x)
```

3.65 $\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx$

Optimal result

Integrand size = 22, antiderivative size = 414

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx = -\frac{120f^2F^{a+bc+bdx}}{b^6d^6\log^6(F)}+\frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)}+\frac{120f^2F^{a+bc+bdx}x}{b^5d^5\log^5(F)} -\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)}-\frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)} +\frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)}+\frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)}+\frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)} -\frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)}-\frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)}-\frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)} +\frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)}+\frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}$$

```
[Out] -120*f^2*F^(b*d*x+b*c+a)/b^6/d^6/ln(F)^6+48*e*f*F^(b*d*x+b*c+a)/b^5/d^5/ln(
F)^5+120*f^2*F^(b*d*x+b*c+a)*x/b^5/d^5/ln(F)^5-6*e^2*F^(b*d*x+b*c+a)/b^4/d^
4/ln(F)^4-48*e*f*F^(b*d*x+b*c+a)*x/b^4/d^4/ln(F)^4-60*f^2*F^(b*d*x+b*c+a)*x
^2/b^4/d^4/ln(F)^4+6*e^2*F^(b*d*x+b*c+a)*x/b^3/d^3/ln(F)^3+24*e*f*F^(b*d*x+
b*c+a)*x^2/b^3/d^3/ln(F)^3+20*f^2*F^(b*d*x+b*c+a)*x^3/b^3/d^3/ln(F)^3-3*e^2
*F^(b*d*x+b*c+a)*x^2/b^2/d^2/ln(F)^2-8*e*f*F^(b*d*x+b*c+a)*x^3/b^2/d^2/ln(F
)^2-5*f^2*F^(b*d*x+b*c+a)*x^4/b^2/d^2/ln(F)^2+e^2*F^(b*d*x+b*c+a)*x^3/b/d/l
n(F)+2*e*f*F^(b*d*x+b*c+a)*x^4/b/d/ln(F)+f^2*F^(b*d*x+b*c+a)*x^5/b/d/ln(F)
```

Rubi [A] (verified)

Time = 0.45 (sec) , antiderivative size = 414, normalized size of antiderivative = 1.00, number of steps used = 17, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2227, 2207, 2225}

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx = -\frac{120f^2F^{a+bc+bdx}}{b^6d^6\log^6(F)}+\frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)}+\frac{120f^2xF^{a+bc+bdx}}{b^5d^5\log^5(F)}-\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{48efxF^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{60f^2x^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{6e^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{24efx^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{20f^2x^3F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{3e^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{8efx^3F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{5f^2x^4F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{e^2x^3F^{a+bc+bdx}}{bd\log(F)}+\frac{2efx^4F^{a+bc+bdx}}{bd\log(F)}+\frac{f^2x^5F^{a+bc+bdx}}{bd\log(F)}$$

```
[In] Int[F^(a + b*(c + d*x))*x^3*(e + f*x)^2,x]
```

```
[Out] (-120*f^2*F^(a + b*c + b*d*x))/(b^6*d^6*Log[F]^6) + (48*e*f*F^(a + b*c + b*
d*x))/(b^5*d^5*Log[F]^5) + (120*f^2*F^(a + b*c + b*d*x)*x)/(b^5*d^5*Log[F]^
5) - (6*e^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) - (48*e*f*F^(a + b*c +
b*d*x)*x)/(b^4*d^4*Log[F]^4) - (60*f^2*F^(a + b*c + b*d*x)*x^2)/(b^4*d^4*Lo
g[F]^4) + (6*e^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) + (24*e*f*F^(a +
 b*c + b*d*x)*x^2)/(b^3*d^3*Log[F]^3) + (20*f^2*F^(a + b*c + b*d*x)*x^3)/(b
^3*d^3*Log[F]^3) - (3*e^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (8*
e*f*F^(a + b*c + b*d*x)*x^3)/(b^2*d^2*Log[F]^2) - (5*f^2*F^(a + b*c + b*d*x
)*x^4)/(b^2*d^2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F]) + (2
*e*f*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^5)/
(b*d*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(e^2F^{a+bc+bdx}x^3+2efF^{a+bc+bdx}x^4+f^2F^{a+bc+bdx}x^5\right)\,dx\\
&= e^2\int F^{a+bc+bdx}x^3\,dx+(2ef)\int F^{a+bc+bdx}x^4\,dx+f^2\int F^{a+bc+bdx}x^5\,dx\\
&= \frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)}+\frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}-\frac{(3e^2)\int F^{a+bc+bdx}x^2\,dx}{bd\log(F)}\\
&\quad-\frac{(8ef)\int F^{a+bc+bdx}x^3\,dx}{bd\log(F)}-\frac{(5f^2)\int F^{a+bc+bdx}x^4\,dx}{bd\log(F)}\\
&= -\frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)}-\frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)}-\frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)}+\frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)}\\
&\quad+\frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}+\frac{(6e^2)\int F^{a+bc+bdx}x\,dx}{b^2d^2\log^2(F)}\\
&\quad+\frac{(24ef)\int F^{a+bc+bdx}x^2\,dx}{b^2d^2\log^2(F)}+\frac{(20f^2)\int F^{a+bc+bdx}x^3\,dx}{b^2d^2\log^2(F)}\\
&= \frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)}+\frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)}+\frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)}-\frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)}\\
&\quad-\frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)}-\frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)}+\frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)}\\
&\quad+\frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}-\frac{(6e^2)\int F^{a+bc+bdx}\,dx}{b^3d^3\log^3(F)}\\
&\quad-\frac{(48ef)\int F^{a+bc+bdx}x\,dx}{b^3d^3\log^3(F)}-\frac{(60f^2)\int F^{a+bc+bdx}x^2\,dx}{b^3d^3\log^3(F)}\\
&= -\frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}-\frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)}-\frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)}+\frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)}+\frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)}\\
&\quad+\frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)}-\frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)}-\frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)}-\frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)}+\frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)}\\
&\quad+\frac{2efF^{a+bc+bdx}x^4}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}+\frac{(48ef)\int F^{a+bc+bdx}\,dx}{b^4d^4\log^4(F)}+\frac{(120f^2)\int F^{a+bc+bdx}x\,dx}{b^4d^4\log^4(F)}
\end{aligned}$$

$$
\begin{aligned}
&= \frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)} + \frac{120f^2F^{a+bc+bdx}x}{b^5d^5\log^5(F)} - \frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)} \\
&\quad - \frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)} + \frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)} + \frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)} \\
&\quad - \frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)} - \frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)} \\
&\quad + \frac{2efF^{a+bc+bdx}x^4}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)} - \frac{(120f^2)\int F^{a+bc+bdx}\,dx}{b^5d^5\log^5(F)}
\end{aligned}
$$

$$
\begin{aligned}
&= -\frac{120f^2F^{a+bc+bdx}}{b^6d^6\log^6(F)} + \frac{48efF^{a+bc+bdx}}{b^5d^5\log^5(F)} + \frac{120f^2F^{a+bc+bdx}x}{b^5d^5\log^5(F)} - \frac{6e^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} \\
&\quad - \frac{48efF^{a+bc+bdx}x}{b^4d^4\log^4(F)} - \frac{60f^2F^{a+bc+bdx}x^2}{b^4d^4\log^4(F)} + \frac{6e^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{24efF^{a+bc+bdx}x^2}{b^3d^3\log^3(F)} \\
&\quad + \frac{20f^2F^{a+bc+bdx}x^3}{b^3d^3\log^3(F)} - \frac{3e^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{8efF^{a+bc+bdx}x^3}{b^2d^2\log^2(F)} \\
&\quad - \frac{5f^2F^{a+bc+bdx}x^4}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x^3}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^4}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^5}{bd\log(F)}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.29 (sec) , antiderivative size = 159, normalized size of antiderivative = 0.38

$$
\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx
$$

$$
= \frac{F^{a+b(c+dx)}\left(-120f^2 + 24bdf(2e+5fx)\log(F) - 6b^2d^2(e^2+8efx+10f^2x^2)\log^2(F) + 2b^3d^3x(3e^2+12efx\right.}{b^6d^6\log^6(F)}
$$

```
[In] Integrate[F^(a + b*(c + d*x))*x^3*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(-120*f^2 + 24*b*d*f*(2*e + 5*f*x)*Log[F] - 6*b^2*d^2*
(e^2 + 8*e*f*x + 10*f^2*x^2)*Log[F]^2 + 2*b^3*d^3*x*(3*e^2 + 12*e*f*x + 10*
f^2*x^2)*Log[F]^3 - b^4*d^4*x^2*(3*e^2 + 8*e*f*x + 5*f^2*x^2)*Log[F]^4 + b^
5*d^5*x^3*(e + f*x)^2*Log[F]^5))/(b^6*d^6*Log[F]^6)
```

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 250, normalized size of antiderivative = 0.60

method	result
gosper	$\frac{\left(f^{2}x^{5}\ln(F)^{5}b^{5}d^{5}+2\ln(F)^{5}b^{5}d^{5}ef\,x^{4}+\ln(F)^{5}b^{5}d^{5}e^{2}x^{3}-5\ln(F)^{4}b^{4}d^{4}f^{2}x^{4}-8\ln(F)^{4}b^{4}d^{4}ef\,x^{3}-3\ln(F)^{4}b^{4}d^{4}e^{2}x^{2}+20\ln(F)}{}$
risch	$\frac{\left(f^{2}x^{5}\ln(F)^{5}b^{5}d^{5}+2\ln(F)^{5}b^{5}d^{5}ef\,x^{4}+\ln(F)^{5}b^{5}d^{5}e^{2}x^{3}-5\ln(F)^{4}b^{4}d^{4}f^{2}x^{4}-8\ln(F)^{4}b^{4}d^{4}ef\,x^{3}-3\ln(F)^{4}b^{4}d^{4}e^{2}x^{2}+20\ln(F)}{}$
meijerg	$\frac{F^{cb+a}f^{2}\left(120-\frac{\left(-6b^{5}d^{5}x^{5}\ln(F)^{5}+30b^{4}d^{4}x^{4}\ln(F)^{4}-120b^{3}d^{3}x^{3}\ln(F)^{3}+360b^{2}d^{2}x^{2}\ln(F)^{2}-720bdx\ln(F)+720\right)e^{bdx\ln(F)}}{6}\right)}{\ln(F)^{6}b^{6}d^{6}}-\frac{2F^{cb}}{}$
norman	$\frac{f^{2}x^{5}e^{(a+b(dx+c))\ln(F)}}{bd\ln(F)}+\frac{\left(\ln(F)^{2}b^{2}d^{2}e^{2}-8ef\ln(F)bd+20f^{2}\right)x^{3}e^{(a+b(dx+c))\ln(F)}}{\ln(F)^{3}b^{3}d^{3}}+\frac{f(2\ln(F)bde-5f)x^{4}e^{(a+b(dx+c))\ln(}}{\ln(F)^{2}b^{2}d^{2}}$
parallelrisch	$\frac{x^{5}F^{bdx+cb+a}f^{2}\ln(F)^{5}b^{5}d^{5}+2\ln(F)^{5}x^{4}F^{bdx+cb+a}b^{5}d^{5}ef+\ln(F)^{5}x^{3}F^{bdx+cb+a}b^{5}d^{5}e^{2}-5\ln(F)^{4}x^{4}F^{bdx+cb+a}b^{4}d^{4}f^{2}-8\ln(}{}$

```
[In] int(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x,method=_RETURNVERBOSE)
```

```
[Out] (f^2*x^5*ln(F)^5*b^5*d^5+2*ln(F)^5*b^5*d^5*e*f*x^4+ln(F)^5*b^5*d^5*e^2*x^3-
5*ln(F)^4*b^4*d^4*f^2*x^4-8*ln(F)^4*b^4*d^4*e*f*x^3-3*ln(F)^4*b^4*d^4*e^2*x
^2+20*ln(F)^3*b^3*d^3*f^2*x^3+24*ln(F)^3*b^3*d^3*e*f*x^2+6*ln(F)^3*b^3*d^3*
e^2*x-60*ln(F)^2*b^2*d^2*f^2*x^2-48*ln(F)^2*b^2*d^2*e*f*x-6*ln(F)^2*b^2*d^2
*e^2+120*ln(F)*b*d*f^2*x+48*e*f*ln(F)*b*d-120*f^2)*F^(b*d*x+b*c+a)/ln(F)^6/
b^6/d^6
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 228, normalized size of antiderivative = 0.55

$$\int F^{a+b(c+dx)}x^{3}(e+fx)^{2}\,dx$$
$$=\frac{\left(\left(b^{5}d^{5}f^{2}x^{5}+2\,b^{5}d^{5}efx^{4}+b^{5}d^{5}e^{2}x^{3}\right)\log\left(F\right)^{5}-\left(5\,b^{4}d^{4}f^{2}x^{4}+8\,b^{4}d^{4}efx^{3}+3\,b^{4}d^{4}e^{2}x^{2}\right)\log\left(F\right)^{4}+2\left(10\,b^{3}\right.}{}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^5*d^5*f^2*x^5 + 2*b^5*d^5*e*f*x^4 + b^5*d^5*e^2*x^3)*log(F)^5 - (5*b^4*
d^4*f^2*x^4 + 8*b^4*d^4*e*f*x^3 + 3*b^4*d^4*e^2*x^2)*log(F)^4 + 2*(10*b^3*d
^3*f^2*x^3 + 12*b^3*d^3*e*f*x^2 + 3*b^3*d^3*e^2*x)*log(F)^3 - 6*(10*b^2*d^2
*f^2*x^2 + 8*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 - 120*f^2 + 24*(5*b*d*f^
2*x + 2*b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^6*d^6*log(F)^6)
```

Sympy [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 323, normalized size of antiderivative = 0.78

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx$$

$$= \begin{cases} \frac{F^{a+b(c+dx)}\left(b^5d^5e^2x^3\log(F)^5+2b^5d^5efx^4\log(F)^5+b^5d^5f^2x^5\log(F)^5-3b^4d^4e^2x^2\log(F)^4-8b^4d^4efx^3\log(F)^4-5b^4d^4f^2x^4\log(F)^4+6b^3d^3e\right.}{} \\ \frac{e^2x^4}{4}+\frac{2efx^5}{5}+\frac{f^2x^6}{6} \end{cases}$$

```
[In] integrate(F**(a+b*(d*x+c))*x**3*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**5*d**5*e**2*x**3*log(F)**5 + 2*b**5*d**
5*e*f*x**4*log(F)**5 + b**5*d**5*f**2*x**5*log(F)**5 - 3*b**4*d**4*e**2*x**
2*log(F)**4 - 8*b**4*d**4*e*f*x**3*log(F)**4 - 5*b**4*d**4*f**2*x**4*log(F)
**4 + 6*b**3*d**3*e**2*x*log(F)**3 + 24*b**3*d**3*e*f*x**2*log(F)**3 + 20*b
**3*d**3*f**2*x**3*log(F)**3 - 6*b**2*d**2*e**2*log(F)**2 - 48*b**2*d**2*e*
f*x*log(F)**2 - 60*b**2*d**2*f**2*x**2*log(F)**2 + 48*b*d*e*f*log(F) + 120*
b*d*f**2*x*log(F) - 120*f**2)/(b**6*d**6*log(F)**6), Ne(b**6*d**6*log(F)**6
, 0)), (e**2*x**4/4 + 2*e*f*x**5/5 + f**2*x**6/6, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 328, normalized size of antiderivative = 0.79

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx$$

$$= \frac{\left(F^{bc+a}b^3d^3x^3\log(F)^3-3\,F^{bc+a}b^2d^2x^2\log(F)^2+6\,F^{bc+a}bdx\log(F)-6\,F^{bc+a}\right)F^{bdx}e^2}{b^4d^4\log(F)^4}$$
$$+\frac{2\left(F^{bc+a}b^4d^4x^4\log(F)^4-4\,F^{bc+a}b^3d^3x^3\log(F)^3+12\,F^{bc+a}b^2d^2x^2\log(F)^2-24\,F^{bc+a}bdx\log(F)+24\,F\right.}{b^5d^5\log(F)^5}$$
$$+\frac{\left(F^{bc+a}b^5d^5x^5\log(F)^5-5\,F^{bc+a}b^4d^4x^4\log(F)^4+20\,F^{bc+a}b^3d^3x^3\log(F)^3-60\,F^{bc+a}b^2d^2x^2\log(F)^2+12\right.}{b^6d^6\log(F)^6}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b^3*d^3*x^3*log(F)^3 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*
F^(b*c + a)*b*d*x*log(F) - 6*F^(b*c + a))*F^(b*d*x)*e^2/(b^4*d^4*log(F)^4)
+ 2*(F^(b*c + a)*b^4*d^4*x^4*log(F)^4 - 4*F^(b*c + a)*b^3*d^3*x^3*log(F)^3
+ 12*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 24*F^(b*c + a)*b*d*x*log(F) + 24*F^
(b*c + a))*F^(b*d*x)*e*f/(b^5*d^5*log(F)^5) + (F^(b*c + a)*b^5*d^5*x^5*log(
F)^5 - 5*F^(b*c + a)*b^4*d^4*x^4*log(F)^4 + 20*F^(b*c + a)*b^3*d^3*x^3*log(
F)^3 - 60*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 120*F^(b*c + a)*b*d*x*log(F) -
 120*F^(b*c + a))*F^(b*d*x)*f^2/(b^6*d^6*log(F)^6)
```

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.44 (sec) , antiderivative size = 9584, normalized size of antiderivative = 23.15

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx = \text{Too large to display}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^3*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] -(((5*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*f^2*x^5*log
(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*f^2*x^5*log(abs(F)) + 10*pi^2*b^5*d^5*f^
2*x^5*log(abs(F))^3 - 2*b^5*d^5*f^2*x^5*log(abs(F))^5 + 10*pi^4*b^5*d^5*e*f
*x^4*log(abs(F))*sgn(F) - 20*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3*sgn(F) - 10
*pi^4*b^5*d^5*e*f*x^4*log(abs(F)) + 20*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3 -
 4*b^5*d^5*e*f*x^4*log(abs(F))^5 + 5*pi^4*b^5*d^5*e^2*x^3*log(abs(F))*sgn(F
) - 10*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*e^2*x^3*l
og(abs(F)) + 10*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3 - 2*b^5*d^5*e^2*x^3*log(
abs(F))^5 - 5*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 30*pi^2*b^4*d^4*f^2*x^4*log(abs
(F))^2*sgn(F) + 5*pi^4*b^4*d^4*f^2*x^4 - 30*pi^2*b^4*d^4*f^2*x^4*log(abs(F)
)^2 + 10*b^4*d^4*f^2*x^4*log(abs(F))^4 - 8*pi^4*b^4*d^4*e*f*x^3*sgn(F) + 48
*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) + 8*pi^4*b^4*d^4*e*f*x^3 - 48*pi
^2*b^4*d^4*e*f*x^3*log(abs(F))^2 + 16*b^4*d^4*e*f*x^3*log(abs(F))^4 - 3*pi^
4*b^4*d^4*e^2*x^2*sgn(F) + 18*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F) + 3
*pi^4*b^4*d^4*e^2*x^2 - 18*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2 + 6*b^4*d^4*e
^2*x^2*log(abs(F))^4 - 60*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 60*pi^2
*b^3*d^3*f^2*x^3*log(abs(F)) - 40*b^3*d^3*f^2*x^3*log(abs(F))^3 - 72*pi^2*b
^3*d^3*e*f*x^2*log(abs(F))*sgn(F) + 72*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) - 4
8*b^3*d^3*e*f*x^2*log(abs(F))^3 - 18*pi^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F)
+ 18*pi^2*b^3*d^3*e^2*x*log(abs(F)) - 12*b^3*d^3*e^2*x*log(abs(F))^3 + 60*p
i^2*b^2*d^2*f^2*x^2*sgn(F) - 60*pi^2*b^2*d^2*f^2*x^2 + 120*b^2*d^2*f^2*x^2*
log(abs(F))^2 + 48*pi^2*b^2*d^2*e*f*x*sgn(F) - 48*pi^2*b^2*d^2*e*f*x + 96*b
^2*d^2*e*f*x*log(abs(F))^2 + 6*pi^2*b^2*d^2*e^2*sgn(F) - 6*pi^2*b^2*d^2*e^2
 + 12*b^2*d^2*e^2*log(abs(F))^2 - 240*b*d*f^2*x*log(abs(F)) - 96*b*d*e*f*lo
g(abs(F)) + 240*f^2)*(pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*s
gn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d
^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)
/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6
*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 -
15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6*
d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^
6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(a
bs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)^2) - 2*(pi^5*b^5*d^5*f^2*x^5*sgn(F)
- 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*f^2*x^5*log(a
bs(F))^4*sgn(F) - pi^5*b^5*d^5*f^2*x^5 + 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F)
```

)^2 - 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4 + 2*pi^5*b^5*d^5*e*f*x^4*sgn(F) -
20*pi^3*b^5*d^5*e*f*x^4*log(abs(F))^2*sgn(F) + 10*pi*b^5*d^5*e*f*x^4*log(ab
s(F))^4*sgn(F) - 2*pi^5*b^5*d^5*e*f*x^4 + 20*pi^3*b^5*d^5*e*f*x^4*log(abs(F
))^2 - 10*pi*b^5*d^5*e*f*x^4*log(abs(F))^4 + pi^5*b^5*d^5*e^2*x^3*sgn(F) -
10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*e^2*x^3*log(abs
(F))^4*sgn(F) - pi^5*b^5*d^5*e^2*x^3 + 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^
2 - 5*pi*b^5*d^5*e^2*x^3*log(abs(F))^4 + 20*pi^3*b^4*d^4*f^2*x^4*log(abs(F)
)*sgn(F) - 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 20*pi^3*b^4*d^4*f^2
*x^4*log(abs(F)) + 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 32*pi^3*b^4*d^4*e*
f*x^3*log(abs(F))*sgn(F) - 32*pi*b^4*d^4*e*f*x^3*log(abs(F))^3*sgn(F) - 32*
pi^3*b^4*d^4*e*f*x^3*log(abs(F)) + 32*pi*b^4*d^4*e*f*x^3*log(abs(F))^3 + 12
*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 12*pi*b^4*d^4*e^2*x^2*log(abs(F)
)^3*sgn(F) - 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 12*pi*b^4*d^4*e^2*x^2*lo
g(abs(F))^3 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 60*pi*b^3*d^3*f^2*x^3*log(ab
s(F))^2*sgn(F) + 20*pi^3*b^3*d^3*f^2*x^3 - 60*pi*b^3*d^3*f^2*x^3*log(abs(F)
)^2 - 24*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*
sgn(F) + 24*pi^3*b^3*d^3*e*f*x^2 - 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 - 6*
pi^3*b^3*d^3*e^2*x*sgn(F) + 18*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) + 6*pi
^3*b^3*d^3*e^2*x - 18*pi*b^3*d^3*e^2*x*log(abs(F))^2 - 120*pi*b^2*d^2*f^2*x
^2*log(abs(F))*sgn(F) + 120*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 96*pi*b^2*d^2*
e*f*x*log(abs(F))*sgn(F) + 96*pi*b^2*d^2*e*f*x*log(abs(F)) - 12*pi*b^2*d^2*
e^2*log(abs(F))*sgn(F) + 12*pi*b^2*d^2*e^2*log(abs(F)) + 120*pi*b*d*f^2*x*s
gn(F) - 120*pi*b*d*f^2*x + 48*pi*b*d*e*f*sgn(F) - 48*pi*b*d*e*f)*(3*pi^5*b^
6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*
d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log
(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^
6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^
6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b
^6*d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^
6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6
*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))
^5)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*p
i*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^5*b^5*d^5*f^2*x^5*sgn(F) - 10*pi
^3*b^5*d^5*f^2*x^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^
4*sgn(F) - pi^5*b^5*d^5*f^2*x^5 + 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^2 - 5
*pi*b^5*d^5*f^2*x^5*log(abs(F))^4 + 2*pi^5*b^5*d^5*e*f*x^4*sgn(F) - 20*pi^3
*b^5*d^5*e*f*x^4*log(abs(F))^2*sgn(F) + 10*pi*b^5*d^5*e*f*x^4*log(abs(F))^4
*sgn(F) - 2*pi^5*b^5*d^5*e*f*x^4 + 20*pi^3*b^5*d^5*e*f*x^4*log(abs(F))^2 -
10*pi*b^5*d^5*e*f*x^4*log(abs(F))^4 + pi^5*b^5*d^5*e^2*x^3*sgn(F) - 10*pi^3
*b^5*d^5*e^2*x^3*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*e^2*x^3*log(abs(F))^4*
sgn(F) - pi^5*b^5*d^5*e^2*x^3 + 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^2 - 5*p
i*b^5*d^5*e^2*x^3*log(abs(F))^4 + 20*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F
) - 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 20*pi^3*b^4*d^4*f^2*x^4*lo
g(abs(F)) + 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 32*pi^3*b^4*d^4*e*f*x^3*l
og(abs(F))*sgn(F) - 32*pi*b^4*d^4*e*f*x^3*log(abs(F))^3*sgn(F) - 32*pi^3*b^

4*d^4*e*f*x^3*log(abs(F)) + 32*pi*b^4*d^4*e*f*x^3*log(abs(F))^3 + 12*pi^3*b
^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 12*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn
(F) - 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 12*pi*b^4*d^4*e^2*x^2*log(abs(F
))^3 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2
*sgn(F) + 20*pi^3*b^3*d^3*f^2*x^3 - 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 2
4*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F)
+ 24*pi^3*b^3*d^3*e*f*x^2 - 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 - 6*pi^3*b^
3*d^3*e^2*x*sgn(F) + 18*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) + 6*pi^3*b^3*
d^3*e^2*x - 18*pi*b^3*d^3*e^2*x*log(abs(F))^2 - 120*pi*b^2*d^2*f^2*x^2*log(
abs(F))*sgn(F) + 120*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 96*pi*b^2*d^2*e*f*x*l
og(abs(F))*sgn(F) + 96*pi*b^2*d^2*e*f*x*log(abs(F)) - 12*pi*b^2*d^2*e^2*log
(abs(F))*sgn(F) + 12*pi*b^2*d^2*e^2*log(abs(F)) + 120*pi*b*d*f^2*x*sgn(F) -
120*pi*b*d*f^2*x + 48*pi*b*d*e*f*sgn(F) - 48*pi*b*d*e*f)*(pi^6*b^6*d^6*sgn
(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*
sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log
(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d
^6*log(abs(F))^2sgn(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d
^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 - 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*
d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d
^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^
6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)
^2) + 2*(5*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*f^2*x^
5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*f^2*x^5*log(abs(F)) + 10*pi^2*b^5*d
^5*f^2*x^5*log(abs(F))^3 - 2*b^5*d^5*f^2*x^5*log(abs(F))^5 + 10*pi^4*b^5*d^
5*e*f*x^4*log(abs(F))*sgn(F) - 20*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3*sgn(F)
- 10*pi^4*b^5*d^5*e*f*x^4*log(abs(F)) + 20*pi^2*b^5*d^5*e*f*x^4*log(abs(F)
)^3 - 4*b^5*d^5*e*f*x^4*log(abs(F))^5 + 5*pi^4*b^5*d^5*e^2*x^3*log(abs(F))*
sgn(F) - 10*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*e^2*
x^3*log(abs(F)) + 10*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3 - 2*b^5*d^5*e^2*x^3
*log(abs(F))^5 - 5*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 30*pi^2*b^4*d^4*f^2*x^4*lo
g(abs(F))^2*sgn(F) + 5*pi^4*b^4*d^4*f^2*x^4 - 30*pi^2*b^4*d^4*f^2*x^4*log(a
bs(F))^2 + 10*b^4*d^4*f^2*x^4*log(abs(F))^4 - 8*pi^4*b^4*d^4*e*f*x^3*sgn(F)
+ 48*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) + 8*pi^4*b^4*d^4*e*f*x^3 -
48*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2 + 16*b^4*d^4*e*f*x^3*log(abs(F))^4 -
3*pi^4*b^4*d^4*e^2*x^2*sgn(F) + 18*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F
) + 3*pi^4*b^4*d^4*e^2*x^2 - 18*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2 + 6*b^4*
d^4*e^2*x^2*log(abs(F))^4 - 60*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 60
*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 40*b^3*d^3*f^2*x^3*log(abs(F))^3 - 72*p
i^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) + 72*pi^2*b^3*d^3*e*f*x^2*log(abs(F)
) - 48*b^3*d^3*e*f*x^2*log(abs(F))^3 - 18*pi^2*b^3*d^3*e^2*x*log(abs(F))*sg
n(F) + 18*pi^2*b^3*d^3*e^2*x*log(abs(F)) - 12*b^3*d^3*e^2*x*log(abs(F))^3 +
60*pi^2*b^2*d^2*f^2*x^2*sgn(F) - 60*pi^2*b^2*d^2*f^2*x^2 + 120*b^2*d^2*f^2
*x^2*log(abs(F))^2 + 48*pi^2*b^2*d^2*e*f*x*sgn(F) - 48*pi^2*b^2*d^2*e*f*x +
96*b^2*d^2*e*f*x*log(abs(F))^2 + 6*pi^2*b^2*d^2*e^2*sgn(F) - 6*pi^2*b^2*d^
2*e^2 + 12*b^2*d^2*e^2*log(abs(F))^2 - 240*b*d*f^2*x*log(abs(F)) - 96*b*d*e

*f*log(abs(F)) + 240*f^2)*(3*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*
d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d
^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5
)/((pi^6*b^6*d^6*sgn(F) - 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 15*pi^2*b^
6*d^6*log(abs(F))^4*sgn(F) - pi^6*b^6*d^6 + 15*pi^4*b^6*d^6*log(abs(F))^2 -
 15*pi^2*b^6*d^6*log(abs(F))^4 + 2*b^6*d^6*log(abs(F))^6)^2 + 4*(3*pi^5*b^6
*d^6*log(abs(F))*sgn(F) - 10*pi^3*b^6*d^6*log(abs(F))^3*sgn(F) + 3*pi*b^6*d
^6*log(abs(F))^5*sgn(F) - 3*pi^5*b^6*d^6*log(abs(F)) + 10*pi^3*b^6*d^6*log(
abs(F))^3 - 3*pi*b^6*d^6*log(abs(F))^5)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*
pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^
(b*d*x*log(abs(F)) + b*c*log(abs(F)) + a*log(abs(F))) - 1/2*I*((pi^5*b^5*d^
5*f^2*x^5*sgn(F) + 5*I*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 10*pi^3*b^
5*d^5*f^2*x^5*log(abs(F))^2*sgn(F) - 10*I*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^
3*sgn(F) + 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5*f^2*x^5
 - 5*I*pi^4*b^5*d^5*f^2*x^5*log(abs(F)) + 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F
))^2 + 10*I*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3 - 5*pi*b^5*d^5*f^2*x^5*log(a
bs(F))^4 - 2*I*b^5*d^5*f^2*x^5*log(abs(F))^5 + 2*pi^5*b^5*d^5*e*f*x^4*sgn(F
) + 10*I*pi^4*b^5*d^5*e*f*x^4*log(abs(F))*sgn(F) - 20*pi^3*b^5*d^5*e*f*x^4*
log(abs(F))^2*sgn(F) - 20*I*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3*sgn(F) + 10*
pi*b^5*d^5*e*f*x^4*log(abs(F))^4*sgn(F) - 2*pi^5*b^5*d^5*e*f*x^4 - 10*I*pi^
4*b^5*d^5*e*f*x^4*log(abs(F)) + 20*pi^3*b^5*d^5*e*f*x^4*log(abs(F))^2 + 20*
I*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3 - 10*pi*b^5*d^5*e*f*x^4*log(abs(F))^4
 - 4*I*b^5*d^5*e*f*x^4*log(abs(F))^5 + pi^5*b^5*d^5*e^2*x^3*sgn(F) + 5*I*pi^
4*b^5*d^5*e^2*x^3*log(abs(F))*sgn(F) - 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^
2*sgn(F) - 10*I*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3*sgn(F) + 5*pi*b^5*d^5*e^
2*x^3*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5*e^2*x^3 - 5*I*pi^4*b^5*d^5*e^2*x^
3*log(abs(F)) + 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^2 + 10*I*pi^2*b^5*d^5*e
^2*x^3*log(abs(F))^3 - 5*pi*b^5*d^5*e^2*x^3*log(abs(F))^4 - 2*I*b^5*d^5*e^2
*x^3*log(abs(F))^5 - 5*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 20*pi^3*b^4*d^4*f^2*
x^4*log(abs(F))*sgn(F) + 30*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - 2
0*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) + 5*I*pi^4*b^4*d^4*f^2*x^4 - 20*p
i^3*b^4*d^4*f^2*x^4*log(abs(F)) - 30*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 +
 20*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 10*I*b^4*d^4*f^2*x^4*log(abs(F))^4 -
 8*I*pi^4*b^4*d^4*e*f*x^3*sgn(F) + 32*pi^3*b^4*d^4*e*f*x^3*log(abs(F))*sgn(
F) + 48*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) - 32*pi*b^4*d^4*e*f*x^3
*log(abs(F))^3*sgn(F) + 8*I*pi^4*b^4*d^4*e*f*x^3 - 32*pi^3*b^4*d^4*e*f*x^3*
log(abs(F)) - 48*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2 + 32*pi*b^4*d^4*e*f*x
^3*log(abs(F))^3 + 16*I*b^4*d^4*e*f*x^3*log(abs(F))^4 - 3*I*pi^4*b^4*d^4*e^
2*x^2*sgn(F) + 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) + 18*I*pi^2*b^4*d
^4*e^2*x^2*log(abs(F))^2*sgn(F) - 12*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn(F
) + 3*I*pi^4*b^4*d^4*e^2*x^2 - 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) - 18*I*p
i^2*b^4*d^4*e^2*x^2*log(abs(F))^2 + 12*pi*b^4*d^4*e^2*x^2*log(abs(F))^3 + 6
*I*b^4*d^4*e^2*x^2*log(abs(F))^4 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F) - 60*I*pi
^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2
*sgn(F) + 20*pi^3*b^3*d^3*f^2*x^3 + 60*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) -

```
 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 40*I*b^3*d^3*f^2*x^3*log(abs(F))^3 -
 24*pi^3*b^3*d^3*e*f*x^2*sgn(F) - 72*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn
(F) + 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) + 24*pi^3*b^3*d^3*e*f*x^2
+ 72*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) - 72*pi*b^3*d^3*e*f*x^2*log(abs(F))
^2 - 48*I*b^3*d^3*e*f*x^2*log(abs(F))^3 - 6*pi^3*b^3*d^3*e^2*x*sgn(F) - 18*
I*pi^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) + 18*pi*b^3*d^3*e^2*x*log(abs(F))^2
*sgn(F) + 6*pi^3*b^3*d^3*e^2*x + 18*I*pi^2*b^3*d^3*e^2*x*log(abs(F)) - 18*p
i*b^3*d^3*e^2*x*log(abs(F))^2 - 12*I*b^3*d^3*e^2*x*log(abs(F))^3 + 60*I*pi^
2*b^2*d^2*f^2*x^2*sgn(F) - 120*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 60*I
*pi^2*b^2*d^2*f^2*x^2 + 120*pi*b^2*d^2*f^2*x^2*log(abs(F)) + 120*I*b^2*d^2*
f^2*x^2*log(abs(F))^2 + 48*I*pi^2*b^2*d^2*e*f*x*sgn(F) - 96*pi*b^2*d^2*e*f*
x*log(abs(F))*sgn(F) - 48*I*pi^2*b^2*d^2*e*f*x + 96*pi*b^2*d^2*e*f*x*log(ab
s(F)) + 96*I*b^2*d^2*e*f*x*log(abs(F))^2 + 6*I*pi^2*b^2*d^2*e^2*sgn(F) - 12
*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - 6*I*pi^2*b^2*d^2*e^2 + 12*pi*b^2*d^2*e
^2*log(abs(F)) + 12*I*b^2*d^2*e^2*log(abs(F))^2 + 120*pi*b*d*f^2*x*sgn(F) -
 120*pi*b*d*f^2*x - 240*I*b*d*f^2*x*log(abs(F)) + 48*pi*b*d*e*f*sgn(F) - 48
*pi*b*d*e*f - 96*I*b*d*e*f*log(abs(F)) + 240*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F
) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F)
 - 1/2*I*pi*a)/(pi^6*b^6*d^6*sgn(F) + 6*I*pi^5*b^6*d^6*log(abs(F))*sgn(F) -
 15*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) - 20*I*pi^3*b^6*d^6*log(abs(F))^3*sgn
(F) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) + 6*I*pi*b^6*d^6*log(abs(F))^5*s
gn(F) - pi^6*b^6*d^6 - 6*I*pi^5*b^6*d^6*log(abs(F)) + 15*pi^4*b^6*d^6*log(a
bs(F))^2 + 20*I*pi^3*b^6*d^6*log(abs(F))^3 - 15*pi^2*b^6*d^6*log(abs(F))^4
- 6*I*pi*b^6*d^6*log(abs(F))^5 + 2*b^6*d^6*log(abs(F))^6) + (pi^5*b^5*d^5*f
^2*x^5*sgn(F) - 5*I*pi^4*b^5*d^5*f^2*x^5*log(abs(F))*sgn(F) - 10*pi^3*b^5*d
^5*f^2*x^5*log(abs(F))^2*sgn(F) + 10*I*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3*s
gn(F) + 5*pi*b^5*d^5*f^2*x^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5*f^2*x^5 +
5*I*pi^4*b^5*d^5*f^2*x^5*log(abs(F)) + 10*pi^3*b^5*d^5*f^2*x^5*log(abs(F))^
2 - 10*I*pi^2*b^5*d^5*f^2*x^5*log(abs(F))^3 - 5*pi*b^5*d^5*f^2*x^5*log(abs(
F))^4 + 2*I*b^5*d^5*f^2*x^5*log(abs(F))^5 + 2*pi^5*b^5*d^5*e*f*x^4*sgn(F) -
 10*I*pi^4*b^5*d^5*e*f*x^4*log(abs(F))*sgn(F) - 20*pi^3*b^5*d^5*e*f*x^4*log
(abs(F))^2*sgn(F) + 20*I*pi^2*b^5*d^5*e*f*x^4*log(abs(F))^3*sgn(F) + 10*pi*
b^5*d^5*e*f*x^4*log(abs(F))^4*sgn(F) - 2*pi^5*b^5*d^5*e*f*x^4 + 10*I*pi^4*b
^5*d^5*e*f*x^4*log(abs(F)) + 20*pi^3*b^5*d^5*e*f*x^4*log(abs(F))^2 - 20*I*p
i^2*b^5*d^5*e*f*x^4*log(abs(F))^3 - 10*pi*b^5*d^5*e*f*x^4*log(abs(F))^4 + 4
*I*b^5*d^5*e*f*x^4*log(abs(F))^5 + pi^5*b^5*d^5*e^2*x^3*sgn(F) - 5*I*pi^4*b
^5*d^5*e^2*x^3*log(abs(F))*sgn(F) - 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^2*s
gn(F) + 10*I*pi^2*b^5*d^5*e^2*x^3*log(abs(F))^3*sgn(F) + 5*pi*b^5*d^5*e^2*x
^3*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5*e^2*x^3 + 5*I*pi^4*b^5*d^5*e^2*x^3*l
og(abs(F)) + 10*pi^3*b^5*d^5*e^2*x^3*log(abs(F))^2 - 10*I*pi^2*b^5*d^5*e^2*
x^3*log(abs(F))^3 - 5*pi*b^5*d^5*e^2*x^3*log(abs(F))^4 + 2*I*b^5*d^5*e^2*x^
3*log(abs(F))^5 + 5*I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 20*pi^3*b^4*d^4*f^2*x^4
*log(abs(F))*sgn(F) - 30*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - 20*p
i*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 5*I*pi^4*b^4*d^4*f^2*x^4 - 20*pi^3
*b^4*d^4*f^2*x^4*log(abs(F)) + 30*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 + 20
```

```
*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - 10*I*b^4*d^4*f^2*x^4*log(abs(F))^4 + 8*
I*pi^4*b^4*d^4*e*f*x^3*sgn(F) + 32*pi^3*b^4*d^4*e*f*x^3*log(abs(F))*sgn(F)
- 48*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) - 32*pi*b^4*d^4*e*f*x^3*lo
g(abs(F))^3*sgn(F) - 8*I*pi^4*b^4*d^4*e*f*x^3 - 32*pi^3*b^4*d^4*e*f*x^3*log
(abs(F)) + 48*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2 + 32*pi*b^4*d^4*e*f*x^3*
log(abs(F))^3 - 16*I*b^4*d^4*e*f*x^3*log(abs(F))^4 + 3*I*pi^4*b^4*d^4*e^2*x
^2*sgn(F) + 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 18*I*pi^2*b^4*d^4*
e^2*x^2*log(abs(F))^2*sgn(F) - 12*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn(F) -
 3*I*pi^4*b^4*d^4*e^2*x^2 - 12*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 18*I*pi^2
*b^4*d^4*e^2*x^2*log(abs(F))^2 + 12*pi*b^4*d^4*e^2*x^2*log(abs(F))^3 - 6*I*
b^4*d^4*e^2*x^2*log(abs(F))^4 - 20*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 60*I*pi^2*
b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 60*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sg
n(F) + 20*pi^3*b^3*d^3*f^2*x^3 - 60*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) - 60
*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 40*I*b^3*d^3*f^2*x^3*log(abs(F))^3 - 24
*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 72*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F)
 + 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) + 24*pi^3*b^3*d^3*e*f*x^2 - 7
2*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) - 72*pi*b^3*d^3*e*f*x^2*log(abs(F))^2
+ 48*I*b^3*d^3*e*f*x^2*log(abs(F))^3 - 6*pi^3*b^3*d^3*e^2*x*sgn(F) + 18*I*p
i^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) + 18*pi*b^3*d^3*e^2*x*log(abs(F))^2*sg
n(F) + 6*pi^3*b^3*d^3*e^2*x - 18*I*pi^2*b^3*d^3*e^2*x*log(abs(F)) - 18*pi*b
^3*d^3*e^2*x*log(abs(F))^2 + 12*I*b^3*d^3*e^2*x*log(abs(F))^3 - 60*I*pi^2*b
^2*d^2*f^2*x^2*sgn(F) - 120*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 60*I*pi
^2*b^2*d^2*f^2*x^2 + 120*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 120*I*b^2*d^2*f^2
*x^2*log(abs(F))^2 - 48*I*pi^2*b^2*d^2*e*f*x*sgn(F) - 96*pi*b^2*d^2*e*f*x*l
og(abs(F))*sgn(F) + 48*I*pi^2*b^2*d^2*e*f*x + 96*pi*b^2*d^2*e*f*x*log(abs(F
)) - 96*I*b^2*d^2*e*f*x*log(abs(F))^2 - 6*I*pi^2*b^2*d^2*e^2*sgn(F) - 12*pi
*b^2*d^2*e^2*log(abs(F))*sgn(F) + 6*I*pi^2*b^2*d^2*e^2 + 12*pi*b^2*d^2*e^2*
log(abs(F)) - 12*I*b^2*d^2*e^2*log(abs(F))^2 + 120*pi*b*d*f^2*x*sgn(F) - 12
0*pi*b*d*f^2*x + 240*I*b*d*f^2*x*log(abs(F)) + 48*pi*b*d*e*f*sgn(F) - 48*pi
*b*d*e*f + 96*I*b*d*e*f*log(abs(F)) - 240*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F)
+ 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) +
 1/2*I*pi*a)/(pi^6*b^6*d^6*sgn(F) - 6*I*pi^5*b^6*d^6*log(abs(F))*sgn(F) - 1
5*pi^4*b^6*d^6*log(abs(F))^2*sgn(F) + 20*I*pi^3*b^6*d^6*log(abs(F))^3*sgn(F
) + 15*pi^2*b^6*d^6*log(abs(F))^4*sgn(F) - 6*I*pi*b^6*d^6*log(abs(F))^5*sgn
(F) - pi^6*b^6*d^6 + 6*I*pi^5*b^6*d^6*log(abs(F)) + 15*pi^4*b^6*d^6*log(abs
(F))^2 - 20*I*pi^3*b^6*d^6*log(abs(F))^3 - 15*pi^2*b^6*d^6*log(abs(F))^4 +
6*I*pi*b^6*d^6*log(abs(F))^5 + 2*b^6*d^6*log(abs(F))^6))*e^(b*d*x*log(abs(F
)) + b*c*log(abs(F)) + a*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 249, normalized size of antiderivative = 0.60

$$\int F^{a+b(c+dx)}x^3(e+fx)^2\,dx$$
$$=\frac{F^{a+b\,c+b\,d\,x}\,\left(b^5\,d^5\,e^2\,x^3\,\ln\left(F\right)^5+2\,b^5\,d^5\,e\,f\,x^4\,\ln\left(F\right)^5+b^5\,d^5\,f^2\,x^5\,\ln\left(F\right)^5-3\,b^4\,d^4\,e^2\,x^2\,\ln\left(F\right)^4-8\,b^4\,d^4\,e\,f}{}$$

```
[In] int(F^(a + b*(c + d*x))*x^3*(e + f*x)^2,x)
```

```
[Out] (F^(a + b*c + b*d*x)*(120*b*d*f^2*x*log(F) - 6*b^2*d^2*e^2*log(F)^2 - 120*f
^2 + 6*b^3*d^3*e^2*x*log(F)^3 - 3*b^4*d^4*e^2*x^2*log(F)^4 + b^5*d^5*e^2*x^
3*log(F)^5 - 60*b^2*d^2*f^2*x^2*log(F)^2 + 20*b^3*d^3*f^2*x^3*log(F)^3 - 5*
b^4*d^4*f^2*x^4*log(F)^4 + b^5*d^5*f^2*x^5*log(F)^5 + 48*b*d*e*f*log(F) - 4
8*b^2*d^2*e*f*x*log(F)^2 + 24*b^3*d^3*e*f*x^2*log(F)^3 - 8*b^4*d^4*e*f*x^3*
log(F)^4 + 2*b^5*d^5*e*f*x^4*log(F)^5))/(b^6*d^6*log(F)^6)
```

3.66 $\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$

Optimal result

Integrand size = 22, antiderivative size = 328

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx = \frac{24f^2F^{a+bc+bdx}}{b^5d^5\log^5(F)} - \frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{24f^2F^{a+bc+bdx}x}{b^4d^4\log^4(F)} + \frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12efF^{a+bc+bdx}x}{b^3d^3\log^3(F)} + \frac{12f^2F^{a+bc+bdx}x^2}{b^3d^3\log^3(F)} - \frac{2e^2F^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{6efF^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} - \frac{4f^2F^{a+bc+bdx}x^3}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x^2}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^3}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^4}{bd\log(F)}$$

```
[Out] 24*f^2*F^(b*d*x+b*c+a)/b^5/d^5/ln(F)^5-12*e*f*F^(b*d*x+b*c+a)/b^4/d^4/ln(F)
^4-24*f^2*F^(b*d*x+b*c+a)*x/b^4/d^4/ln(F)^4+2*e^2*F^(b*d*x+b*c+a)/b^3/d^3/l
n(F)^3+12*e*f*F^(b*d*x+b*c+a)*x/b^3/d^3/ln(F)^3+12*f^2*F^(b*d*x+b*c+a)*x^2/
b^3/d^3/ln(F)^3-2*e^2*F^(b*d*x+b*c+a)*x/b^2/d^2/ln(F)^2-6*e*f*F^(b*d*x+b*c+
a)*x^2/b^2/d^2/ln(F)^2-4*f^2*F^(b*d*x+b*c+a)*x^3/b^2/d^2/ln(F)^2+e^2*F^(b*d
*x+b*c+a)*x^2/b/d/ln(F)+2*e*f*F^(b*d*x+b*c+a)*x^3/b/d/ln(F)+f^2*F^(b*d*x+b*
c+a)*x^4/b/d/ln(F)
```

Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 328, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.136$, Rules used

$= \{2227, 2207, 2225\}$

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx = \frac{24f^2F^{a+bc+bdx}}{b^5d^5\log^5(F)} - \frac{12efF^{a+bc+bdx}}{b^4d^4\log^4(F)} - \frac{24f^2xF^{a+bc+bdx}}{b^4d^4\log^4(F)} + \frac{2e^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12efxF^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{12f^2x^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} - \frac{2e^2xF^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{6efx^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4f^2x^3F^{a+bc+bdx}}{b^2d^2\log^2(F)} + \frac{e^2x^2F^{a+bc+bdx}}{bd\log(F)} + \frac{2efx^3F^{a+bc+bdx}}{bd\log(F)} + \frac{f^2x^4F^{a+bc+bdx}}{bd\log(F)}$$

```
[In] Int[F^(a + b*(c + d*x))*x^2*(e + f*x)^2,x]
```

```
[Out] (24*f^2*F^(a + b*c + b*d*x))/(b^5*d^5*Log[F]^5) - (12*e*f*F^(a + b*c + b*d*
x))/(b^4*d^4*Log[F]^4) - (24*f^2*F^(a + b*c + b*d*x)*x)/(b^4*d^4*Log[F]^4)
+ (2*e^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) + (12*e*f*F^(a + b*c + b*d
*x)*x)/(b^3*d^3*Log[F]^3) + (12*f^2*F^(a + b*c + b*d*x)*x^2)/(b^3*d^3*Log[F
]^3) - (2*e^2*F^(a + b*c + b*d*x)*x)/(b^2*d^2*Log[F]^2) - (6*e*f*F^(a + b*c
 + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) - (4*f^2*F^(a + b*c + b*d*x)*x^3)/(b^2*d^
2*Log[F]^2) + (e^2*F^(a + b*c + b*d*x)*x^2)/(b*d*Log[F]) + (2*e*f*F^(a + b*
c + b*d*x)*x^3)/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^4)/(b*d*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(e^2F^{a+bc+bdx}x^2 + 2efF^{a+bc+bdx}x^3 + f^2F^{a+bc+bdx}x^4\right)\,dx$$

$$= e^2 \int F^{a+bc+bdx} x^2 \, dx + (2ef) \int F^{a+bc+bdx} x^3 \, dx + f^2 \int F^{a+bc+bdx} x^4 \, dx$$

$$= \frac{e^2 F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^4}{bd \log(F)} - \frac{(2e^2) \int F^{a+bc+bdx} x \, dx}{bd \log(F)} - \frac{(6ef) \int F^{a+bc+bdx} x^2 \, dx}{bd \log(F)} - \frac{(4f^2) \int F^{a+bc+bdx} x^3 \, dx}{bd \log(F)}$$

$$= -\frac{2e^2 F^{a+bc+bdx} x}{b^2 d^2 \log^2(F)} - \frac{6ef F^{a+bc+bdx} x^2}{b^2 d^2 \log^2(F)} - \frac{4f^2 F^{a+bc+bdx} x^3}{b^2 d^2 \log^2(F)} + \frac{e^2 F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^4}{bd \log(F)} + \frac{(2e^2) \int F^{a+bc+bdx} \, dx}{b^2 d^2 \log^2(F)} + \frac{(12ef) \int F^{a+bc+bdx} x \, dx}{b^2 d^2 \log^2(F)} + \frac{(12f^2) \int F^{a+bc+bdx} x^2 \, dx}{b^2 d^2 \log^2(F)}$$

$$= \frac{2e^2 F^{a+bc+bdx}}{b^3 d^3 \log^3(F)} + \frac{12ef F^{a+bc+bdx} x}{b^3 d^3 \log^3(F)} + \frac{12f^2 F^{a+bc+bdx} x^2}{b^3 d^3 \log^3(F)} - \frac{2e^2 F^{a+bc+bdx} x}{b^2 d^2 \log^2(F)} - \frac{6ef F^{a+bc+bdx} x^2}{b^2 d^2 \log^2(F)} - \frac{4f^2 F^{a+bc+bdx} x^3}{b^2 d^2 \log^2(F)} + \frac{e^2 F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^4}{bd \log(F)} - \frac{(12ef) \int F^{a+bc+bdx} \, dx}{b^3 d^3 \log^3(F)} - \frac{(24f^2) \int F^{a+bc+bdx} x \, dx}{b^3 d^3 \log^3(F)}$$

$$= -\frac{12ef F^{a+bc+bdx}}{b^4 d^4 \log^4(F)} - \frac{24f^2 F^{a+bc+bdx} x}{b^4 d^4 \log^4(F)} + \frac{2e^2 F^{a+bc+bdx}}{b^3 d^3 \log^3(F)} + \frac{12ef F^{a+bc+bdx} x}{b^3 d^3 \log^3(F)} + \frac{12f^2 F^{a+bc+bdx} x^2}{b^3 d^3 \log^3(F)} - \frac{2e^2 F^{a+bc+bdx} x}{b^2 d^2 \log^2(F)} - \frac{6ef F^{a+bc+bdx} x^2}{b^2 d^2 \log^2(F)} - \frac{4f^2 F^{a+bc+bdx} x^3}{b^2 d^2 \log^2(F)} + \frac{e^2 F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^4}{bd \log(F)} + \frac{(24f^2) \int F^{a+bc+bdx} \, dx}{b^4 d^4 \log^4(F)}$$

$$= \frac{24f^2 F^{a+bc+bdx}}{b^5 d^5 \log^5(F)} - \frac{12ef F^{a+bc+bdx}}{b^4 d^4 \log^4(F)} - \frac{24f^2 F^{a+bc+bdx} x}{b^4 d^4 \log^4(F)} + \frac{2e^2 F^{a+bc+bdx}}{b^3 d^3 \log^3(F)} + \frac{12ef F^{a+bc+bdx} x}{b^3 d^3 \log^3(F)} + \frac{12f^2 F^{a+bc+bdx} x^2}{b^3 d^3 \log^3(F)} - \frac{2e^2 F^{a+bc+bdx} x}{b^2 d^2 \log^2(F)} - \frac{6ef F^{a+bc+bdx} x^2}{b^2 d^2 \log^2(F)} - \frac{4f^2 F^{a+bc+bdx} x^3}{b^2 d^2 \log^2(F)} + \frac{e^2 F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^4}{bd \log(F)}$$

Mathematica [A] (verified)

Time = 0.26 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.37

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$$
$$=\frac{F^{a+b(c+dx)}\left(24f^2-12bdf(e+2fx)\log(F)+2b^2d^2(e^2+6efx+6f^2x^2)\log^2(F)-2b^3d^3x(e^2+3efx+2f^2\right.}{b^5d^5\log^5(F)}$$

```
[In] Integrate[F^(a + b*(c + d*x))*x^2*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(24*f^2 - 12*b*d*f*(e + 2*f*x)*Log[F] + 2*b^2*d^2*(e^2
 + 6*e*f*x + 6*f^2*x^2)*Log[F]^2 - 2*b^3*d^3*x*(e^2 + 3*e*f*x + 2*f^2*x^2)*
Log[F]^3 + b^4*d^4*x^2*(e + f*x)^2*Log[F]^4))/(b^5*d^5*Log[F]^5)
```

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 197, normalized size of antiderivative = 0.60

method	result
gosper	$\frac{\left(\ln(F)^4b^4d^4f^2x^4+2\ln(F)^4b^4d^4ef\,x^3+\ln(F)^4b^4d^4e^2x^2-4\ln(F)^3b^3d^3f^2x^3-6\ln(F)^3b^3d^3ef\,x^2-2\ln(F)^3b^3d^3e^2x+12\ln(F)^2b\right.}{\ln(F)^5b^5d^5}$
risch	$\frac{\left(\ln(F)^4b^4d^4f^2x^4+2\ln(F)^4b^4d^4ef\,x^3+\ln(F)^4b^4d^4e^2x^2-4\ln(F)^3b^3d^3f^2x^3-6\ln(F)^3b^3d^3ef\,x^2-2\ln(F)^3b^3d^3e^2x+12\ln(F)^2b\right.}{\ln(F)^5b^5d^5}$
meijerg	$-\frac{F^{cb+a}f^2\left(24-\frac{\left(5b^4d^4x^4\ln(F)^4-20b^3d^3x^3\ln(F)^3+60b^2d^2x^2\ln(F)^2-120bdx\ln(F)+120\right)e^{bdx\ln(F)}}{5}\right)}{\ln(F)^5b^5d^5}+\frac{2F^{cb+a}fe\left(6-\frac{\left(-4b^3d^3x\right.}{}\right.}{}$
norman	$\frac{f^2x^4e^{(a+b(dx+c))\ln(F)}}{bd\ln(F)}+\frac{\left(\ln(F)^2b^2d^2e^2-6ef\ln(F)bd+12f^2\right)x^2e^{(a+b(dx+c))\ln(F)}}{\ln(F)^3b^3d^3}+\frac{2\left(\ln(F)^2b^2d^2e^2-6ef\ln(F)bd+12f^2\right.}{\ln(F)^5b^5d^5}$
parallelrisch	$\frac{\ln(F)^4x^4F^{bdx+cb+a}b^4d^4f^2+2\ln(F)^4x^3F^{bdx+cb+a}b^4d^4ef+\ln(F)^4x^2F^{bdx+cb+a}b^4d^4e^2-4\ln(F)^3x^3F^{bdx+cb+a}b^3d^3f^2-6\ln(F}{}$

```
[In] int(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x,method=_RETURNVERBOSE)
```

```
[Out] (ln(F)^4*b^4*d^4*f^2*x^4+2*ln(F)^4*b^4*d^4*e*f*x^3+ln(F)^4*b^4*d^4*e^2*x^2-
4*ln(F)^3*b^3*d^3*f^2*x^3-6*ln(F)^3*b^3*d^3*e*f*x^2-2*ln(F)^3*b^3*d^3*e^2*x
+12*ln(F)^2*b^2*d^2*f^2*x^2+12*ln(F)^2*b^2*d^2*e*f*x+2*ln(F)^2*b^2*d^2*e^2-
24*ln(F)*b*d*f^2*x-12*e*f*ln(F)*b*d+24*f^2)*F^(b*d*x+b*c+a)/ln(F)^5/b^5/d^5
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 178, normalized size of antiderivative = 0.54

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$$
$$= \frac{\left((b^4d^4f^2x^4+2\,b^4d^4efx^3+b^4d^4e^2x^2)\log\left(F\right)^4-2\,(2\,b^3d^3f^2x^3+3\,b^3d^3efx^2+b^3d^3e^2x)\log\left(F\right)^3+2\,(6\,b^2d^2f\right.}{b^5d^5\log\left(F\right)^5}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="fricas")
```

```
[Out] ((b^4*d^4*f^2*x^4 + 2*b^4*d^4*e*f*x^3 + b^4*d^4*e^2*x^2)*log(F)^4 - 2*(2*b^
3*d^3*f^2*x^3 + 3*b^3*d^3*e*f*x^2 + b^3*d^3*e^2*x)*log(F)^3 + 2*(6*b^2*d^2*
f^2*x^2 + 6*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 + 24*f^2 - 12*(2*b*d*f^2*
x + b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^5*d^5*log(F)^5)
```

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 260, normalized size of antiderivative = 0.79

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$$
$$= \begin{cases} \frac{F^{a+b(c+dx)}\left(b^4d^4e^2x^2\log\left(F\right)^4+2b^4d^4efx^3\log\left(F\right)^4+b^4d^4f^2x^4\log\left(F\right)^4-2b^3d^3e^2x\log\left(F\right)^3-6b^3d^3efx^2\log\left(F\right)^3-4b^3d^3f^2x^3\log\left(F\right)^3+2b^2d^2e^2\right.}{b^5d^5\log\left(F\right)^5} \\ \frac{e^2x^3}{3}+\frac{efx^4}{2}+\frac{f^2x^5}{5} \end{cases}$$

```
[In] integrate(F**(a+b*(d*x+c))*x**2*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**4*d**4*e**2*x**2*log(F)**4 + 2*b**4*d**
4*e*f*x**3*log(F)**4 + b**4*d**4*f**2*x**4*log(F)**4 - 2*b**3*d**3*e**2*x*l
og(F)**3 - 6*b**3*d**3*e*f*x**2*log(F)**3 - 4*b**3*d**3*f**2*x**3*log(F)**3
 + 2*b**2*d**2*e**2*log(F)**2 + 12*b**2*d**2*e*f*x*log(F)**2 + 12*b**2*d**2
*f**2*x**2*log(F)**2 - 12*b*d*e*f*log(F) - 24*b*d*f**2*x*log(F) + 24*f**2)/
(b**5*d**5*log(F)**5), Ne(b**5*d**5*log(F)**5, 0)), (e**2*x**3/3 + e*f*x**4
/2 + f**2*x**5/5, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 262, normalized size of antiderivative = 0.80

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx = \frac{\left(F^{bc+a}b^2d^2x^2\log\left(F\right)^2 - 2\,F^{bc+a}bdx\log\left(F\right) + 2\,F^{bc+a}\right)F^{bdx}e^2}{b^3d^3\log\left(F\right)^3}$$
$$+\frac{2\left(F^{bc+a}b^3d^3x^3\log\left(F\right)^3 - 3\,F^{bc+a}b^2d^2x^2\log\left(F\right)^2 + 6\,F^{bc+a}bdx\log\left(F\right) - 6\,F^{bc+a}\right)F^{bdx}ef}{b^4d^4\log\left(F\right)^4}$$
$$+\frac{\left(F^{bc+a}b^4d^4x^4\log\left(F\right)^4 - 4\,F^{bc+a}b^3d^3x^3\log\left(F\right)^3 + 12\,F^{bc+a}b^2d^2x^2\log\left(F\right)^2 - 24\,F^{bc+a}bdx\log\left(F\right) + 24\,F\right.}{b^5d^5\log\left(F\right)^5}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*c +
 a))*F^(b*d*x)*e^2/(b^3*d^3*log(F)^3) + 2*(F^(b*c + a)*b^3*d^3*x^3*log(F)^3
 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*F^(b*c + a)*b*d*x*log(F) - 6*F^(b
*c + a))*F^(b*d*x)*e*f/(b^4*d^4*log(F)^4) + (F^(b*c + a)*b^4*d^4*x^4*log(F)
^4 - 4*F^(b*c + a)*b^3*d^3*x^3*log(F)^3 + 12*F^(b*c + a)*b^2*d^2*x^2*log(F)
^2 - 24*F^(b*c + a)*b*d*x*log(F) + 24*F^(b*c + a))*F^(b*d*x)*f^2/(b^5*d^5*l
og(F)^5)
```

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.53 (sec) , antiderivative size = 6582, normalized size of antiderivative = 20.07

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx = \text{Too large to display}$$

```
[In] integrate(F^(a+b*(d*x+c))*x^2*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] -((2*(2*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - 2*pi*b^4*d^4*f^2*x^4*log(
abs(F))^3*sgn(F) - 2*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + 2*pi*b^4*d^4*f^2*x^
4*log(abs(F))^3 + 4*pi^3*b^4*d^4*e*f*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*d^4*
e*f*x^3*log(abs(F))^3*sgn(F) - 4*pi^3*b^4*d^4*e*f*x^3*log(abs(F)) + 4*pi*b^
4*d^4*e*f*x^3*log(abs(F))^3 + 2*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 2
*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn(F) - 2*pi^3*b^4*d^4*e^2*x^2*log(abs(F
)) + 2*pi*b^4*d^4*e^2*x^2*log(abs(F))^3 - 2*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 6
*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) + 2*pi^3*b^3*d^3*f^2*x^3 - 6*pi*b^
3*d^3*f^2*x^3*log(abs(F))^2 - 3*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 9*pi*b^3*d^3*
e*f*x^2*log(abs(F))^2*sgn(F) + 3*pi^3*b^3*d^3*e*f*x^2 - 9*pi*b^3*d^3*e*f*x^
2*log(abs(F))^2 - pi^3*b^3*d^3*e^2*x*sgn(F) + 3*pi*b^3*d^3*e^2*x*log(abs(F)
```

```
)^2*sgn(F) + pi^3*b^3*d^3*e^2*x - 3*pi*b^3*d^3*e^2*x*log(abs(F))^2 - 12*pi*
b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 12*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 12
*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) + 12*pi*b^2*d^2*e*f*x*log(abs(F)) - 2*
pi*b^2*d^2*e^2*log(abs(F))*sgn(F) + 2*pi*b^2*d^2*e^2*log(abs(F)) + 12*pi*b*
d*f^2*x*sgn(F) - 12*pi*b*d*f^2*x + 6*pi*b*d*e*f*sgn(F) - 6*pi*b*d*e*f)*(pi^
5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(
abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*
d^5*log(abs(F))^4)/((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sg
n(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*l
og(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*
sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F))
+ 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2) - (pi^4*b^4*d
^4*f^2*x^4*sgn(F) - 6*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*
d^4*f^2*x^4 + 6*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 - 2*b^4*d^4*f^2*x^4*log(
abs(F))^4 + 2*pi^4*b^4*d^4*e*f*x^3*sgn(F) - 12*pi^2*b^4*d^4*e*f*x^3*log(abs
(F))^2*sgn(F) - 2*pi^4*b^4*d^4*e*f*x^3 + 12*pi^2*b^4*d^4*e*f*x^3*log(abs(F)
)^2 - 4*b^4*d^4*e*f*x^3*log(abs(F))^4 + pi^4*b^4*d^4*e^2*x^2*sgn(F) - 6*pi^
2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4*e^2*x^2 + 6*pi^2*b^4*
d^4*e^2*x^2*log(abs(F))^2 - 2*b^4*d^4*e^2*x^2*log(abs(F))^4 + 12*pi^2*b^3*d
^3*f^2*x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 8*b^3
*d^3*f^2*x^3*log(abs(F))^3 + 18*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) - 1
8*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) + 12*b^3*d^3*e*f*x^2*log(abs(F))^3 + 6*p
i^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) - 6*pi^2*b^3*d^3*e^2*x*log(abs(F)) + 4
*b^3*d^3*e^2*x*log(abs(F))^3 - 12*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 12*pi^2*b^2
*d^2*f^2*x^2 - 24*b^2*d^2*f^2*x^2*log(abs(F))^2 - 12*pi^2*b^2*d^2*e*f*x*sgn
(F) + 12*pi^2*b^2*d^2*e*f*x - 24*b^2*d^2*e*f*x*log(abs(F))^2 - 2*pi^2*b^2*d
^2*e^2*sgn(F) + 2*pi^2*b^2*d^2*e^2 - 4*b^2*d^2*e^2*log(abs(F))^2 + 48*b*d*f
^2*x*log(abs(F)) + 24*b*d*e*f*log(abs(F)) - 48*f^2)*(5*pi^4*b^5*d^5*log(abs
(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs
(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)/((pi^5*b^5*
d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F)
)^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*lo
g(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(a
bs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^
3 - 2*b^5*d^5*log(abs(F))^5)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x -
1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^4*b^4*d
^4*f^2*x^4*sgn(F) - 6*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - pi^4*b^4*
d^4*f^2*x^4 + 6*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 - 2*b^4*d^4*f^2*x^4*log(
abs(F))^4 + 2*pi^4*b^4*d^4*e*f*x^3*sgn(F) - 12*pi^2*b^4*d^4*e*f*x^3*log(abs
(F))^2*sgn(F) - 2*pi^4*b^4*d^4*e*f*x^3 + 12*pi^2*b^4*d^4*e*f*x^3*log(abs(F)
)^2 - 4*b^4*d^4*e*f*x^3*log(abs(F))^4 + pi^4*b^4*d^4*e^2*x^2*sgn(F) - 6*pi^
2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4*e^2*x^2 + 6*pi^2*b^4*
d^4*e^2*x^2*log(abs(F))^2 - 2*b^4*d^4*e^2*x^2*log(abs(F))^4 + 12*pi^2*b^3*d
^3*f^2*x^3*log(abs(F))*sgn(F) - 12*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 8*b^3
*d^3*f^2*x^3*log(abs(F))^3 + 18*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) - 1
```

8*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) + 12*b^3*d^3*e*f*x^2*log(abs(F))^3 + 6*p
i^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) - 6*pi^2*b^3*d^3*e^2*x*log(abs(F)) + 4
*b^3*d^3*e^2*x*log(abs(F))^3 - 12*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 12*pi^2*b^2
*d^2*f^2*x^2 - 24*b^2*d^2*f^2*x^2*log(abs(F))^2 - 12*pi^2*b^2*d^2*e*f*x*sgn
(F) + 12*pi^2*b^2*d^2*e*f*x - 24*b^2*d^2*e*f*x*log(abs(F))^2 - 2*pi^2*b^2*d
^2*e^2*sgn(F) + 2*pi^2*b^2*d^2*e^2 - 4*b^2*d^2*e^2*log(abs(F))^2 + 48*b*d*f
^2*x*log(abs(F)) + 24*b*d*e*f*log(abs(F)) - 48*f^2)*(pi^5*b^5*d^5*sgn(F) -
10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) -
pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)/
((pi^5*b^5*d^5*sgn(F) - 10*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5
*log(abs(F))^4*sgn(F) - pi^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi
*b^5*d^5*log(abs(F))^4)^2 + (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^
5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*l
og(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)^2) + 2*(2*pi^3*b^4*d^4*f^2*x^4*log(
abs(F))*sgn(F) - 2*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - 2*pi^3*b^4*d^4
*f^2*x^4*log(abs(F)) + 2*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 + 4*pi^3*b^4*d^4*
e*f*x^3*log(abs(F))*sgn(F) - 4*pi*b^4*d^4*e*f*x^3*log(abs(F))^3*sgn(F) - 4*
pi^3*b^4*d^4*e*f*x^3*log(abs(F)) + 4*pi*b^4*d^4*e*f*x^3*log(abs(F))^3 + 2*p
i^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 2*pi*b^4*d^4*e^2*x^2*log(abs(F))^3
*sgn(F) - 2*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 2*pi*b^4*d^4*e^2*x^2*log(abs
(F))^3 - 2*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 6*pi*b^3*d^3*f^2*x^3*log(abs(F))^2
*sgn(F) + 2*pi^3*b^3*d^3*f^2*x^3 - 6*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 - 3*p
i^3*b^3*d^3*e*f*x^2*sgn(F) + 9*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) + 3*
pi^3*b^3*d^3*e*f*x^2 - 9*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 - pi^3*b^3*d^3*e^
2*x*sgn(F) + 3*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) + pi^3*b^3*d^3*e^2*x -
3*pi*b^3*d^3*e^2*x*log(abs(F))^2 - 12*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F
) + 12*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 12*pi*b^2*d^2*e*f*x*log(abs(F))*sgn
(F) + 12*pi*b^2*d^2*e*f*x*log(abs(F)) - 2*pi*b^2*d^2*e^2*log(abs(F))*sgn(F)
+ 2*pi*b^2*d^2*e^2*log(abs(F)) + 12*pi*b*d*f^2*x*sgn(F) - 12*pi*b*d*f^2*x
+ 6*pi*b*d*e*f*sgn(F) - 6*pi*b*d*e*f)*(5*pi^4*b^5*d^5*log(abs(F))*sgn(F) -
10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2
*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*log(abs(F))^5)/((pi^5*b^5*d^5*sgn(F) - 1
0*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 5*pi*b^5*d^5*log(abs(F))^4*sgn(F) - p
i^5*b^5*d^5 + 10*pi^3*b^5*d^5*log(abs(F))^2 - 5*pi*b^5*d^5*log(abs(F))^4)^2
+ (5*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 10*pi^2*b^5*d^5*log(abs(F))^3*sgn(F
) - 5*pi^4*b^5*d^5*log(abs(F)) + 10*pi^2*b^5*d^5*log(abs(F))^3 - 2*b^5*d^5*
log(abs(F))^5)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn
(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*
log(abs(F)) + a*log(abs(F))) - 8*I*((I*pi^4*b^4*d^4*f^2*x^4*sgn(F) - 4*pi^3
*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^
2*sgn(F) + 4*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*d^4*f^2*x
^4 + 4*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + 6*I*pi^2*b^4*d^4*f^2*x^4*log(abs(
F))^2 - 4*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - 2*I*b^4*d^4*f^2*x^4*log(abs(F)
)^4 + 2*I*pi^4*b^4*d^4*e*f*x^3*sgn(F) - 8*pi^3*b^4*d^4*e*f*x^3*log(abs(F))*
sgn(F) - 12*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) + 8*pi*b^4*d^4*e*f*

x^3*log(abs(F))^3*sgn(F) - 2*I*pi^4*b^4*d^4*e*f*x^3 + 8*pi^3*b^4*d^4*e*f*x^3*log(abs(F)) + 12*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2 - 8*pi*b^4*d^4*e*f*x^3*log(abs(F))^3 - 4*I*b^4*d^4*e*f*x^3*log(abs(F))^4 + I*pi^4*b^4*d^4*e^2*x^2*sgn(F) - 4*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F) + 4*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn(F) - I*pi^4*b^4*d^4*e^2*x^2 + 4*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 6*I*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2 - 4*pi*b^4*d^4*e^2*x^2*log(abs(F))^3 - 2*I*b^4*d^4*e^2*x^2*log(abs(F))^4 + 4*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 12*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 12*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - 4*pi^3*b^3*d^3*f^2*x^3 - 12*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 12*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 8*I*b^3*d^3*f^2*x^3*log(abs(F))^3 + 6*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 18*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) - 18*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) - 6*pi^3*b^3*d^3*e*f*x^2 - 18*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) + 18*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 + 12*I*b^3*d^3*e*f*x^2*log(abs(F))^3 + 2*pi^3*b^3*d^3*e^2*x*sgn(F) + 6*I*pi^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) - 6*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) - 2*pi^3*b^3*d^3*e^2*x - 6*I*pi^2*b^3*d^3*e^2*x*log(abs(F)) + 6*pi*b^3*d^3*e^2*x*log(abs(F))^2 + 4*I*b^3*d^3*e^2*x*log(abs(F))^3 - 12*I*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 24*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*d^2*f^2*x^2 - 24*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 24*I*b^2*d^2*f^2*x^2*log(abs(F))^2 - 12*I*pi^2*b^2*d^2*e*f*x*sgn(F) + 24*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) + 12*I*pi^2*b^2*d^2*e*f*x - 24*pi*b^2*d^2*e*f*x*log(abs(F)) - 24*I*b^2*d^2*e*f*x*log(abs(F))^2 - 2*I*pi^2*b^2*d^2*e^2*sgn(F) + 4*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*d^2*e^2 - 4*pi*b^2*d^2*e^2*log(abs(F)) - 4*I*b^2*d^2*e^2*log(abs(F))^2 - 24*pi*b*d*f^2*x*sgn(F) + 24*pi*b*d*f^2*x + 48*I*b*d*f^2*x*log(abs(F)) - 12*pi*b*d*e*f*sgn(F) + 12*pi*b*d*e*f + 24*I*b*d*e*f*log(abs(F)) - 48*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(16*I*pi^5*b^5*d^5*sgn(F) - 80*pi^4*b^5*d^5*log(abs(F))*sgn(F) - 160*I*pi^3*b^5*d^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) + 80*I*pi*b^5*d^5*log(abs(F))^4*sgn(F) - 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*log(abs(F)) + 160*I*pi^3*b^5*d^5*log(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))^3 - 80*I*pi*b^5*d^5*log(abs(F))^4 + 32*b^5*d^5*log(abs(F))^5) - (I*pi^4*b^4*d^4*f^2*x^4*sgn(F) + 4*pi^3*b^4*d^4*f^2*x^4*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2*sgn(F) - 4*pi*b^4*d^4*f^2*x^4*log(abs(F))^3*sgn(F) - I*pi^4*b^4*d^4*f^2*x^4 - 4*pi^3*b^4*d^4*f^2*x^4*log(abs(F)) + 6*I*pi^2*b^4*d^4*f^2*x^4*log(abs(F))^2 + 4*pi*b^4*d^4*f^2*x^4*log(abs(F))^3 - 2*I*b^4*d^4*f^2*x^4*log(abs(F))^4 + 2*I*pi^4*b^4*d^4*e*f*x^3*sgn(F) + 8*pi^3*b^4*d^4*e*f*x^3*log(abs(F))*sgn(F) - 12*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2*sgn(F) - 8*pi*b^4*d^4*e*f*x^3*log(abs(F))^3*sgn(F) - 2*I*pi^4*b^4*d^4*e*f*x^3 - 8*pi^3*b^4*d^4*e*f*x^3*log(abs(F)) + 12*I*pi^2*b^4*d^4*e*f*x^3*log(abs(F))^2 + 8*pi*b^4*d^4*e*f*x^3*log(abs(F))^3 - 4*I*b^4*d^4*e*f*x^3*log(abs(F))^4 + I*pi^4*b^4*d^4*e^2*x^2*sgn(F) + 4*pi^3*b^4*d^4*e^2*x^2*log(abs(F))*sgn(F) - 6*I*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2*sgn(F) - 4*pi*b^4*d^4*e^2*x^2*log(abs(F))^3*sgn(F) - I*pi^4*b^4*d^4*e^2*x^2 - 4*pi^3*b^4*d^4*e^2*x^2*log(abs(F)) + 6

```
*I*pi^2*b^4*d^4*e^2*x^2*log(abs(F))^2 + 4*pi*b^4*d^4*e^2*x^2*log(abs(F))^3
- 2*I*b^4*d^4*e^2*x^2*log(abs(F))^4 - 4*pi^3*b^3*d^3*f^2*x^3*sgn(F) + 12*I*
pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) + 12*pi*b^3*d^3*f^2*x^3*log(abs(F))
^2*sgn(F) + 4*pi^3*b^3*d^3*f^2*x^3 - 12*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F))
- 12*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 8*I*b^3*d^3*f^2*x^3*log(abs(F))^3 -
 6*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 18*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(
F) + 18*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) + 6*pi^3*b^3*d^3*e*f*x^2 -
18*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) - 18*pi*b^3*d^3*e*f*x^2*log(abs(F))^2
 + 12*I*b^3*d^3*e*f*x^2*log(abs(F))^3 - 2*pi^3*b^3*d^3*e^2*x*sgn(F) + 6*I*p
i^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) + 6*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn
(F) + 2*pi^3*b^3*d^3*e^2*x - 6*I*pi^2*b^3*d^3*e^2*x*log(abs(F)) - 6*pi*b^3*
d^3*e^2*x*log(abs(F))^2 + 4*I*b^3*d^3*e^2*x*log(abs(F))^3 - 12*I*pi^2*b^2*d
^2*f^2*x^2*sgn(F) - 24*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 12*I*pi^2*b^
2*d^2*f^2*x^2 + 24*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 24*I*b^2*d^2*f^2*x^2*lo
g(abs(F))^2 - 12*I*pi^2*b^2*d^2*e*f*x*sgn(F) - 24*pi*b^2*d^2*e*f*x*log(abs(
F))*sgn(F) + 12*I*pi^2*b^2*d^2*e*f*x + 24*pi*b^2*d^2*e*f*x*log(abs(F)) - 24
*I*b^2*d^2*e*f*x*log(abs(F))^2 - 2*I*pi^2*b^2*d^2*e^2*sgn(F) - 4*pi*b^2*d^2
*e^2*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*d^2*e^2 + 4*pi*b^2*d^2*e^2*log(abs(F
)) - 4*I*b^2*d^2*e^2*log(abs(F))^2 + 24*pi*b*d*f^2*x*sgn(F) - 24*pi*b*d*f^2
*x + 48*I*b*d*f^2*x*log(abs(F)) + 12*pi*b*d*e*f*sgn(F) - 12*pi*b*d*e*f + 24
*I*b*d*e*f*log(abs(F)) - 48*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d
*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(
-16*I*pi^5*b^5*d^5*sgn(F) - 80*pi^4*b^5*d^5*log(abs(F))*sgn(F) + 160*I*pi^3
*b^5*d^5*log(abs(F))^2*sgn(F) + 160*pi^2*b^5*d^5*log(abs(F))^3*sgn(F) - 80*
I*pi*b^5*d^5*log(abs(F))^4*sgn(F) + 16*I*pi^5*b^5*d^5 + 80*pi^4*b^5*d^5*log
(abs(F)) - 160*I*pi^3*b^5*d^5*log(abs(F))^2 - 160*pi^2*b^5*d^5*log(abs(F))^
3 + 80*I*pi*b^5*d^5*log(abs(F))^4 + 32*b^5*d^5*log(abs(F))^5))*e^(b*d*x*log
(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.21 (sec) , antiderivative size = 196, normalized size of antiderivative = 0.60

$$\int F^{a+b(c+dx)}x^2(e+fx)^2\,dx$$
$$= \frac{F^{a+b\,c+b\,d\,x}\,\left(b^4\,d^4\,e^2\,x^2\,\ln\left(F\right)^4+2\,b^4\,d^4\,e\,f\,x^3\,\ln\left(F\right)^4+b^4\,d^4\,f^2\,x^4\,\ln\left(F\right)^4-2\,b^3\,d^3\,e^2\,x\,\ln\left(F\right)^3-6\,b^3\,d^3\,e\,f}{}$$

```
[In] int(F^(a + b*(c + d*x))*x^2*(e + f*x)^2,x)
```

```
[Out] (F^(a + b*c + b*d*x)*(24*f^2 + 2*b^2*d^2*e^2*log(F)^2 - 24*b*d*f^2*x*log(F)
 - 2*b^3*d^3*e^2*x*log(F)^3 + b^4*d^4*e^2*x^2*log(F)^4 + 12*b^2*d^2*f^2*x^2
*log(F)^2 - 4*b^3*d^3*f^2*x^3*log(F)^3 + b^4*d^4*f^2*x^4*log(F)^4 - 12*b*d*
e*f*log(F) + 12*b^2*d^2*e*f*x*log(F)^2 - 6*b^3*d^3*e*f*x^2*log(F)^3 + 2*b^4
*d^4*e*f*x^3*log(F)^4))/(b^5*d^5*log(F)^5)
```

3.67 $\int F^{a+b(c+dx)}x(e+fx)^2\,dx$

Optimal result

Integrand size = 20, antiderivative size = 242

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx=-\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{6f^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)}-\frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)}-\frac{3f^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)}+\frac{e^2F^{a+bc+bdx}x}{bd\log(F)}+\frac{2efF^{a+bc+bdx}x^2}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x^3}{bd\log(F)}$$

```
[Out] -6*f^2*F^(b*d*x+b*c+a)/b^4/d^4/ln(F)^4+4*e*f*F^(b*d*x+b*c+a)/b^3/d^3/ln(F)^
3+6*f^2*F^(b*d*x+b*c+a)*x/b^3/d^3/ln(F)^3-e^2*F^(b*d*x+b*c+a)/b^2/d^2/ln(F)
^2-4*e*f*F^(b*d*x+b*c+a)*x/b^2/d^2/ln(F)^2-3*f^2*F^(b*d*x+b*c+a)*x^2/b^2/d^
2/ln(F)^2+e^2*F^(b*d*x+b*c+a)*x/b/d/ln(F)+2*e*f*F^(b*d*x+b*c+a)*x^2/b/d/ln(
F)+f^2*F^(b*d*x+b*c+a)*x^3/b/d/ln(F)
```

Rubi [A] (verified)

Time = 0.23 (sec) , antiderivative size = 242, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.150, Rules used = {2227, 2207, 2225}

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx=-\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)}+\frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)}+\frac{6f^2xF^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{4efxF^{a+bc+bdx}}{b^2d^2\log^2(F)}-\frac{3f^2x^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{e^2xF^{a+bc+bdx}}{bd\log(F)}+\frac{2efx^2F^{a+bc+bdx}}{bd\log(F)}+\frac{f^2x^3F^{a+bc+bdx}}{bd\log(F)}$$

```
[In] Int[F^(a + b*(c + d*x))*x*(e + f*x)^2,x]
```

```
[Out] (-6*f^2*F^(a + b*c + b*d*x))/(b^4*d^4*Log[F]^4) + (4*e*f*F^(a + b*c + b*d*x
))/(b^3*d^3*Log[F]^3) + (6*f^2*F^(a + b*c + b*d*x)*x)/(b^3*d^3*Log[F]^3) -
(e^2*F^(a + b*c + b*d*x))/(b^2*d^2*Log[F]^2) - (4*e*f*F^(a + b*c + b*d*x)*x
)/(b^2*d^2*Log[F]^2) - (3*f^2*F^(a + b*c + b*d*x)*x^2)/(b^2*d^2*Log[F]^2) +
 (e^2*F^(a + b*c + b*d*x)*x)/(b*d*Log[F]) + (2*e*f*F^(a + b*c + b*d*x)*x^2)
/(b*d*Log[F]) + (f^2*F^(a + b*c + b*d*x)*x^3)/(b*d*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(e^2 F^{a+bc+bdx} x + 2ef F^{a+bc+bdx} x^2 + f^2 F^{a+bc+bdx} x^3\right) dx \\
&= e^2 \int F^{a+bc+bdx} x \, dx + (2ef) \int F^{a+bc+bdx} x^2 \, dx + f^2 \int F^{a+bc+bdx} x^3 \, dx \\
&= \frac{e^2 F^{a+bc+bdx} x}{bd \log(F)} + \frac{2ef F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^3}{bd \log(F)} - \frac{e^2 \int F^{a+bc+bdx} \, dx}{bd \log(F)} \\
&\quad - \frac{(4ef) \int F^{a+bc+bdx} x \, dx}{bd \log(F)} - \frac{(3f^2) \int F^{a+bc+bdx} x^2 \, dx}{bd \log(F)} \\
&= -\frac{e^2 F^{a+bc+bdx}}{b^2 d^2 \log^2(F)} - \frac{4ef F^{a+bc+bdx} x}{b^2 d^2 \log^2(F)} - \frac{3f^2 F^{a+bc+bdx} x^2}{b^2 d^2 \log^2(F)} + \frac{e^2 F^{a+bc+bdx} x}{bd \log(F)} \\
&\quad + \frac{2ef F^{a+bc+bdx} x^2}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x^3}{bd \log(F)} + \frac{(4ef) \int F^{a+bc+bdx} \, dx}{b^2 d^2 \log^2(F)} + \frac{(6f^2) \int F^{a+bc+bdx} x \, dx}{b^2 d^2 \log^2(F)}
\end{aligned}
$$

$$= \frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{6f^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} - \frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{3f^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^2}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^3}{bd\log(F)} - \frac{(6f^2)\int F^{a+bc+bdx}\,dx}{b^3d^3\log^3(F)}$$

$$= -\frac{6f^2F^{a+bc+bdx}}{b^4d^4\log^4(F)} + \frac{4efF^{a+bc+bdx}}{b^3d^3\log^3(F)} + \frac{6f^2F^{a+bc+bdx}x}{b^3d^3\log^3(F)} - \frac{e^2F^{a+bc+bdx}}{b^2d^2\log^2(F)} - \frac{4efF^{a+bc+bdx}x}{b^2d^2\log^2(F)} - \frac{3f^2F^{a+bc+bdx}x^2}{b^2d^2\log^2(F)} + \frac{e^2F^{a+bc+bdx}x}{bd\log(F)} + \frac{2efF^{a+bc+bdx}x^2}{bd\log(F)} + \frac{f^2F^{a+bc+bdx}x^3}{bd\log(F)}$$

Mathematica [A] (verified)

Time = 0.21 (sec) , antiderivative size = 91, normalized size of antiderivative = 0.38

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx = \frac{F^{a+b(c+dx)}\left(-6f^2+2bdf(2e+3fx)\log(F)-b^2d^2(e^2+4efx+3f^2x^2)\log^2(F)+b^3d^3x(e+fx)^2\log^3(F)\right)}{b^4d^4\log^4(F)}$$

```
[In] Integrate[F^(a + b*(c + d*x))*x*(e + f*x)^2,x]
```

```
[Out] (F^(a + b*(c + d*x))*(-6*f^2 + 2*b*d*f*(2*e + 3*f*x)*Log[F] - b^2*d^2*(e^2
+ 4*e*f*x + 3*f^2*x^2)*Log[F]^2 + b^3*d^3*x*(e + f*x)^2*Log[F]^3))/(b^4*d^4
*Log[F]^4)
```

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 144, normalized size of antiderivative = 0.60

method	result
gosper	$\frac{\left(\ln(F)^3b^3d^3f^2x^3+2\ln(F)^3b^3d^3ef\,x^2+\ln(F)^3b^3d^3e^2x-3\ln(F)^2b^2d^2f^2x^2-4\ln(F)^2b^2d^2efx-\ln(F)^2b^2d^2e^2+6\ln(F)bd\,f^2x+4e\right.}{\ln(F)^4b^4d^4}$
risch	$\frac{\left(\ln(F)^3b^3d^3f^2x^3+2\ln(F)^3b^3d^3ef\,x^2+\ln(F)^3b^3d^3e^2x-3\ln(F)^2b^2d^2f^2x^2-4\ln(F)^2b^2d^2efx-\ln(F)^2b^2d^2e^2+6\ln(F)bd\,f^2x+4e\right.}{\ln(F)^4b^4d^4}$
meijerg	$\frac{F^{cb+a}f^2\left(6-\frac{\left(-4b^3d^3x^3\ln(F)^3+12b^2d^2x^2\ln(F)^2-24bdx\ln(F)+24\right)e^{bdx\ln(F)}}{4}\right)}{\ln(F)^4b^4d^4}-\frac{2F^{cb+a}fe\left(2-\frac{\left(3b^2d^2x^2\ln(F)^2-6bdx\ln(F)+6\right)e^{b}}{3}\right.}{b^3d^3\ln(F)^3}$
norman	$\frac{f^2x^3e^{(a+b(dx+c))\ln(F)}}{bd\ln(F)}+\frac{\left(\ln(F)^2b^2d^2e^2-4ef\ln(F)bd+6f^2\right)x\,e^{(a+b(dx+c))\ln(F)}}{\ln(F)^3b^3d^3}+\frac{f(2\ln(F)bde-3f)x^2e^{(a+b(dx+c))\ln(F)}}{\ln(F)^2b^2d^2}$
parallelrisch	$\frac{\ln(F)^3x^3F^{bdx+cb+a}b^3d^3f^2+2\ln(F)^3x^2F^{bdx+cb+a}b^3d^3ef+\ln(F)^3x\,F^{bdx+cb+a}b^3d^3e^2-3\ln(F)^2x^2F^{bdx+cb+a}b^2d^2f^2-4\ln(F)^2}{\ln(F)^4b^4d^4}$

```
[In] int(F^(a+b*(d*x+c))*x*(f*x+e)^2,x,method=_RETURNVERBOSE)
```

[Out] (ln(F)^3*b^3*d^3*f^2*x^3+2*ln(F)^3*b^3*d^3*e*f*x^2+ln(F)^3*b^3*d^3*e^2*x-3*
ln(F)^2*b^2*d^2*f^2*x^2-4*ln(F)^2*b^2*d^2*e*f*x-ln(F)^2*b^2*d^2*e^2+6*ln(F)
*b*d*f^2*x+4*e*f*ln(F)*b*d-6*f^2)*F^(b*d*x+b*c+a)/ln(F)^4/b^4/d^4

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 132, normalized size of antiderivative = 0.55

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx$$
$$=\frac{\left((b^3d^3f^2x^3+2\,b^3d^3efx^2+b^3d^3e^2x)\log{(F)}^3-(3\,b^2d^2f^2x^2+4\,b^2d^2efx+b^2d^2e^2)\log{(F)}^2-6\,f^2+2\,(3\,b\right.}{b^4d^4\log{(F)}^4}$$

[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="fricas")

[Out] ((b^3*d^3*f^2*x^3 + 2*b^3*d^3*e*f*x^2 + b^3*d^3*e^2*x)*log(F)^3 - (3*b^2*d^
2*f^2*x^2 + 4*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 - 6*f^2 + 2*(3*b*d*f^2*
x + 2*b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^4*d^4*log(F)^4)

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 199, normalized size of antiderivative = 0.82

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx$$
$$=\begin{cases}\frac{F^{a+b(c+dx)}\left(b^3d^3e^2x\log{(F)}^3+2b^3d^3efx^2\log{(F)}^3+b^3d^3f^2x^3\log{(F)}^3-b^2d^2e^2\log{(F)}^2-4b^2d^2efx\log{(F)}^2-3b^2d^2f^2x^2\log{(F)}^2+4bdef\log{(\right.}{b^4d^4\log{(F)}^4} \\ \frac{e^2x^2}{2}+\frac{2efx^3}{3}+\frac{f^2x^4}{4}\end{cases}$$

[In] integrate(F**(a+b*(d*x+c))*x*(f*x+e)**2,x)

[Out] Piecewise((F**(a + b*(c + d*x))*(b**3*d**3*e**2*x*log(F)**3 + 2*b**3*d**3*e
*f*x**2*log(F)**3 + b**3*d**3*f**2*x**3*log(F)**3 - b**2*d**2*e**2*log(F)**
2 - 4*b**2*d**2*e*f*x*log(F)**2 - 3*b**2*d**2*f**2*x**2*log(F)**2 + 4*b*d*e
*f*log(F) + 6*b*d*f**2*x*log(F) - 6*f**2)/(b**4*d**4*log(F)**4), Ne(b**4*d*
*4*log(F)**4, 0)), (e**2*x**2/2 + 2*e*f*x**3/3 + f**2*x**4/4, True))

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 196, normalized size of antiderivative = 0.81

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx = \frac{\left(F^{bc+a}bdx\log\left(F\right)-F^{bc+a}\right)F^{bdx}e^2}{b^2d^2\log\left(F\right)^2} + \frac{2\left(F^{bc+a}b^2d^2x^2\log\left(F\right)^2-2\,F^{bc+a}bdx\log\left(F\right)+2\,F^{bc+a}\right)F^{bdx}ef}{b^3d^3\log\left(F\right)^3} + \frac{\left(F^{bc+a}b^3d^3x^3\log\left(F\right)^3-3\,F^{bc+a}b^2d^2x^2\log\left(F\right)^2+6\,F^{bc+a}bdx\log\left(F\right)-6\,F^{bc+a}\right)F^{bdx}f^2}{b^4d^4\log\left(F\right)^4}$$

```
[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] (F^(b*c + a)*b*d*x*log(F) - F^(b*c + a))*F^(b*d*x)*e^2/(b^2*d^2*log(F)^2) +
 2*(F^(b*c + a)*b^2*d^2*x^2*log(F)^2 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*
c + a))*F^(b*d*x)*e*f/(b^3*d^3*log(F)^3) + (F^(b*c + a)*b^3*d^3*x^3*log(F)^
3 - 3*F^(b*c + a)*b^2*d^2*x^2*log(F)^2 + 6*F^(b*c + a)*b*d*x*log(F) - 6*F^(
b*c + a))*F^(b*d*x)*f^2/(b^4*d^4*log(F)^4)
```

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.45 (sec) , antiderivative size = 4114, normalized size of antiderivative = 17.00

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx = \text{Too large to display}$$

```
[In] integrate(F^(a+b*(d*x+c))*x*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] -(((3*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*f^2*x^3*log(
abs(F)) + 2*b^3*d^3*f^2*x^3*log(abs(F))^3 + 6*pi^2*b^3*d^3*e*f*x^2*log(abs(
F))*sgn(F) - 6*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) + 4*b^3*d^3*e*f*x^2*log(abs
(F))^3 + 3*pi^2*b^3*d^3*e^2*x*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*e^2*x*log
(abs(F)) + 2*b^3*d^3*e^2*x*log(abs(F))^3 - 3*pi^2*b^2*d^2*f^2*x^2*sgn(F) +
3*pi^2*b^2*d^2*f^2*x^2 - 6*b^2*d^2*f^2*x^2*log(abs(F))^2 - 4*pi^2*b^2*d^2*e
*f*x*sgn(F) + 4*pi^2*b^2*d^2*e*f*x - 8*b^2*d^2*e*f*x*log(abs(F))^2 - pi^2*b
^2*d^2*e^2*sgn(F) + pi^2*b^2*d^2*e^2 - 2*b^2*d^2*e^2*log(abs(F))^2 + 12*b*d
*f^2*x*log(abs(F)) + 8*b*d*e*f*log(abs(F)) - 12*f^2)*(pi^4*b^4*d^4*sgn(F) -
 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(ab
s(F))^2 - 2*b^4*d^4*log(abs(F))^4)/((pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*l
```

og(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d
^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(
abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)^2)
- 4*(pi^3*b^3*d^3*f^2*x^3*sgn(F) - 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F
) - pi^3*b^3*d^3*f^2*x^3 + 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 2*pi^3*b^3*
d^3*e*f*x^2*sgn(F) - 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) - 2*pi^3*b^3
*d^3*e*f*x^2 + 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 + pi^3*b^3*d^3*e^2*x*sgn(
F) - 3*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*e^2*x + 3*pi*b^
3*d^3*e^2*x*log(abs(F))^2 + 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 6*pi*
b^2*d^2*f^2*x^2*log(abs(F)) + 8*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) - 8*pi*
b^2*d^2*e*f*x*log(abs(F)) + 2*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - 2*pi*b^2*
d^2*e^2*log(abs(F)) - 6*pi*b*d*f^2*x*sgn(F) + 6*pi*b*d*f^2*x - 4*pi*b*d*e*f
*sgn(F) + 4*pi*b*d*e*f)*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(a
bs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi
^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*
pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*
log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs
(F)) + pi*b^4*d^4*log(abs(F))^3)^2))*cos(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*
x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a) - ((pi^3*b
^3*d^3*f^2*x^3*sgn(F) - 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - pi^3*b^
3*d^3*f^2*x^3 + 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 2*pi^3*b^3*d^3*e*f*x^2
*sgn(F) - 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) - 2*pi^3*b^3*d^3*e*f*x^
2 + 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 + pi^3*b^3*d^3*e^2*x*sgn(F) - 3*pi*b
^3*d^3*e^2*x*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*e^2*x + 3*pi*b^3*d^3*e^2*x
*log(abs(F))^2 + 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - 6*pi*b^2*d^2*f^2
*x^2*log(abs(F)) + 8*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) - 8*pi*b^2*d^2*e*f
*x*log(abs(F)) + 2*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - 2*pi*b^2*d^2*e^2*log
(abs(F)) - 6*pi*b*d*f^2*x*sgn(F) + 6*pi*b*d*f^2*x - 4*pi*b*d*e*f*sgn(F) + 4
*pi*b*d*e*f)*(pi^4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - p
i^4*b^4*d^4 + 6*pi^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)/((pi^
4*b^4*d^4*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*p
i^2*b^4*d^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*l
og(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(
F)) + pi*b^4*d^4*log(abs(F))^3)^2) + 4*(3*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*
sgn(F) - 3*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 2*b^3*d^3*f^2*x^3*log(abs(F))
^3 + 6*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) - 6*pi^2*b^3*d^3*e*f*x^2*log
(abs(F)) + 4*b^3*d^3*e*f*x^2*log(abs(F))^3 + 3*pi^2*b^3*d^3*e^2*x*log(abs(F
))*sgn(F) - 3*pi^2*b^3*d^3*e^2*x*log(abs(F)) + 2*b^3*d^3*e^2*x*log(abs(F))^
3 - 3*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 3*pi^2*b^2*d^2*f^2*x^2 - 6*b^2*d^2*f^2*
x^2*log(abs(F))^2 - 4*pi^2*b^2*d^2*e*f*x*sgn(F) + 4*pi^2*b^2*d^2*e*f*x - 8*
b^2*d^2*e*f*x*log(abs(F))^2 - pi^2*b^2*d^2*e^2*sgn(F) + pi^2*b^2*d^2*e^2 -
2*b^2*d^2*e^2*log(abs(F))^2 + 12*b*d*f^2*x*log(abs(F)) + 8*b*d*e*f*log(abs(
F)) - 12*f^2)*(pi^3*b^4*d^4*log(abs(F))*sgn(F) - pi*b^4*d^4*log(abs(F))^3*s
gn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*b^4*d^4*log(abs(F))^3)/((pi^4*b^4*d^4
*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - pi^4*b^4*d^4 + 6*pi^2*b^4*d

^4*log(abs(F))^2 - 2*b^4*d^4*log(abs(F))^4)^2 + 16*(pi^3*b^4*d^4*log(abs(F)
)*sgn(F) - pi*b^4*d^4*log(abs(F))^3*sgn(F) - pi^3*b^4*d^4*log(abs(F)) + pi*
b^4*d^4*log(abs(F))^3)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi
*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)
) + b*c*log(abs(F)) + a*log(abs(F))) - 1/2*I*((pi^3*b^3*d^3*f^2*x^3*sgn(F)
+ 3*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F))*sgn(F) - 3*pi*b^3*d^3*f^2*x^3*log(ab
s(F))^2*sgn(F) - pi^3*b^3*d^3*f^2*x^3 - 3*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)
) + 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2 + 2*I*b^3*d^3*f^2*x^3*log(abs(F))^3
+ 2*pi^3*b^3*d^3*e*f*x^2*sgn(F) + 6*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(
F) - 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2*sgn(F) - 2*pi^3*b^3*d^3*e*f*x^2 - 6
*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F)) + 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 +
4*I*b^3*d^3*e*f*x^2*log(abs(F))^3 + pi^3*b^3*d^3*e^2*x*sgn(F) + 3*I*pi^2*b^
3*d^3*e^2*x*log(abs(F))*sgn(F) - 3*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) -
pi^3*b^3*d^3*e^2*x - 3*I*pi^2*b^3*d^3*e^2*x*log(abs(F)) + 3*pi*b^3*d^3*e^2*
x*log(abs(F))^2 + 2*I*b^3*d^3*e^2*x*log(abs(F))^3 - 3*I*pi^2*b^2*d^2*f^2*x^
2*sgn(F) + 6*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) + 3*I*pi^2*b^2*d^2*f^2*x
^2 - 6*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 6*I*b^2*d^2*f^2*x^2*log(abs(F))^2 -
 4*I*pi^2*b^2*d^2*e*f*x*sgn(F) + 8*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) + 4*
I*pi^2*b^2*d^2*e*f*x - 8*pi*b^2*d^2*e*f*x*log(abs(F)) - 8*I*b^2*d^2*e*f*x*l
og(abs(F))^2 - I*pi^2*b^2*d^2*e^2*sgn(F) + 2*pi*b^2*d^2*e^2*log(abs(F))*sgn
(F) + I*pi^2*b^2*d^2*e^2 - 2*pi*b^2*d^2*e^2*log(abs(F)) - 2*I*b^2*d^2*e^2*l
og(abs(F))^2 - 6*pi*b*d*f^2*x*sgn(F) + 6*pi*b*d*f^2*x + 12*I*b*d*f^2*x*log(
abs(F)) - 4*pi*b*d*e*f*sgn(F) + 4*pi*b*d*e*f + 8*I*b*d*e*f*log(abs(F)) - 12
*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F) - 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1
/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) - 1/2*I*pi*a)/(pi^4*b^4*d^4*sgn(F) + 4*I*pi
^3*b^4*d^4*log(abs(F))*sgn(F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) - 4*I*p
i*b^4*d^4*log(abs(F))^3*sgn(F) - pi^4*b^4*d^4 - 4*I*pi^3*b^4*d^4*log(abs(F)
) + 6*pi^2*b^4*d^4*log(abs(F))^2 + 4*I*pi*b^4*d^4*log(abs(F))^3 - 2*b^4*d^4
*log(abs(F))^4) + (pi^3*b^3*d^3*f^2*x^3*sgn(F) - 3*I*pi^2*b^3*d^3*f^2*x^3*l
og(abs(F))*sgn(F) - 3*pi*b^3*d^3*f^2*x^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^
3*f^2*x^3 + 3*I*pi^2*b^3*d^3*f^2*x^3*log(abs(F)) + 3*pi*b^3*d^3*f^2*x^3*log
(abs(F))^2 - 2*I*b^3*d^3*f^2*x^3*log(abs(F))^3 + 2*pi^3*b^3*d^3*e*f*x^2*sgn
(F) - 6*I*pi^2*b^3*d^3*e*f*x^2*log(abs(F))*sgn(F) - 6*pi*b^3*d^3*e*f*x^2*lo
g(abs(F))^2*sgn(F) - 2*pi^3*b^3*d^3*e*f*x^2 + 6*I*pi^2*b^3*d^3*e*f*x^2*log(
abs(F)) + 6*pi*b^3*d^3*e*f*x^2*log(abs(F))^2 - 4*I*b^3*d^3*e*f*x^2*log(abs(
F))^3 + pi^3*b^3*d^3*e^2*x*sgn(F) - 3*I*pi^2*b^3*d^3*e^2*x*log(abs(F))*sgn(
F) - 3*pi*b^3*d^3*e^2*x*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3*e^2*x + 3*I*pi^
2*b^3*d^3*e^2*x*log(abs(F)) + 3*pi*b^3*d^3*e^2*x*log(abs(F))^2 - 2*I*b^3*d^
3*e^2*x*log(abs(F))^3 + 3*I*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 6*pi*b^2*d^2*f^2*
x^2*log(abs(F))*sgn(F) - 3*I*pi^2*b^2*d^2*f^2*x^2 - 6*pi*b^2*d^2*f^2*x^2*lo
g(abs(F)) + 6*I*b^2*d^2*f^2*x^2*log(abs(F))^2 + 4*I*pi^2*b^2*d^2*e*f*x*sgn(
F) + 8*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) - 4*I*pi^2*b^2*d^2*e*f*x - 8*pi*
b^2*d^2*e*f*x*log(abs(F)) + 8*I*b^2*d^2*e*f*x*log(abs(F))^2 + I*pi^2*b^2*d^
2*e^2*sgn(F) + 2*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - I*pi^2*b^2*d^2*e^2 - 2
*pi*b^2*d^2*e^2*log(abs(F)) + 2*I*b^2*d^2*e^2*log(abs(F))^2 - 6*pi*b*d*f^2*

```
x*sgn(F) + 6*pi*b*d*f^2*x - 12*I*b*d*f^2*x*log(abs(F)) - 4*pi*b*d*e*f*sgn(F
) + 4*pi*b*d*e*f - 8*I*b*d*e*f*log(abs(F)) + 12*I*f^2)*e^(-1/2*I*pi*b*d*x*s
gn(F) + 1/2*I*pi*b*d*x - 1/2*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sg
n(F) + 1/2*I*pi*a)/(pi^4*b^4*d^4*sgn(F) - 4*I*pi^3*b^4*d^4*log(abs(F))*sgn(
F) - 6*pi^2*b^4*d^4*log(abs(F))^2*sgn(F) + 4*I*pi*b^4*d^4*log(abs(F))^3*sgn
(F) - pi^4*b^4*d^4 + 4*I*pi^3*b^4*d^4*log(abs(F)) + 6*pi^2*b^4*d^4*log(abs(
F))^2 - 4*I*pi*b^4*d^4*log(abs(F))^3 - 2*b^4*d^4*log(abs(F))^4))*e^(b*d*x*l
og(abs(F)) + b*c*log(abs(F)) + a*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 143, normalized size of antiderivative = 0.59

$$\int F^{a+b(c+dx)}x(e+fx)^2\,dx = \frac{F^{a+b\,c+b\,d\,x}\,\left(b^3\,d^3\,e^2\,x\ln\left(F\right)^3+2\,b^3\,d^3\,e\,f\,x^2\ln\left(F\right)^3+b^3\,d^3\,f^2\,x^3\ln\left(F\right)^3-b^2\,d^2\,e^2\ln\left(F\right)^2-4\,b^2\,d^2\,e\,f\,x\ln}{b^4\,d^4\ln\left(F\right)^4}$$

```
[In] int(F^(a + b*(c + d*x))*x*(e + f*x)^2,x)
```

```
[Out] (F^(a + b*c + b*d*x)*(6*b*d*f^2*x*log(F) - b^2*d^2*e^2*log(F)^2 - 6*f^2 + b
^3*d^3*e^2*x*log(F)^3 - 3*b^2*d^2*f^2*x^2*log(F)^2 + b^3*d^3*f^2*x^3*log(F)
^3 + 4*b*d*e*f*log(F) - 4*b^2*d^2*e*f*x*log(F)^2 + 2*b^3*d^3*e*f*x^2*log(F)
^3))/(b^4*d^4*log(F)^4)
```

3.68 $\int F^{a+b(c+dx)}(e+fx)^2\,dx$

Optimal result

Integrand size = 19, antiderivative size = 85

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx=\frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{2fF^{a+bc+bdx}(e+fx)}{b^2d^2\log^2(F)}+\frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)}$$

```
[Out] 2*f^2*F^(b*d*x+b*c+a)/b^3/d^3/ln(F)^3-2*f*F^(b*d*x+b*c+a)*(f*x+e)/b^2/d^2/l
n(F)^2+F^(b*d*x+b*c+a)*(f*x+e)^2/b/d/ln(F)
```

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.158, Rules used = {2218, 2207, 2225}

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx=\frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)}-\frac{2f(e+fx)F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{(e+fx)^2F^{a+bc+bdx}}{bd\log(F)}$$

```
[In] Int[F^(a + b*(c + d*x))*(e + f*x)^2,x]
```

```
[Out] (2*f^2*F^(a + b*c + b*d*x))/(b^3*d^3*Log[F]^3) - (2*f*F^(a + b*c + b*d*x)*(
e + f*x))/(b^2*d^2*Log[F]^2) + (F^(a + b*c + b*d*x)*(e + f*x)^2)/(b*d*Log[F
])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2218

```
Int[((a_.) + (b_.)*((F_)^((g_.)*(v_)))^(n_.))^(p_.)*(u_)^(m_.), x_Symbol] :
> Int[NormalizePowerOfLinear[u, x]^m*(a + b*(F^(g*ExpandToSum[v, x]))^n)^p,
 x] /; FreeQ[{F, a, b, g, n, p}, x] && LinearQ[v, x] && PowerOfLinearQ[u, x
] &&  !(LinearMatchQ[v, x] && PowerOfLinearMatchQ[u, x]) && IntegerQ[m]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \int F^{a+bc+bdx}(e+fx)^2\,dx\\ &= \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)} - \frac{(2f)\int F^{a+bc+bdx}(e+fx)\,dx}{bd\log(F)}\\ &= -\frac{2fF^{a+bc+bdx}(e+fx)}{b^2d^2\log^2(F)} + \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)} + \frac{(2f^2)\int F^{a+bc+bdx}\,dx}{b^2d^2\log^2(F)}\\ &= \frac{2f^2F^{a+bc+bdx}}{b^3d^3\log^3(F)} - \frac{2fF^{a+bc+bdx}(e+fx)}{b^2d^2\log^2(F)} + \frac{F^{a+bc+bdx}(e+fx)^2}{bd\log(F)}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.17 (sec) , antiderivative size = 58, normalized size of antiderivative = 0.68

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx = \frac{F^{a+b(c+dx)}\left(2f^2-2bdf(e+fx)\log(F)+b^2d^2(e+fx)^2\log^2(F)\right)}{b^3d^3\log^3(F)}$$

```
[In] Integrate[F^(a + b*(c + d*x))*(e + f*x)^2,x]
[Out] (F^(a + b*(c + d*x))*(2*f^2 - 2*b*d*f*(e + f*x)*Log[F] + b^2*d^2*(e + f*x)^
2*Log[F]^2))/(b^3*d^3*Log[F]^3)
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 93, normalized size of antiderivative = 1.09

method	result
gosper	$\frac{\left(\ln(F)^2 b^2 d^2 f^2 x^2+2\ln(F)^2 b^2 d^2 efx+\ln(F)^2 b^2 d^2 e^2-2\ln(F) bd\, f^2 x-2ef\ln(F) bd+2f^2\right) F^{bdx+cb+a}}{b^3 d^3 \ln(F)^3}$
risch	$\frac{\left(\ln(F)^2 b^2 d^2 f^2 x^2+2\ln(F)^2 b^2 d^2 efx+\ln(F)^2 b^2 d^2 e^2-2\ln(F) bd\, f^2 x-2ef\ln(F) bd+2f^2\right) F^{bdx+cb+a}}{b^3 d^3 \ln(F)^3}$
norman	$\frac{\left(\ln(F)^2 b^2 d^2 e^2-2ef\ln(F) bd+2f^2\right) e^{(a+b(dx+c))\ln(F)}}{b^3 d^3 \ln(F)^3}+\frac{f^2 x^2 e^{(a+b(dx+c))\ln(F)}}{bd\ln(F)}+\frac{2f(\ln(F) bde-f)x\, e^{(a+b(dx+c))\ln(F)}}{b^2 d^2 \ln(F)^2}$
meijerg	$-\frac{F^{cb+a} f^2 \left(2-\frac{\left(3b^2 d^2 x^2 \ln(F)^2-6bdx\ln(F)+6\right) e^{bdx\ln(F)}}{3}\right)}{b^3 d^3 \ln(F)^3}+\frac{2F^{cb+a} fe\left(1-\frac{(-2bdx\ln(F)+2) e^{bdx\ln(F)}}{2}\right)}{b^2 d^2 \ln(F)^2}-\frac{F^{cb+a} e^2 (1-e^{bdx\ln}}{bd\ln(F)}$
parallelrisch	$\frac{\ln(F)^2 x^2 F^{bdx+cb+a} b^2 d^2 f^2+2\ln(F)^2 x F^{bdx+cb+a} b^2 d^2 ef+\ln(F)^2 F^{bdx+cb+a} b^2 d^2 e^2-2\ln(F) x F^{bdx+cb+a} bd f^2-2\ln(F) F^{bdx+c}}{b^3 d^3 \ln(F)^3}$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2,x,method=_RETURNVERBOSE)
[Out] (ln(F)^2*b^2*d^2*f^2*x^2+2*ln(F)^2*b^2*d^2*e*f*x+ln(F)^2*b^2*d^2*e^2-2*ln(F
)*b*d*f^2*x-2*e*f*ln(F)*b*d+2*f^2)*F^(b*d*x+b*c+a)/b^3/d^3/ln(F)^3
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.00

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx = \frac{\left((b^2d^2f^2x^2+2\,b^2d^2efx+b^2d^2e^2)\log(F)^2+2\,f^2-2\,(bdf^2x+bdef)\log(F)\right)F^{bdx+bc+a}}{b^3d^3\log(F)^3}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="fricas")
[Out] ((b^2*d^2*f^2*x^2 + 2*b^2*d^2*e*f*x + b^2*d^2*e^2)*log(F)^2 + 2*f^2 - 2*(b*
d*f^2*x + b*d*e*f)*log(F))*F^(b*d*x + b*c + a)/(b^3*d^3*log(F)^3)
```

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 134, normalized size of antiderivative = 1.58

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx$$
$$=\begin{cases}\frac{F^{a+b(c+dx)}\left(b^2d^2e^2\log{(F)}^2+2b^2d^2efx\log{(F)}^2+b^2d^2f^2x^2\log{(F)}^2-2bdef\log{(F)}-2bdf^2x\log{(F)}+2f^2\right)}{b^3d^3\log{(F)}^3} & \text{for } b^3d^3\log{(F)}^3\neq 0\\ e^2x+efx^2+\frac{f^2x^3}{3} & \text{otherwise}\end{cases}$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2,x)
```

```
[Out] Piecewise((F**(a + b*(c + d*x))*(b**2*d**2*e**2*log(F)**2 + 2*b**2*d**2*e*f
*x*log(F)**2 + b**2*d**2*f**2*x**2*log(F)**2 - 2*b*d*e*f*log(F) - 2*b*d*f**
2*x*log(F) + 2*f**2)/(b**3*d**3*log(F)**3), Ne(b**3*d**3*log(F)**3, 0)), (e
**2*x + e*f*x**2 + f**2*x**3/3, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 134, normalized size of antiderivative = 1.58

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx=\frac{F^{bdx+bc+a}e^2}{bd\log{(F)}}+\frac{2\left(F^{bc+a}bdx\log{(F)}-F^{bc+a}\right)F^{bdx}ef}{b^2d^2\log{(F)}^2}+\frac{\left(F^{bc+a}b^2d^2x^2\log{(F)}^2-2\,F^{bc+a}bdx\log{(F)}+2\,F^{bc+a}\right)F^{bdx}f^2}{b^3d^3\log{(F)}^3}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="maxima")
```

```
[Out] F^(b*d*x + b*c + a)*e^2/(b*d*log(F)) + 2*(F^(b*c + a)*b*d*x*log(F) - F^(b*c
 + a))*F^(b*d*x)*e*f/(b^2*d^2*log(F)^2) + (F^(b*c + a)*b^2*d^2*x^2*log(F)^2
 - 2*F^(b*c + a)*b*d*x*log(F) + 2*F^(b*c + a))*F^(b*d*x)*f^2/(b^3*d^3*log(F
)^3)
```

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.46 (sec) , antiderivative size = 2264, normalized size of antiderivative = 26.64

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx=\text{Too large to display}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2,x, algorithm="giac")
```

```
[Out] -((2*(pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - pi*b^2*d^2*f^2*x^2*log(abs(F)
) + 2*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) - 2*pi*b^2*d^2*e*f*x*log(abs(F))
+ pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - pi*b^2*d^2*e^2*log(abs(F)) - pi*b*d*f
^2*x*sgn(F) + pi*b*d*f^2*x - pi*b*d*e*f*sgn(F) + pi*b*d*e*f)*(pi^3*b^3*d^3*
sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*lo
g(abs(F))^2)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi
^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sg
n(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2) - (pi^2*b^2
*d^2*f^2*x^2*sgn(F) - pi^2*b^2*d^2*f^2*x^2 + 2*b^2*d^2*f^2*x^2*log(abs(F))^
2 + 2*pi^2*b^2*d^2*e*f*x*sgn(F) - 2*pi^2*b^2*d^2*e*f*x + 4*b^2*d^2*e*f*x*lo
g(abs(F))^2 + pi^2*b^2*d^2*e^2*sgn(F) - pi^2*b^2*d^2*e^2 + 2*b^2*d^2*e^2*lo
g(abs(F))^2 - 4*b*d*f^2*x*log(abs(F)) - 4*b*d*e*f*log(abs(F)) + 4*f^2)*(3*p
i^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log
(abs(F))^3)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^
3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn
(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3)^2))*cos(-1/2*pi
*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*b*c - 1/2*pi*a*sg
n(F) + 1/2*pi*a) - ((pi^2*b^2*d^2*f^2*x^2*sgn(F) - pi^2*b^2*d^2*f^2*x^2 + 2
*b^2*d^2*f^2*x^2*log(abs(F))^2 + 2*pi^2*b^2*d^2*e*f*x*sgn(F) - 2*pi^2*b^2*d
^2*e*f*x + 4*b^2*d^2*e*f*x*log(abs(F))^2 + pi^2*b^2*d^2*e^2*sgn(F) - pi^2*b
^2*d^2*e^2 + 2*b^2*d^2*e^2*log(abs(F))^2 - 4*b*d*f^2*x*log(abs(F)) - 4*b*d*
e*f*log(abs(F)) + 4*f^2)*(pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F))^2*
sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)/((pi^3*b^3*d^3*sgn(F) -
 3*pi*b^3*d^3*log(abs(F))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F)
)^2)^2 + (3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) +
2*b^3*d^3*log(abs(F))^3)^2) + 2*(pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) - pi
*b^2*d^2*f^2*x^2*log(abs(F)) + 2*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) - 2*pi
*b^2*d^2*e*f*x*log(abs(F)) + pi*b^2*d^2*e^2*log(abs(F))*sgn(F) - pi*b^2*d^2
*e^2*log(abs(F)) - pi*b*d*f^2*x*sgn(F) + pi*b*d*f^2*x - pi*b*d*e*f*sgn(F) +
 pi*b*d*e*f)*(3*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)
) + 2*b^3*d^3*log(abs(F))^3)/((pi^3*b^3*d^3*sgn(F) - 3*pi*b^3*d^3*log(abs(F
))^2*sgn(F) - pi^3*b^3*d^3 + 3*pi*b^3*d^3*log(abs(F))^2)^2 + (3*pi^2*b^3*d^
3*log(abs(F))*sgn(F) - 3*pi^2*b^3*d^3*log(abs(F)) + 2*b^3*d^3*log(abs(F))^3
)^2))*sin(-1/2*pi*b*d*x*sgn(F) + 1/2*pi*b*d*x - 1/2*pi*b*c*sgn(F) + 1/2*pi*
b*c - 1/2*pi*a*sgn(F) + 1/2*pi*a))*e^(b*d*x*log(abs(F)) + b*c*log(abs(F)) +
 a*log(abs(F))) - 2*I*((-I*pi^2*b^2*d^2*f^2*x^2*sgn(F) + 2*pi*b^2*d^2*f^2*x
^2*log(abs(F))*sgn(F) + I*pi^2*b^2*d^2*f^2*x^2 - 2*pi*b^2*d^2*f^2*x^2*log(a
bs(F)) - 2*I*b^2*d^2*f^2*x^2*log(abs(F))^2 - 2*I*pi^2*b^2*d^2*e*f*x*sgn(F)
+ 4*pi*b^2*d^2*e*f*x*log(abs(F))*sgn(F) + 2*I*pi^2*b^2*d^2*e*f*x - 4*pi*b^2
*d^2*e*f*x*log(abs(F)) - 4*I*b^2*d^2*e*f*x*log(abs(F))^2 - I*pi^2*b^2*d^2*e
^2*sgn(F) + 2*pi*b^2*d^2*e^2*log(abs(F))*sgn(F) + I*pi^2*b^2*d^2*e^2 - 2*pi
*b^2*d^2*e^2*log(abs(F)) - 2*I*b^2*d^2*e^2*log(abs(F))^2 - 2*pi*b*d*f^2*x*s
gn(F) + 2*pi*b*d*f^2*x + 4*I*b*d*f^2*x*log(abs(F)) - 2*pi*b*d*e*f*sgn(F) +
2*pi*b*d*e*f + 4*I*b*d*e*f*log(abs(F)) - 4*I*f^2)*e^(1/2*I*pi*b*d*x*sgn(F)
- 1/2*I*pi*b*d*x + 1/2*I*pi*b*c*sgn(F) - 1/2*I*pi*b*c + 1/2*I*pi*a*sgn(F) -
```

```
 1/2*I*pi*a)/(-4*I*pi^3*b^3*d^3*sgn(F) + 12*pi^2*b^3*d^3*log(abs(F))*sgn(F)
 + 12*I*pi*b^3*d^3*log(abs(F))^2*sgn(F) + 4*I*pi^3*b^3*d^3 - 12*pi^2*b^3*d^
3*log(abs(F)) - 12*I*pi*b^3*d^3*log(abs(F))^2 + 8*b^3*d^3*log(abs(F))^3) -
(-I*pi^2*b^2*d^2*f^2*x^2*sgn(F) - 2*pi*b^2*d^2*f^2*x^2*log(abs(F))*sgn(F) +
 I*pi^2*b^2*d^2*f^2*x^2 + 2*pi*b^2*d^2*f^2*x^2*log(abs(F)) - 2*I*b^2*d^2*f^
2*x^2*log(abs(F))^2 - 2*I*pi^2*b^2*d^2*e*f*x*sgn(F) - 4*pi*b^2*d^2*e*f*x*lo
g(abs(F))*sgn(F) + 2*I*pi^2*b^2*d^2*e*f*x + 4*pi*b^2*d^2*e*f*x*log(abs(F))
- 4*I*b^2*d^2*e*f*x*log(abs(F))^2 - I*pi^2*b^2*d^2*e^2*sgn(F) - 2*pi*b^2*d^
2*e^2*log(abs(F))*sgn(F) + I*pi^2*b^2*d^2*e^2 + 2*pi*b^2*d^2*e^2*log(abs(F)
) - 2*I*b^2*d^2*e^2*log(abs(F))^2 + 2*pi*b*d*f^2*x*sgn(F) - 2*pi*b*d*f^2*x
+ 4*I*b*d*f^2*x*log(abs(F)) + 2*pi*b*d*e*f*sgn(F) - 2*pi*b*d*e*f + 4*I*b*d*
e*f*log(abs(F)) - 4*I*f^2)*e^(-1/2*I*pi*b*d*x*sgn(F) + 1/2*I*pi*b*d*x - 1/2
*I*pi*b*c*sgn(F) + 1/2*I*pi*b*c - 1/2*I*pi*a*sgn(F) + 1/2*I*pi*a)/(4*I*pi^3
*b^3*d^3*sgn(F) + 12*pi^2*b^3*d^3*log(abs(F))*sgn(F) - 12*I*pi*b^3*d^3*log(
abs(F))^2*sgn(F) - 4*I*pi^3*b^3*d^3 - 12*pi^2*b^3*d^3*log(abs(F)) + 12*I*pi
*b^3*d^3*log(abs(F))^2 + 8*b^3*d^3*log(abs(F))^3))*e^(b*d*x*log(abs(F)) + b
*c*log(abs(F)) + a*log(abs(F)))
```

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 92, normalized size of antiderivative = 1.08

$$\int F^{a+b(c+dx)}(e+fx)^2\,dx$$
$$=\frac{F^{a+b\,c+b\,d\,x}\,\left(b^2\,d^2\,e^2\ln\left(F\right)^2+2\,b^2\,d^2\,e\,f\,x\ln\left(F\right)^2+b^2\,d^2\,f^2\,x^2\ln\left(F\right)^2-2\,b\,d\,e\,f\,\ln\left(F\right)-2\,b\,d\,f^2\,x\,\ln\left(F\right)\right.}{b^3\,d^3\ln\left(F\right)^3}$$

```
[In] int(F^(a + b*(c + d*x))*(e + f*x)^2,x)
```

```
[Out] (F^(a + b*c + b*d*x)*(2*f^2 + b^2*d^2*e^2*log(F)^2 - 2*b*d*f^2*x*log(F) + b
^2*d^2*f^2*x^2*log(F)^2 - 2*b*d*e*f*log(F) + 2*b^2*d^2*e*f*x*log(F)^2))/(b^
3*d^3*log(F)^3)
```

3.69 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x} \, dx$

Optimal result

Integrand size = 22, antiderivative size = 96

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x} \, dx = e^2 F^{a+bc} \operatorname{ExpIntegralEi}(bdx \log(F)) - \frac{f^2 F^{a+bc+bdx}}{b^2 d^2 \log^2(F)} + \frac{2ef F^{a+bc+bdx}}{bd \log(F)} + \frac{f^2 F^{a+bc+bdx} x}{bd \log(F)}$$

```
[Out] e^2*F^(b*c+a)*Ei(b*d*x*ln(F))-f^2*F^(b*d*x+b*c+a)/b^2/d^2/ln(F)^2+2*e*f*F^(
b*d*x+b*c+a)/b/d/ln(F)+f^2*F^(b*d*x+b*c+a)*x/b/d/ln(F)
```

Rubi [A] (verified)

Time = 0.16 (sec) , antiderivative size = 96, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.182, Rules used = {2230, 2225, 2209, 2207}

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x} \, dx = -\frac{f^2 F^{a+bc+bdx}}{b^2 d^2 \log^2(F)} + e^2 F^{a+bc} \operatorname{ExpIntegralEi}(bdx \log(F)) + \frac{2ef F^{a+bc+bdx}}{bd \log(F)} + \frac{f^2 x F^{a+bc+bdx}}{bd \log(F)}$$

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x,x]
```

```
[Out] e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (f^2*F^(a + b*c + b*d*x))/(b^
2*d^2*Log[F]^2) + (2*e*f*F^(a + b*c + b*d*x))/(b*d*Log[F]) + (f^2*F^(a + b*
c + b*d*x)*x)/(b*d*Log[F])
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(2efF^{a+bc+bdx}+\frac{e^2F^{a+bc+bdx}}{x}+f^2F^{a+bc+bdx}x\right)dx\\
&= e^2\int \frac{F^{a+bc+bdx}}{x}\,dx+(2ef)\int F^{a+bc+bdx}\,dx+f^2\int F^{a+bc+bdx}x\,dx\\
&= e^2F^{a+bc}\text{Ei}(bdx\log(F))+\frac{2efF^{a+bc+bdx}}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x}{bd\log(F)}-\frac{f^2\int F^{a+bc+bdx}\,dx}{bd\log(F)}\\
&= e^2F^{a+bc}\text{Ei}(bdx\log(F))-\frac{f^2F^{a+bc+bdx}}{b^2d^2\log^2(F)}+\frac{2efF^{a+bc+bdx}}{bd\log(F)}+\frac{f^2F^{a+bc+bdx}x}{bd\log(F)}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.27 (sec) , antiderivative size = 54, normalized size of antiderivative = 0.56

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = F^{a+bc}\left(e^2\,\text{ExpIntegralEi}(bdx\log(F)) + \frac{fF^{bdx}(-f+bd(2e+fx)\log(F))}{b^2d^2\log^2(F)}\right)$$

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x,x]
```

```
[Out] F^(a + b*c)*(e^2*ExpIntegralEi[b*d*x*Log[F]] + (f*F^(b*d*x)*(-f + b*d*(2*e
+ f*x)*Log[F]))/(b^2*d^2*Log[F]^2))
```

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 118, normalized size of antiderivative = 1.23

method	result
meijerg	$\frac{F^{cb+a}f^2\left(1-\frac{(-2bdx\ln(F)+2)\mathrm{e}^{bdx\ln(F)}}{2}\right)}{b^2d^2\ln(F)^2}-\frac{2F^{cb+a}fe\left(1-\mathrm{e}^{bdx\ln(F)}\right)}{bd\ln(F)}+F^{cb+a}e^2(\ln(x)+\ln(-bd)+\ln(\ln(F))-\ln$
risch	$-e^2F^{cb}F^a\,\mathrm{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(F))+\frac{F^{bdx}F^{cb+a}f^2x}{\ln(F)bd}+\frac{2F^{bdx}F^{cb+a}ef}{\ln(F)bd}-$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x,x,method=_RETURNVERBOSE)
```

```
[Out] 1/b^2/d^2/ln(F)^2*F^(b*c+a)*f^2*(1-1/2*(-2*b*d*x*ln(F)+2)*exp(b*d*x*ln(F)))
-2*F^(b*c+a)*f*e/b/d/ln(F)*(1-exp(b*d*x*ln(F)))+F^(b*c+a)*e^2*(ln(x)+ln(-b*
d)+ln(ln(F))-ln(-b*d*x*ln(F))-Ei(1,-b*d*x*ln(F)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 75, normalized size of antiderivative = 0.78

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = \frac{F^{bc+a}b^2d^2e^2\mathrm{Ei}(bdx\log(F))\log(F)^2-(f^2-(bdf^2x+2\,bdef)\log(F))F^{bdx+bc+a}}{b^2d^2\log(F)^2}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="fricas")
```

```
[Out] (F^(b*c + a)*b^2*d^2*e^2*Ei(b*d*x*log(F))*log(F)^2 - (f^2 - (b*d*f^2*x + 2*
b*d*e*f)*log(F))*F^(b*d*x + b*c + a))/(b^2*d^2*log(F)^2)
```

Sympy [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = \int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x,x)
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 87, normalized size of antiderivative = 0.91

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = F^{bc+a}e^2\text{Ei}(bdx\log(F)) + \frac{2\,F^{bdx+bc+a}ef}{bd\log(F)} + \frac{\left(F^{bc+a}bdx\log(F) - F^{bc+a}\right)F^{bdx}f^2}{b^2d^2\log(F)^2}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="maxima")
[Out] F^(b*c + a)*e^2*Ei(b*d*x*log(F)) + 2*F^(b*d*x + b*c + a)*e*f/(b*d*log(F)) +
 (F^(b*c + a)*b*d*x*log(F) - F^(b*c + a))*F^(b*d*x)*f^2/(b^2*d^2*log(F)^2)
```

Giac [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = \int \frac{(fx+e)^2F^{(dx+c)b+a}}{x}\,dx$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x,x, algorithm="giac")
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x, x)
```

Mupad [B] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 80, normalized size of antiderivative = 0.83

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x}\,dx = \frac{F^{a+b\,c}\left(b^2\,d^2\,e^2\,\text{ei}(b\,d\,x\,\ln(F))\,\ln(F)^2 - F^{b\,d\,x}\,f^2 + F^{b\,d\,x}\,b\,d\,f^2\,x\,\ln(F) + 2\,F^{b\,d\,x}\,b\,d\,e\,f\,\ln(F)\right)}{b^2\,d^2\ln(F)^2}$$

```
[In] int((F^(a + b*(c + d*x))*(e + f*x)^2)/x,x)
[Out] (F^(a + b*c)*(b^2*d^2*e^2*ei(b*d*x*log(F))*log(F)^2 - F^(b*d*x)*f^2 + F^(b*
d*x)*b*d*f^2*x*log(F) + 2*F^(b*d*x)*b*d*e*f*log(F)))/(b^2*d^2*log(F)^2)
```

3.70 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2} \, dx$

Optimal result

Integrand size = 22, antiderivative size = 85

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2} \, dx = -\frac{e^2 F^{a+bc+bdx}}{x} + 2efF^{a+bc} \text{ExpIntegralEi}(bdx \log(F)) + \frac{f^2 F^{a+bc+bdx}}{bd \log(F)} + bde^2 F^{a+bc} \text{ExpIntegralEi}(bdx \log(F)) \log(F)$$

```
[Out] -e^2*F^(b*d*x+b*c+a)/x+2*e*f*F^(b*c+a)*Ei(b*d*x*ln(F))+f^2*F^(b*d*x+b*c+a)/
b/d/ln(F)+b*d*e^2*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)
```

Rubi [A] (verified)

Time = 0.18 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.182, Rules used = {2230, 2225, 2208, 2209}

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2} \, dx = bde^2 \log(F) F^{a+bc} \text{ExpIntegralEi}(bdx \log(F)) - \frac{e^2 F^{a+bc+bdx}}{x} + 2efF^{a+bc} \text{ExpIntegralEi}(bdx \log(F)) + \frac{f^2 F^{a+bc+bdx}}{bd \log(F)}$$

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^2,x]
```

```
[Out] -((e^2*F^(a + b*c + b*d*x))/x) + 2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[
F]] + (f^2*F^(a + b*c + b*d*x))/(b*d*Log[F]) + b*d*e^2*F^(a + b*c)*ExpInteg
ralEi[b*d*x*Log[F]]*Log[F]
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(f^2F^{a+bc+bdx}+\frac{e^2F^{a+bc+bdx}}{x^2}+\frac{2efF^{a+bc+bdx}}{x}\right)\,dx\\
&= e^2\int \frac{F^{a+bc+bdx}}{x^2}\,dx+(2ef)\int \frac{F^{a+bc+bdx}}{x}\,dx+f^2\int F^{a+bc+bdx}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{x}+2efF^{a+bc}\text{Ei}(bdx\log(F))+\frac{f^2F^{a+bc+bdx}}{bd\log(F)}+\left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{x}+2efF^{a+bc}\text{Ei}(bdx\log(F))+\frac{f^2F^{a+bc+bdx}}{bd\log(F)}+bde^2F^{a+bc}\text{Ei}(bdx\log(F))\log(F)
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 58, normalized size of antiderivative = 0.68

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = F^{a+bc}\left(F^{bdx}\left(-\frac{e^2}{x}+\frac{f^2}{bd\log(F)}\right) + e\,\text{ExpIntegralEi}(bdx\log(F))(2f+bde\log(F))\right)$$

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^2,x]
```

```
[Out] F^(a + b*c)*(F^(b*d*x)*(-(e^2/x) + f^2/(b*d*Log[F])) + e*ExpIntegralEi[b*d*
x*Log[F]]*(2*f + b*d*e*Log[F]))
```

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 153, normalized size of antiderivative = 1.80

method	result
risch	$-\frac{\ln(F)^2 F^{cb} F^a \operatorname{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(F))b^2d^2e^2x+2\ln(F)F^{cb}F^a \operatorname{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(}{\ln(F)bdx}$
meijerg	$-\frac{F^{cb+a}f^2\left(1-e^{bdx\ln(F)}\right)}{bd\ln(F)}+2F^{cb+a}fe(\ln(x)+\ln(-bd)+\ln(\ln(F))-\ln(-bdx\ln(F))-\operatorname{Ei}_1(-bdx\ln$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x,method=_RETURNVERBOSE)
```

```
[Out] -1/ln(F)/b/d*(ln(F)^2*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a
)*ln(F))*b^2*d^2*e^2*x+2*ln(F)*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(
F)-(b*c+a)*ln(F))*b*d*e*f*x+ln(F)*F^(b*d*x)*F^(b*c+a)*b*d*e^2-F^(b*d*x)*F^(
b*c+a)*f^2*x)/x
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 83, normalized size of antiderivative = 0.98

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = \frac{\left(b^2d^2e^2x\log(F)^2+2\,bdefx\log(F)\right)F^{bc+a}\text{Ei}(bdx\log(F))-(bde^2\log(F)-f^2x)F^{bdx+bc+a}}{bdx\log(F)}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="fricas")
```

```
[Out] ((b^2*d^2*e^2*x*log(F)^2 + 2*b*d*e*f*x*log(F))*F^(b*c + a)*Ei(b*d*x*log(F))
 - (b*d*e^2*log(F) - f^2*x)*F^(b*d*x + b*c + a))/(b*d*x*log(F))
```

Sympy [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = \int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**2,x)
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**2, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 68, normalized size of antiderivative = 0.80

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = F^{bc+a}bde^2\Gamma(-1,-bdx\log(F))\log(F) + 2\,F^{bc+a}ef\mathrm{Ei}(bdx\log(F)) + \frac{F^{bdx+bc+a}f^2}{bd\log(F)}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="maxima")
[Out] F^(b*c + a)*b*d*e^2*gamma(-1, -b*d*x*log(F))*log(F) + 2*F^(b*c + a)*e*f*Ei(
b*d*x*log(F)) + F^(b*d*x + b*c + a)*f^2/(b*d*log(F))
```

Giac [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = \int \frac{(fx+e)^2F^{(dx+c)b+a}}{x^2}\,dx$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^2,x, algorithm="giac")
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^2, x)
```

Mupad [B] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 89, normalized size of antiderivative = 1.05

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^2}\,dx = 2\,F^{a+b\,c}\,e\,f\,\mathrm{ei}(b\,d\,x\,\ln(F)) - \frac{F^{b\,d\,x}\,F^{a+b\,c}\,e^2}{x} + \frac{F^{a+b\,c+b\,d\,x}\,f^2}{b\,d\,\ln(F)} - F^{a+b\,c}\,b\,d\,e^2\,\ln(F)\,\mathrm{expint}(-b\,d\,x\,\ln(F))$$

```
[In] int((F^(a + b*(c + d*x))*(e + f*x)^2)/x^2,x)
[Out] 2*F^(a + b*c)*e*f*ei(b*d*x*log(F)) - (F^(b*d*x)*F^(a + b*c)*e^2)/x + (F^(a
+ b*c + b*d*x)*f^2)/(b*d*log(F)) - F^(a + b*c)*b*d*e^2*log(F)*expint(-b*d*x
*log(F))
```

3.71 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3} dx$

Optimal result

Integrand size = 22, antiderivative size = 136

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3} dx = &-\frac{e^2F^{a+bc+bdx}}{2x^2} - \frac{2efF^{a+bc+bdx}}{x} \\ &+ f^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{bde^2F^{a+bc+bdx}\log(F)}{2x} \\ &+ 2bdefF^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log(F) \\ &+ \frac{1}{2}b^2d^2e^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^2(F)\end{aligned}$$

```
[Out] -1/2*e^2*F^(b*d*x+b*c+a)/x^2-2*e*f*F^(b*d*x+b*c+a)/x+f^2*F^(b*c+a)*Ei(b*d*x
*ln(F))-1/2*b*d*e^2*F^(b*d*x+b*c+a)*ln(F)/x+2*b*d*e*f*F^(b*c+a)*Ei(b*d*x*ln
(F))*ln(F)+1/2*b^2*d^2*e^2*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)^2
```

Rubi [A] (verified)

Time = 0.23 (sec) , antiderivative size = 136, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2230, 2208, 2209}

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3} dx = &\frac{1}{2}b^2d^2e^2\log^2(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) \\ &- \frac{e^2F^{a+bc+bdx}}{2x^2} - \frac{bde^2\log(F)F^{a+bc+bdx}}{2x} \\ &+ 2bdef\log(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) \\ &- \frac{2efF^{a+bc+bdx}}{x} + f^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\end{aligned}$$

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^3,x]
```

```
[Out] -1/2*(e^2*F^(a + b*c + b*d*x))/x^2 - (2*e*f*F^(a + b*c + b*d*x))/x + f^2*F^
(a + b*c)*ExpIntegralEi[b*d*x*Log[F]] - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F]
)/(2*x) + 2*b*d*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F] + (b^2*d
^2*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(\frac{e^2 F^{a+bc+bdx}}{x^3}+\frac{2ef F^{a+bc+bdx}}{x^2}+\frac{f^2 F^{a+bc+bdx}}{x}\right) dx \\
&= e^2 \int \frac{F^{a+bc+bdx}}{x^3}\, dx+(2ef) \int \frac{F^{a+bc+bdx}}{x^2}\, dx+f^2 \int \frac{F^{a+bc+bdx}}{x}\, dx \\
&= -\frac{e^2 F^{a+bc+bdx}}{2x^2}-\frac{2ef F^{a+bc+bdx}}{x}+f^2 F^{a+bc}\text{Ei}(bdx\log(F)) \\
&\quad +\frac{1}{2}\left(bde^2\log(F)\right) \int \frac{F^{a+bc+bdx}}{x^2}\, dx+(2bdef\log(F)) \int \frac{F^{a+bc+bdx}}{x}\, dx \\
&= -\frac{e^2 F^{a+bc+bdx}}{2x^2}-\frac{2ef F^{a+bc+bdx}}{x}+f^2 F^{a+bc}\text{Ei}(bdx\log(F))-\frac{bde^2 F^{a+bc+bdx}\log(F)}{2x} \\
&\quad +2bdef F^{a+bc}\text{Ei}(bdx\log(F))\log(F)+\frac{1}{2}\left(b^2d^2e^2\log^2(F)\right) \int \frac{F^{a+bc+bdx}}{x}\, dx \\
&= -\frac{e^2 F^{a+bc+bdx}}{2x^2}-\frac{2ef F^{a+bc+bdx}}{x}+f^2 F^{a+bc}\text{Ei}(bdx\log(F))-\frac{bde^2 F^{a+bc+bdx}\log(F)}{2x} \\
&\quad +2bdef F^{a+bc}\text{Ei}(bdx\log(F))\log(F)+\frac{1}{2}b^2d^2e^2 F^{a+bc}\text{Ei}(bdx\log(F))\log^2(F)
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.33 (sec) , antiderivative size = 76, normalized size of antiderivative = 0.56

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = \frac{F^{a+bc}\left(-eF^{bdx}(e+4fx+bdex\log(F))+x^2\,\mathrm{ExpIntegralEi}(bdx\log(F))\left(2f^2+4bdef\log(F)+b^2d^2e^2\log^2(\right.\right.}{2x^2}$$

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^3,x]
```

```
[Out] (F^(a + b*c)*(-(e*F^(b*d*x)*(e + 4*f*x + b*d*e*x*Log[F])) + x^2*ExpIntegral
Ei[b*d*x*Log[F]]*(2*f^2 + 4*b*d*e*f*Log[F] + b^2*d^2*e^2*Log[F]^2)))/(2*x^2
)
```

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 208, normalized size of antiderivative = 1.53

method	result
risch	$-\frac{\ln(F)^2 F^{cb} F^a \operatorname{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(F))b^2d^2e^2x^2+4\ln(F)F^{cb}F^a\operatorname{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln}{}$
meijerg	$F^{cb+a}f^2(\ln(x)+\ln(-bd)+\ln(\ln(F))-\ln(-bdx\ln(F))-\operatorname{Ei}_1(-bdx\ln(F)))-2bd\ln(F)F^{cb+}$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x,method=_RETURNVERBOSE)
```

```
[Out] -1/2*(ln(F)^2*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F))
*b^2*d^2*e^2*x^2+4*ln(F)*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*
c+a)*ln(F))*b*d*e*f*x^2+ln(F)*F^(b*d*x)*F^(b*c+a)*b*d*e^2*x+2*F^(c*b)*F^a*E
i(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F))*f^2*x^2+4*F^(b*d*x)*F^(b*c
+a)*e*f*x+F^(b*d*x)*F^(b*c+a)*e^2)/x^2
```

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 89, normalized size of antiderivative = 0.65

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = \frac{\left(b^2d^2e^2x^2\log(F)^2+4\,bdefx^2\log(F)+2\,f^2x^2\right)F^{bc+a}\mathrm{Ei}(bdx\log(F))-\left(bde^2x\log(F)+4\,efx+e^2\right)F^{bdx+bc}}{2\,x^2}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="fricas")
```

```
[Out] 1/2*((b^2*d^2*e^2*x^2*log(F)^2 + 4*b*d*e*f*x^2*log(F) + 2*f^2*x^2)*F^(b*c +
 a)*Ei(b*d*x*log(F)) - (b*d*e^2*x*log(F) + 4*e*f*x + e^2)*F^(b*d*x + b*c +
a))/x^2
```

Sympy [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = \int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**3,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**3, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 74, normalized size of antiderivative = 0.54

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = -F^{bc+a}b^2d^2e^2\Gamma(-2,-bdx\log(F))\log(F)^2 + 2F^{bc+a}bdef\Gamma(-1,-bdx\log(F))\log(F) + F^{bc+a}f^2\mathrm{Ei}(bdx\log(F))$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="maxima")
```

```
[Out] -F^(b*c + a)*b^2*d^2*e^2*gamma(-2, -b*d*x*log(F))*log(F)^2 + 2*F^(b*c + a)*
b*d*e*f*gamma(-1, -b*d*x*log(F))*log(F) + F^(b*c + a)*f^2*Ei(b*d*x*log(F))
```

Giac [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = \int \frac{(fx+e)^2F^{(dx+c)b+a}}{x^3}\,dx$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^3,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^3, x)
```

Mupad [B] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 133, normalized size of antiderivative = 0.98

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^3}\,dx = F^{a+b\,c}\,f^2\,\mathrm{ei}(b\,d\,x\,\ln(F)) - \frac{2\,F^{b\,d\,x}\,F^{a+b\,c}\,e\,f}{x} - F^{a+b\,c}\,b^2\,d^2\,e^2\ln(F)^2\left(\frac{\mathrm{expint}(-b\,d\,x\,\ln(F))}{2} + F^{b\,d\,x}\left(\frac{1}{2\,b\,d\,x\,\ln(F)} + \frac{1}{2\,b^2\,d^2\,x^2\ln(F)^2}\right)\right) - 2\,F^{a+b\,c}\,b\,d\,e\,f\,\ln(F)\,\mathrm{expint}(-b\,d\,x\,\ln(F))$$

```
[In] int((F^(a + b*(c + d*x))*(e + f*x)^2)/x^3,x)
```

```
[Out] F^(a + b*c)*f^2*ei(b*d*x*log(F)) - (2*F^(b*d*x)*F^(a + b*c)*e*f)/x - F^(a +
 b*c)*b^2*d^2*e^2*log(F)^2*(expint(-b*d*x*log(F))/2 + F^(b*d*x)*(1/(2*b*d*x
*log(F)) + 1/(2*b^2*d^2*x^2*log(F)^2))) - 2*F^(a + b*c)*b*d*e*f*log(F)*expi
nt(-b*d*x*log(F))
```

3.72 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4} dx$

Optimal result

Integrand size = 22, antiderivative size = 217

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4} dx = & -\frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{f^2F^{a+bc+bdx}}{x} \\ & - \frac{bde^2F^{a+bc+bdx}\log(F)}{6x^2} - \frac{bdefF^{a+bc+bdx}\log(F)}{x} \\ & + bdf^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log(F) \\ & - \frac{b^2d^2e^2F^{a+bc+bdx}\log^2(F)}{6x} \\ & + b^2d^2efF^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^2(F) \\ & + \frac{1}{6}b^3d^3e^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^3(F)\end{aligned}$$

```
[Out] -1/3*e^2*F^(b*d*x+b*c+a)/x^3-e*f*F^(b*d*x+b*c+a)/x^2-f^2*F^(b*d*x+b*c+a)/x-
1/6*b*d*e^2*F^(b*d*x+b*c+a)*ln(F)/x^2-b*d*e*f*F^(b*d*x+b*c+a)*ln(F)/x+b*d*f
^2*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)-1/6*b^2*d^2*e^2*F^(b*d*x+b*c+a)*ln(F)^2/
x+b^2*d^2*e*f*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)^2+1/6*b^3*d^3*e^2*F^(b*c+a)*E
i(b*d*x*ln(F))*ln(F)^3
```

Rubi [A] (verified)

Time = 0.29 (sec) , antiderivative size = 217, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.136$, Rules used

$= \{2230, 2208, 2209\}$

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = \frac{1}{6}b^3d^3e^2\log^3(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{6x} + b^2d^2ef\log^2(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{3x^3} - \frac{bde^2\log(F)F^{a+bc+bdx}}{6x^2} - \frac{efF^{a+bc+bdx}}{x^2} - \frac{bdef\log(F)F^{a+bc+bdx}}{x} + bdf^2\log(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{f^2F^{a+bc+bdx}}{x}$$

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^4,x]
```

```
[Out] -1/3*(e^2*F^(a + b*c + b*d*x))/x^3 - (e*f*F^(a + b*c + b*d*x))/x^2 - (f^2*F
^(a + b*c + b*d*x))/x - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(6*x^2) - (b*d
*e*f*F^(a + b*c + b*d*x)*Log[F])/x + b*d*f^2*F^(a + b*c)*ExpIntegralEi[b*d*
x*Log[F]]*Log[F] - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(6*x) + b^2*d
^2*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2 + (b^3*d^3*e^2*F^(a
 + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^3)/6
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(\frac{e^2 F^{a+bc+bdx}}{x^4} + \frac{2ef F^{a+bc+bdx}}{x^3} + \frac{f^2 F^{a+bc+bdx}}{x^2} \right) dx$$

$$= e^2 \int \frac{F^{a+bc+bdx}}{x^4} dx + (2ef) \int \frac{F^{a+bc+bdx}}{x^3} dx + f^2 \int \frac{F^{a+bc+bdx}}{x^2} dx$$

$$= -\frac{e^2 F^{a+bc+bdx}}{3x^3} - \frac{ef F^{a+bc+bdx}}{x^2} - \frac{f^2 F^{a+bc+bdx}}{x} + \frac{1}{3}\left(bde^2 \log(F)\right) \int \frac{F^{a+bc+bdx}}{x^3} dx + (bdef \log(F)) \int \frac{F^{a+bc+bdx}}{x^2} dx + \left(bdf^2 \log(F)\right) \int \frac{F^{a+bc+bdx}}{x} dx$$

$$= -\frac{e^2 F^{a+bc+bdx}}{3x^3} - \frac{ef F^{a+bc+bdx}}{x^2} - \frac{f^2 F^{a+bc+bdx}}{x} - \frac{bde^2 F^{a+bc+bdx} \log(F)}{6x^2} - \frac{bdef F^{a+bc+bdx} \log(F)}{x} + bdf^2 F^{a+bc} \text{Ei}(bdx \log(F)) \log(F) + \frac{1}{6}\left(b^2 d^2 e^2 \log^2(F)\right) \int \frac{F^{a+bc+bdx}}{x^2} dx + \left(b^2 d^2 ef \log^2(F)\right) \int \frac{F^{a+bc+bdx}}{x} dx$$

$$= -\frac{e^2 F^{a+bc+bdx}}{3x^3} - \frac{ef F^{a+bc+bdx}}{x^2} - \frac{f^2 F^{a+bc+bdx}}{x} - \frac{bde^2 F^{a+bc+bdx} \log(F)}{6x^2} - \frac{bdef F^{a+bc+bdx} \log(F)}{x} + bdf^2 F^{a+bc} \text{Ei}(bdx \log(F)) \log(F) - \frac{b^2 d^2 e^2 F^{a+bc+bdx} \log^2(F)}{6x} + b^2 d^2 ef F^{a+bc} \text{Ei}(bdx \log(F)) \log^2(F) + \frac{1}{6}\left(b^3 d^3 e^2 \log^3(F)\right) \int \frac{F^{a+bc+bdx}}{x} dx$$

$$= -\frac{e^2 F^{a+bc+bdx}}{3x^3} - \frac{ef F^{a+bc+bdx}}{x^2} - \frac{f^2 F^{a+bc+bdx}}{x} - \frac{bde^2 F^{a+bc+bdx} \log(F)}{6x^2} - \frac{bdef F^{a+bc+bdx} \log(F)}{x} + bdf^2 F^{a+bc} \text{Ei}(bdx \log(F)) \log(F) - \frac{b^2 d^2 e^2 F^{a+bc+bdx} \log^2(F)}{6x} + b^2 d^2 ef F^{a+bc} \text{Ei}(bdx \log(F)) \log^2(F) + \frac{1}{6} b^3 d^3 e^2 F^{a+bc} \text{Ei}(bdx \log(F)) \log^3(F)$$

Mathematica [A] (verified)

Time = 0.28 (sec) , antiderivative size = 116, normalized size of antiderivative = 0.53

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx$$
$$= \frac{F^{a+bc}\big(bdx^3\,\text{ExpIntegralEi}(bdx\log(F))\log(F)\left(6f^2+6bdef\log(F)+b^2d^2e^2\log^2(F)\right)-F^{bdx}\big(2(e^2+3efx}{6x^3}$$

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^4,x]
```

```
[Out] (F^(a + b*c)*(b*d*x^3*ExpIntegralEi[b*d*x*Log[F]]*Log[F]*(6*f^2 + 6*b*d*e*f
*Log[F] + b^2*d^2*e^2*Log[F]^2) - F^(b*d*x)*(2*(e^2 + 3*e*f*x + 3*f^2*x^2)
+ b*d*e*x*(e + 6*f*x)*Log[F] + b^2*d^2*e^2*x^2*Log[F]^2)))/(6*x^3)
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 294, normalized size of antiderivative = 1.35

method	result
risch	$-\frac{\ln(F)^3F^{cb}F^a\,\text{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(F))b^3d^3e^2x^3+6\ln(F)^2F^{cb}F^a\,\text{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)}{}$
meijerg	$-bd\ln(F)\,F^{cb+a}f^2\Big(\frac{1}{bdx\ln(F)}+1-\ln(x)-\ln(-bd)-\ln(\ln(F))-\frac{2+2bdx\ln(F)}{2bdx\ln(F)}+\frac{e^{bdx\ln(F)}}{bdx\ln(F)}+\ln(-b$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x,method=_RETURNVERBOSE)
```

```
[Out] -1/6*(ln(F)^3*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F))
*b^3*d^3*e^2*x^3+6*ln(F)^2*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(
b*c+a)*ln(F))*b^2*d^2*e*f*x^3+ln(F)^2*F^(b*d*x)*F^(b*c+a)*b^2*d^2*e^2*x^2+6
*ln(F)*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F))*b*d*f^
2*x^3+6*ln(F)*F^(b*d*x)*F^(b*c+a)*b*d*e*f*x^2+ln(F)*F^(b*d*x)*F^(b*c+a)*b*d
*e^2*x+6*F^(b*d*x)*F^(b*c+a)*f^2*x^2+6*F^(b*d*x)*F^(b*c+a)*e*f*x+2*F^(b*d*x
)*F^(b*c+a)*e^2)/x^3
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 137, normalized size of antiderivative = 0.63

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx$$
$$= \frac{\left(b^3d^3e^2x^3\log(F)^3+6\,b^2d^2efx^3\log(F)^2+6\,bdf^2x^3\log(F)\right)F^{bc+a}\text{Ei}(bdx\log(F))-\left(b^2d^2e^2x^2\log(F)^2+6\right.}{6\,x^3}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="fricas")
```

```
[Out] 1/6*((b^3*d^3*e^2*x^3*log(F)^3 + 6*b^2*d^2*e*f*x^3*log(F)^2 + 6*b*d*f^2*x^3
*log(F))*F^(b*c + a)*Ei(b*d*x*log(F)) - (b^2*d^2*e^2*x^2*log(F)^2 + 6*f^2*x
^2 + 6*e*f*x + 2*e^2 + (6*b*d*e*f*x^2 + b*d*e^2*x)*log(F))*F^(b*d*x + b*c +
 a))/x^3
```

Sympy [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = \int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**4,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**4, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 85, normalized size of antiderivative = 0.39

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = {} & F^{bc+a}b^3d^3e^2\Gamma(-3,-bdx\log(F))\log(F)^3 \\ & - 2\,F^{bc+a}b^2d^2ef\Gamma(-2,-bdx\log(F))\log(F)^2 \\ & + F^{bc+a}bdf^2\Gamma(-1,-bdx\log(F))\log(F)\end{aligned}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="maxima")
```

```
[Out] F^(b*c + a)*b^3*d^3*e^2*gamma(-3, -b*d*x*log(F))*log(F)^3 - 2*F^(b*c + a)*b
^2*d^2*e*f*gamma(-2, -b*d*x*log(F))*log(F)^2 + F^(b*c + a)*b*d*f^2*gamma(-1
, -b*d*x*log(F))*log(F)
```

Giac [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = \int \frac{(fx+e)^2F^{(dx+c)b+a}}{x^4}\,dx$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^4,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^4, x)
```

Mupad [B] (verification not implemented)

Time = 0.30 (sec) , antiderivative size = 202, normalized size of antiderivative = 0.93

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^4}\,dx = -\frac{F^{b\,d\,x}\,F^{a+b\,c}\,f^2}{x} - F^{a+b\,c}\,b^3\,d^3\,e^2\ln\left(F\right)^3\left(F^{b\,d\,x}\left(\frac{1}{6\,b\,d\,x\,\ln\left(F\right)} + \frac{1}{6\,b^2\,d^2\,x^2\ln\left(F\right)^2} + \frac{1}{3\,b^3\,d^3\,x^3\ln\left(F\right)^3}\right) + \frac{\mathrm{expint}(-b\,d\,x\,\ln\left(F\right))}{6}\right) - F^{a+b\,c}\,b\,d\,f^2\,\ln\left(F\right)\,\mathrm{expint}(-b\,d\,x\,\ln\left(F\right)) - 2\,F^{a+b\,c}\,b^2\,d^2\,e\,f\ln\left(F\right)^2\left(\frac{\mathrm{expint}(-b\,d\,x\,\ln\left(F\right))}{2} + F^{b\,d\,x}\left(\frac{1}{2\,b\,d\,x\,\ln\left(F\right)} + \frac{1}{2\,b^2\,d^2\,x^2\ln\left(F\right)^2}\right)\right)$$

```
[In] int((F^(a + b*(c + d*x))*(e + f*x)^2)/x^4,x)
```

```
[Out] - (F^(b*d*x)*F^(a + b*c)*f^2)/x - F^(a + b*c)*b^3*d^3*e^2*log(F)^3*(F^(b*d*
x)*(1/(6*b*d*x*log(F)) + 1/(6*b^2*d^2*x^2*log(F)^2) + 1/(3*b^3*d^3*x^3*log(
F)^3)) + expint(-b*d*x*log(F))/6) - F^(a + b*c)*b*d*f^2*log(F)*expint(-b*d*
x*log(F)) - 2*F^(a + b*c)*b^2*d^2*e*f*log(F)^2*(expint(-b*d*x*log(F))/2 + F
^(b*d*x)*(1/(2*b*d*x*log(F)) + 1/(2*b^2*d^2*x^2*log(F)^2)))
```

3.73 $\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx$

Optimal result

Integrand size = 22, antiderivative size = 321

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = &-\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}\\ &-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}\\ &-\frac{bdefF^{a+bc+bdx}\log(F)}{3x^2}-\frac{bdf^2F^{a+bc+bdx}\log(F)}{2x}\\ &-\frac{b^2d^2e^2F^{a+bc+bdx}\log^2(F)}{24x^2}-\frac{b^2d^2efF^{a+bc+bdx}\log^2(F)}{3x}\\ &+\frac{1}{2}b^2d^2f^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^2(F)\\ &-\frac{b^3d^3e^2F^{a+bc+bdx}\log^3(F)}{24x}\\ &+\frac{1}{3}b^3d^3efF^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^3(F)\\ &+\frac{1}{24}b^4d^4e^2F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F))\log^4(F)\end{aligned}$$

```
[Out] -1/4*e^2*F^(b*d*x+b*c+a)/x^4-2/3*e*f*F^(b*d*x+b*c+a)/x^3-1/2*f^2*F^(b*d*x+b
*c+a)/x^2-1/12*b*d*e^2*F^(b*d*x+b*c+a)*ln(F)/x^3-1/3*b*d*e*f*F^(b*d*x+b*c+a
)*ln(F)/x^2-1/2*b*d*f^2*F^(b*d*x+b*c+a)*ln(F)/x-1/24*b^2*d^2*e^2*F^(b*d*x+b
*c+a)*ln(F)^2/x^2-1/3*b^2*d^2*e*f*F^(b*d*x+b*c+a)*ln(F)^2/x+1/2*b^2*d^2*f^2
*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)^2-1/24*b^3*d^3*e^2*F^(b*d*x+b*c+a)*ln(F)^3
/x+1/3*b^3*d^3*e*f*F^(b*c+a)*Ei(b*d*x*ln(F))*ln(F)^3+1/24*b^4*d^4*e^2*F^(b*
c+a)*Ei(b*d*x*ln(F))*ln(F)^4
```

Rubi [A] (verified)

Time = 0.37 (sec) , antiderivative size = 321, normalized size of antiderivative = 1.00, number of steps used = 14, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.136, Rules used = {2230, 2208, 2209}

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \frac{1}{24}b^4d^4e^2\log^4(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{b^3d^3e^2\log^3(F)F^{a+bc+bdx}}{24x} + \frac{1}{3}b^3d^3ef\log^3(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{b^2d^2e^2\log^2(F)F^{a+bc+bdx}}{24x^2} - \frac{b^2d^2ef\log^2(F)F^{a+bc+bdx}}{3x} + \frac{1}{2}b^2d^2f^2\log^2(F)F^{a+bc}\,\text{ExpIntegralEi}(bdx\log(F)) - \frac{e^2F^{a+bc+bdx}}{4x^4} - \frac{bde^2\log(F)F^{a+bc+bdx}}{12x^3} - \frac{2efF^{a+bc+bdx}}{3x^3} - \frac{bdef\log(F)F^{a+bc+bdx}}{3x^2} - \frac{f^2F^{a+bc+bdx}}{2x^2} - \frac{bdf^2\log(F)F^{a+bc+bdx}}{2x}$$

```
[In] Int[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^5,x]
```

```
[Out] -1/4*(e^2*F^(a + b*c + b*d*x))/x^4 - (2*e*f*F^(a + b*c + b*d*x))/(3*x^3) -
(f^2*F^(a + b*c + b*d*x))/(2*x^2) - (b*d*e^2*F^(a + b*c + b*d*x)*Log[F])/(1
2*x^3) - (b*d*e*f*F^(a + b*c + b*d*x)*Log[F])/(3*x^2) - (b*d*f^2*F^(a + b*c
 + b*d*x)*Log[F])/(2*x) - (b^2*d^2*e^2*F^(a + b*c + b*d*x)*Log[F]^2)/(24*x^
2) - (b^2*d^2*e*f*F^(a + b*c + b*d*x)*Log[F]^2)/(3*x) + (b^2*d^2*f^2*F^(a +
 b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2)/2 - (b^3*d^3*e^2*F^(a + b*c + b
*d*x)*Log[F]^3)/(24*x) + (b^3*d^3*e*f*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F
]]*Log[F]^3)/3 + (b^4*d^4*e^2*F^(a + b*c)*ExpIntegralEi[b*d*x*Log[F]]*Log[F
]^4)/24
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(\frac{e^2F^{a+bc+bdx}}{x^5}+\frac{2efF^{a+bc+bdx}}{x^4}+\frac{f^2F^{a+bc+bdx}}{x^3}\right)dx\\
&= e^2\int \frac{F^{a+bc+bdx}}{x^5}\,dx+(2ef)\int \frac{F^{a+bc+bdx}}{x^4}\,dx+f^2\int \frac{F^{a+bc+bdx}}{x^3}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}+\frac{1}{4}\left(bde^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x^4}\,dx\\
&\quad+\frac{1}{3}(2bdef\log(F))\int \frac{F^{a+bc+bdx}}{x^3}\,dx+\frac{1}{2}\left(bdf^2\log(F)\right)\int \frac{F^{a+bc+bdx}}{x^2}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}\\
&\quad-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}-\frac{bdefF^{a+bc+bdx}\log(F)}{3x^2}\\
&\quad-\frac{bdf^2F^{a+bc+bdx}\log(F)}{2x}+\frac{1}{12}\left(b^2d^2e^2\log^2(F)\right)\int \frac{F^{a+bc+bdx}}{x^3}\,dx\\
&\quad+\frac{1}{3}\left(b^2d^2ef\log^2(F)\right)\int \frac{F^{a+bc+bdx}}{x^2}\,dx+\frac{1}{2}\left(b^2d^2f^2\log^2(F)\right)\int \frac{F^{a+bc+bdx}}{x}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}\\
&\quad-\frac{bdefF^{a+bc+bdx}\log(F)}{3x^2}-\frac{bdf^2F^{a+bc+bdx}\log(F)}{2x}-\frac{b^2d^2e^2F^{a+bc+bdx}\log^2(F)}{24x^2}\\
&\quad-\frac{b^2d^2efF^{a+bc+bdx}\log^2(F)}{3x}+\frac{1}{2}b^2d^2f^2F^{a+bc}\text{Ei}(bdx\log(F))\log^2(F)\\
&\quad+\frac{1}{24}\left(b^3d^3e^2\log^3(F)\right)\int \frac{F^{a+bc+bdx}}{x^2}\,dx+\frac{1}{3}\left(b^3d^3ef\log^3(F)\right)\int \frac{F^{a+bc+bdx}}{x}\,dx\\
&= -\frac{e^2F^{a+bc+bdx}}{4x^4}-\frac{2efF^{a+bc+bdx}}{3x^3}-\frac{f^2F^{a+bc+bdx}}{2x^2}-\frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3}\\
&\quad-\frac{bdefF^{a+bc+bdx}\log(F)}{3x^2}-\frac{bdf^2F^{a+bc+bdx}\log(F)}{2x}\\
&\quad-\frac{b^2d^2e^2F^{a+bc+bdx}\log^2(F)}{24x^2}-\frac{b^2d^2efF^{a+bc+bdx}\log^2(F)}{3x}\\
&\quad+\frac{1}{2}b^2d^2f^2F^{a+bc}\text{Ei}(bdx\log(F))\log^2(F)-\frac{b^3d^3e^2F^{a+bc+bdx}\log^3(F)}{24x}\\
&\quad+\frac{1}{3}b^3d^3efF^{a+bc}\text{Ei}(bdx\log(F))\log^3(F)+\frac{1}{24}\left(b^4d^4e^2\log^4(F)\right)\int \frac{F^{a+bc+bdx}}{x}\,dx
\end{aligned}$$

$$= -\frac{e^2F^{a+bc+bdx}}{4x^4} - \frac{2efF^{a+bc+bdx}}{3x^3} - \frac{f^2F^{a+bc+bdx}}{2x^2} - \frac{bde^2F^{a+bc+bdx}\log(F)}{12x^3} - \frac{bdefF^{a+bc+bdx}\log(F)}{3x^2} - \frac{bdf^2F^{a+bc+bdx}\log(F)}{2x} - \frac{b^2d^2e^2F^{a+bc+bdx}\log^2(F)}{24x^2} - \frac{b^2d^2efF^{a+bc+bdx}\log^2(F)}{3x} + \frac{1}{2}b^2d^2f^2F^{a+bc}\text{Ei}(bdx\log(F))\log^2(F) - \frac{b^3d^3e^2F^{a+bc+bdx}\log^3(F)}{24x} + \frac{1}{3}b^3d^3efF^{a+bc}\text{Ei}(bdx\log(F))\log^3(F) + \frac{1}{24}b^4d^4e^2F^{a+bc}\text{Ei}(bdx\log(F))\log^4(F)$$

Mathematica [A] (verified)

Time = 0.32 (sec) , antiderivative size = 156, normalized size of antiderivative = 0.49

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \frac{F^{a+bc}\left(b^2d^2x^4\,\text{ExpIntegralEi}(bdx\log(F))\log^2(F)\left(12f^2+8bdef\log(F)+b^2d^2e^2\log^2(F)\right)-F^{bdx}\left(2(3e^2+8\right.\right.}{24x^4}$$

```
[In] Integrate[(F^(a + b*(c + d*x))*(e + f*x)^2)/x^5,x]
```

```
[Out] (F^(a + b*c)*(b^2*d^2*x^4*ExpIntegralEi[b*d*x*Log[F]]*Log[F]^2*(12*f^2 + 8*
b*d*e*f*Log[F] + b^2*d^2*e^2*Log[F]^2) - F^(b*d*x)*(2*(3*e^2 + 8*e*f*x + 6*
f^2*x^2) + 2*b*d*x*(e^2 + 4*e*f*x + 6*f^2*x^2)*Log[F] + b^2*d^2*e*x^2*(e +
8*f*x)*Log[F]^2 + b^3*d^3*e^2*x^3*Log[F]^3)))/(24*x^4)
```

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 386, normalized size of antiderivative = 1.20

method	result
risch	$-\frac{\ln(F)^4F^{cb}F^a\,\text{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)\ln(F))b^4d^4e^2x^4+8\ln(F)^3F^{cb}F^a\,\text{Ei}_1(cb\ln(F)+a\ln(F)-bdx\ln(F)-(cb+a)}{}$
meijerg	$\ln(F)^2b^2d^2F^{cb+a}f^2\Big(-\frac{1}{2b^2d^2x^2\ln(F)^2}-\frac{1}{bdx\ln(F)}-\frac{3}{4}+\frac{\ln(x)}{2}+\frac{\ln(-bd)}{2}+\frac{\ln(\ln(F))}{2}+\frac{9b^2d^2x^2\ln(F)^2+12bdx\ln}{12b^2d^2x^2\ln(F)^2}$

```
[In] int(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x,method=_RETURNVERBOSE)
```

```
[Out] -1/24*(ln(F)^4*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F)
)*b^4*d^4*e^2*x^4+8*ln(F)^3*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-
(b*c+a)*ln(F))*b^3*d^3*e*f*x^4+ln(F)^3*F^(b*d*x)*F^(b*c+a)*b^3*d^3*e^2*x^3+
12*ln(F)^2*F^(c*b)*F^a*Ei(1,c*b*ln(F)+a*ln(F)-b*d*x*ln(F)-(b*c+a)*ln(F))*b^
2*d^2*f^2*x^4+8*ln(F)^2*F^(b*d*x)*F^(b*c+a)*b^2*d^2*e*f*x^3+ln(F)^2*F^(b*d*
x)*F^(b*c+a)*b^2*d^2*e^2*x^2+12*ln(F)*F^(b*d*x)*F^(b*c+a)*b*d*f^2*x^3+8*ln(
```

```
F)*F^(b*d*x)*F^(b*c+a)*b*d*e*f*x^2+2*ln(F)*F^(b*d*x)*F^(b*c+a)*b*d*e^2*x+12
*F^(b*d*x)*F^(b*c+a)*f^2*x^2+16*F^(b*d*x)*F^(b*c+a)*e*f*x+6*F^(b*d*x)*F^(b*
c+a)*e^2)/x^4
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 186, normalized size of antiderivative = 0.58

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \frac{\left(b^4d^4e^2x^4\log\left(F\right)^4+8\,b^3d^3efx^4\log\left(F\right)^3+12\,b^2d^2f^2x^4\log\left(F\right)^2\right)F^{bc+a}\mathrm{Ei}(bdx\log\left(F\right))-\left(b^3d^3e^2x^3\log\left(F\right)\right.}{}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="fricas")
```

```
[Out] 1/24*((b^4*d^4*e^2*x^4*log(F)^4 + 8*b^3*d^3*e*f*x^4*log(F)^3 + 12*b^2*d^2*f
^2*x^4*log(F)^2)*F^(b*c + a)*Ei(b*d*x*log(F)) - (b^3*d^3*e^2*x^3*log(F)^3 +
 12*f^2*x^2 + 16*e*f*x + (8*b^2*d^2*e*f*x^3 + b^2*d^2*e^2*x^2)*log(F)^2 + 6
*e^2 + 2*(6*b*d*f^2*x^3 + 4*b*d*e*f*x^2 + b*d*e^2*x)*log(F))*F^(b*d*x + b*c
 + a))/x^4
```

Sympy [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \int \frac{F^{a+b(c+dx)}\left(e+fx\right)^2}{x^5}\,dx$$

```
[In] integrate(F**(a+b*(d*x+c))*(f*x+e)**2/x**5,x)
```

```
[Out] Integral(F**(a + b*(c + d*x))*(e + f*x)**2/x**5, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 93, normalized size of antiderivative = 0.29

$$\begin{aligned}\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = &-F^{bc+a}b^4d^4e^2\Gamma(-4,-bdx\log\left(F\right))\log\left(F\right)^4\\&+2\,F^{bc+a}b^3d^3ef\Gamma(-3,-bdx\log\left(F\right))\log\left(F\right)^3\\&-F^{bc+a}b^2d^2f^2\Gamma(-2,-bdx\log\left(F\right))\log\left(F\right)^2\end{aligned}$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="maxima")
```

```
[Out] -F^(b*c + a)*b^4*d^4*e^2*gamma(-4, -b*d*x*log(F))*log(F)^4 + 2*F^(b*c + a)*
b^3*d^3*e*f*gamma(-3, -b*d*x*log(F))*log(F)^3 - F^(b*c + a)*b^2*d^2*f^2*gam
ma(-2, -b*d*x*log(F))*log(F)^2
```

Giac [F]

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = \int \frac{(fx+e)^2F^{(dx+c)b+a}}{x^5}\,dx$$

```
[In] integrate(F^(a+b*(d*x+c))*(f*x+e)^2/x^5,x, algorithm="giac")
```

```
[Out] integrate((f*x + e)^2*F^((d*x + c)*b + a)/x^5, x)
```

Mupad [B] (verification not implemented)

Time = 0.31 (sec) , antiderivative size = 258, normalized size of antiderivative = 0.80

$$\int \frac{F^{a+b(c+dx)}(e+fx)^2}{x^5}\,dx = -F^{a+b\,c}\,b^2\,d^2\,f^2\ln(F)^2\left(\frac{\mathrm{expint}(-b\,d\,x\,\ln(F))}{2} + F^{b\,d\,x}\left(\frac{1}{2\,b\,d\,x\,\ln(F)} + \frac{1}{2\,b^2\,d^2\,x^2\ln(F)^2}\right)\right) - F^{a+b\,c}\,b^4\,d^4\,e^2\ln(F)^4\left(F^{b\,d\,x}\left(\frac{1}{24\,b\,d\,x\,\ln(F)} + \frac{1}{24\,b^2\,d^2\,x^2\ln(F)^2} + \frac{1}{12\,b^3\,d^3\,x^3\ln(F)^3} + \frac{1}{4\,b^4\,d^4\,x^4\ln(F)^4}\right) + \frac{\mathrm{expint}(-b\,d\,x\,\ln(F))}{24}\right) - 2\,F^{a+b\,c}\,b^3\,d^3\,e\,f\ln(F)^3\left(F^{b\,d\,x}\left(\frac{1}{6\,b\,d\,x\,\ln(F)} + \frac{1}{6\,b^2\,d^2\,x^2\ln(F)^2} + \frac{1}{3\,b^3\,d^3\,x^3\ln(F)^3}\right) + \frac{\mathrm{expint}(-b\,d\,x\,\ln(F))}{6}\right)$$

```
[In] int((F^(a + b*(c + d*x))*(e + f*x)^2)/x^5,x)
```

```
[Out] - F^(a + b*c)*b^2*d^2*f^2*log(F)^2*(expint(-b*d*x*log(F))/2 + F^(b*d*x)*(1/
(2*b*d*x*log(F)) + 1/(2*b^2*d^2*x^2*log(F)^2))) - F^(a + b*c)*b^4*d^4*e^2*l
og(F)^4*(F^(b*d*x)*(1/(24*b*d*x*log(F)) + 1/(24*b^2*d^2*x^2*log(F)^2) + 1/(
12*b^3*d^3*x^3*log(F)^3) + 1/(4*b^4*d^4*x^4*log(F)^4)) + expint(-b*d*x*log(
F))/24) - 2*F^(a + b*c)*b^3*d^3*e*f*log(F)^3*(F^(b*d*x)*(1/(6*b*d*x*log(F))
 + 1/(6*b^2*d^2*x^2*log(F)^2) + 1/(3*b^3*d^3*x^3*log(F)^3)) + expint(-b*d*x
*log(F))/6)
```

3.74 $\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx$

Optimal result

Integrand size = 25, antiderivative size = 754

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = -\frac{5040d^3e^{-a-bx}}{b^4}-\frac{2160d^2(bc-ad)e^{-a-bx}}{b^4}-\frac{360d(bc-ad)^2e^{-a-bx}}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}}{b^4}-\frac{5040d^3e^{-a-bx}(a+bx)}{b^4}-\frac{2160d^2(bc-ad)e^{-a-bx}(a+bx)}{b^4}-\frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4}-\frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4}-\frac{2520d^3e^{-a-bx}(a+bx)^2}{b^4}-\frac{1080d^2(bc-ad)e^{-a-bx}(a+bx)^2}{b^4}-\frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4}-\frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4}-\frac{840d^3e^{-a-bx}(a+bx)^3}{b^4}-\frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4}-\frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4}-\frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4}-\frac{210d^3e^{-a-bx}(a+bx)^4}{b^4}-\frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4}-\frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4}-\frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4}-\frac{42d^3e^{-a-bx}(a+bx)^5}{b^4}-\frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4}-\frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4}-\frac{7d^3e^{-a-bx}(a+bx)^6}{b^4}-\frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4}-\frac{d^3e^{-a-bx}(a+bx)^7}{b^4}$$

```
[Out] -(-a*d+b*c)^3*exp(-b*x-a)*(b*x+a)^4/b^4-d^3*exp(-b*x-a)*(b*x+a)^7/b^4-2160*
d^2*(-a*d+b*c)*exp(-b*x-a)/b^4-360*d*(-a*d+b*c)^2*exp(-b*x-a)/b^4-5040*d^3*
exp(-b*x-a)*(b*x+a)/b^4-24*(-a*d+b*c)^3*exp(-b*x-a)*(b*x+a)/b^4-2520*d^3*ex
p(-b*x-a)*(b*x+a)^2/b^4-12*(-a*d+b*c)^3*exp(-b*x-a)*(b*x+a)^2/b^4-840*d^3*e
xp(-b*x-a)*(b*x+a)^3/b^4-4*(-a*d+b*c)^3*exp(-b*x-a)*(b*x+a)^3/b^4-210*d^3*e
xp(-b*x-a)*(b*x+a)^4/b^4-42*d^3*exp(-b*x-a)*(b*x+a)^5/b^4-7*d^3*exp(-b*x-a)
```

```
*(b*x+a)^6/b^4-3*d*(-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)^5/b^4-3*d^2*(-a*d+b*c)*
exp(-b*x-a)*(b*x+a)^6/b^4-24*(-a*d+b*c)^3*exp(-b*x-a)/b^4-2160*d^2*(-a*d+b*
c)*exp(-b*x-a)*(b*x+a)/b^4-360*d*(-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)/b^4-1080*
d^2*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^2/b^4-180*d*(-a*d+b*c)^2*exp(-b*x-a)*(b*
x+a)^2/b^4-360*d^2*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^3/b^4-60*d*(-a*d+b*c)^2*e
xp(-b*x-a)*(b*x+a)^3/b^4-90*d^2*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^4/b^4-15*d*(
-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)^4/b^4-18*d^2*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)
^5/b^4-5040*d^3*exp(-b*x-a)/b^4
```

Rubi [A] (verified)

Time = 0.60 (sec) , antiderivative size = 754, normalized size of antiderivative = 1.00, number of steps used = 28, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.120$, Rules used

$= \{2227,\ 2207,\ 2225\}$

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = -\frac{3d^2e^{-a-bx}(a+bx)^6(bc-ad)}{b^4} - \frac{18d^2e^{-a-bx}(a+bx)^5(bc-ad)}{b^4} - \frac{90d^2e^{-a-bx}(a+bx)^4(bc-ad)}{b^4} - \frac{360d^2e^{-a-bx}(a+bx)^3(bc-ad)}{b^4} - \frac{1080d^2e^{-a-bx}(a+bx)^2(bc-ad)}{b^4} - \frac{2160d^2e^{-a-bx}(a+bx)(bc-ad)}{b^4} - \frac{2160d^2e^{-a-bx}(bc-ad)}{b^4} - \frac{3de^{-a-bx}(a+bx)^5(bc-ad)^2}{b^4} - \frac{e^{-a-bx}(a+bx)^4(bc-ad)^3}{b^4} - \frac{15de^{-a-bx}(a+bx)^4(bc-ad)^2}{b^4} - \frac{4e^{-a-bx}(a+bx)^3(bc-ad)^3}{b^4} - \frac{60de^{-a-bx}(a+bx)^3(bc-ad)^2}{b^4} - \frac{12e^{-a-bx}(a+bx)^2(bc-ad)^3}{b^4} - \frac{180de^{-a-bx}(a+bx)^2(bc-ad)^2}{b^4} - \frac{24e^{-a-bx}(a+bx)(bc-ad)^3}{b^4} - \frac{360de^{-a-bx}(a+bx)(bc-ad)^2}{b^4} - \frac{24e^{-a-bx}(bc-ad)^3}{b^4} - \frac{360de^{-a-bx}(bc-ad)^2}{b^4} - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4} - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{840d^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{2520d^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{5040d^3e^{-a-bx}(a+bx)}{b^4} - \frac{5040d^3e^{-a-bx}}{b^4}$$

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^3,x]
```

```
[Out] (-5040*d^3*E^(-a - b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x))/b^4 - (3
60*d*(b*c - a*d)^2*E^(-a - b*x))/b^4 - (24*(b*c - a*d)^3*E^(-a - b*x))/b^4
- (5040*d^3*E^(-a - b*x)*(a + b*x))/b^4 - (2160*d^2*(b*c - a*d)*E^(-a - b*x
)*(a + b*x))/b^4 - (360*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x))/b^4 - (24*(
b*c - a*d)^3*E^(-a - b*x)*(a + b*x))/b^4 - (2520*d^3*E^(-a - b*x)*(a + b*x)
^2)/b^4 - (1080*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2)/b^4 - (180*d*(b*c
 - a*d)^2*E^(-a - b*x)*(a + b*x)^2)/b^4 - (12*(b*c - a*d)^3*E^(-a - b*x)*(a
 + b*x)^2)/b^4 - (840*d^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (360*d^2*(b*c - a
*d)*E^(-a - b*x)*(a + b*x)^3)/b^4 - (60*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b
*x)^3)/b^4 - (4*(b*c - a*d)^3*E^(-a - b*x)*(a + b*x)^3)/b^4 - (210*d^3*E^(-
a - b*x)*(a + b*x)^4)/b^4 - (90*d^2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^4)/b
^4 - (15*d*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^4 - ((b*c - a*d)^3*E^(
-a - b*x)*(a + b*x)^4)/b^4 - (42*d^3*E^(-a - b*x)*(a + b*x)^5)/b^4 - (18*d^
2*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^4 - (3*d*(b*c - a*d)^2*E^(-a - b*
x)*(a + b*x)^5)/b^4 - (7*d^3*E^(-a - b*x)*(a + b*x)^6)/b^4 - (3*d^2*(b*c -
a*d)*E^(-a - b*x)*(a + b*x)^6)/b^4 - (d^3*E^(-a - b*x)*(a + b*x)^7)/b^4
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \int \left(\frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^3}+\frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^3}\right.\\ &\qquad\left.+\frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^3}+\frac{d^3e^{-a-bx}(a+bx)^7}{b^3}\right)dx\\ &=\frac{d^3\int e^{-a-bx}(a+bx)^7\,dx}{b^3}+\frac{(3d^2(bc-ad))\int e^{-a-bx}(a+bx)^6\,dx}{b^3}\\ &\quad+\frac{(3d(bc-ad)^2)\int e^{-a-bx}(a+bx)^5\,dx}{b^3}+\frac{(bc-ad)^3\int e^{-a-bx}(a+bx)^4\,dx}{b^3}\end{aligned}$$

$$= -\frac{(bc-ad)^3 e^{-a-bx}(a+bx)^4}{b^4} - \frac{3d(bc-ad)^2 e^{-a-bx}(a+bx)^5}{b^4} - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4}$$
$$- \frac{d^3 e^{-a-bx}(a+bx)^7}{b^4} + \frac{(7d^3)\int e^{-a-bx}(a+bx)^6\,dx}{b^3} + \frac{(18d^2(bc-ad))\int e^{-a-bx}(a+bx)^5\,dx}{b^3}$$
$$+ \frac{(15d(bc-ad)^2)\int e^{-a-bx}(a+bx)^4\,dx}{b^3} + \frac{(4(bc-ad)^3)\int e^{-a-bx}(a+bx)^3\,dx}{b^3}$$

$$= -\frac{4(bc-ad)^3 e^{-a-bx}(a+bx)^3}{b^4} - \frac{15d(bc-ad)^2 e^{-a-bx}(a+bx)^4}{b^4}$$
$$- \frac{(bc-ad)^3 e^{-a-bx}(a+bx)^4}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4}$$
$$- \frac{3d(bc-ad)^2 e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3 e^{-a-bx}(a+bx)^6}{b^4}$$
$$- \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3 e^{-a-bx}(a+bx)^7}{b^4}$$
$$+ \frac{(42d^3)\int e^{-a-bx}(a+bx)^5\,dx}{b^3} + \frac{(90d^2(bc-ad))\int e^{-a-bx}(a+bx)^4\,dx}{b^3}$$
$$+ \frac{(60d(bc-ad)^2)\int e^{-a-bx}(a+bx)^3\,dx}{b^3} + \frac{(12(bc-ad)^3)\int e^{-a-bx}(a+bx)^2\,dx}{b^3}$$

$$= -\frac{12(bc-ad)^3 e^{-a-bx}(a+bx)^2}{b^4} - \frac{60d(bc-ad)^2 e^{-a-bx}(a+bx)^3}{b^4}$$
$$- \frac{4(bc-ad)^3 e^{-a-bx}(a+bx)^3}{b^4} - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4}$$
$$- \frac{15d(bc-ad)^2 e^{-a-bx}(a+bx)^4}{b^4} - \frac{(bc-ad)^3 e^{-a-bx}(a+bx)^4}{b^4}$$
$$- \frac{42d^3 e^{-a-bx}(a+bx)^5}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4}$$
$$- \frac{3d(bc-ad)^2 e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3 e^{-a-bx}(a+bx)^6}{b^4}$$
$$- \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3 e^{-a-bx}(a+bx)^7}{b^4}$$
$$+ \frac{(210d^3)\int e^{-a-bx}(a+bx)^4\,dx}{b^3} + \frac{(360d^2(bc-ad))\int e^{-a-bx}(a+bx)^3\,dx}{b^3}$$
$$+ \frac{(180d(bc-ad)^2)\int e^{-a-bx}(a+bx)^2\,dx}{b^3} + \frac{(24(bc-ad)^3)\int e^{-a-bx}(a+bx)\,dx}{b^3}$$

$$
\begin{aligned}
&= -\frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4} - \frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4} - \frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4} - \frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4} \\
&\quad - \frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} \\
&\quad - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4} \\
&\quad + \frac{(840d^3)\int e^{-a-bx}(a+bx)^3\,dx}{b^3} + \frac{(1080d^2(bc-ad))\int e^{-a-bx}(a+bx)^2\,dx}{b^3} \\
&\quad + \frac{(360d(bc-ad)^2)\int e^{-a-bx}(a+bx)\,dx}{b^3} + \frac{(24(bc-ad)^3)\int e^{-a-bx}\,dx}{b^3} \\
&= -\frac{24(bc-ad)^3e^{-a-bx}}{b^4} - \frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4} \\
&\quad - \frac{1080d^2(bc-ad)e^{-a-bx}(a+bx)^2}{b^4} - \frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{840d^3e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4} - \frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4} - \frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} \\
&\quad - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4} - \frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4} \\
&\quad - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} \\
&\quad - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4} + \frac{(2520d^3)\int e^{-a-bx}(a+bx)^2\,dx}{b^3} \\
&\quad + \frac{(2160d^2(bc-ad))\int e^{-a-bx}(a+bx)\,dx}{b^3} + \frac{(360d(bc-ad)^2)\int e^{-a-bx}\,dx}{b^3}
\end{aligned}
$$

$$
\begin{aligned}
&= -\frac{360d(bc-ad)^2e^{-a-bx}}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}}{b^4} - \frac{2160d^2(bc-ad)e^{-a-bx}(a+bx)}{b^4} \\
&\quad - \frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4} \\
&\quad - \frac{2520d^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{1080d^2(bc-ad)e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4} - \frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{840d^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4} - \frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4} - \frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4} \\
&\quad - \frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} \\
&\quad - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4} \\
&\quad + \frac{(5040d^3)\int e^{-a-bx}(a+bx)\,dx}{b^3} + \frac{(2160d^2(bc-ad))\int e^{-a-bx}\,dx}{b^3}
\end{aligned}
$$

$$
\begin{aligned}
&= -\frac{2160d^2(bc-ad)e^{-a-bx}}{b^4} - \frac{360d(bc-ad)^2e^{-a-bx}}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}}{b^4} \\
&\quad - \frac{5040d^3e^{-a-bx}(a+bx)}{b^4} - \frac{2160d^2(bc-ad)e^{-a-bx}(a+bx)}{b^4} \\
&\quad - \frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4} \\
&\quad - \frac{2520d^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{1080d^2(bc-ad)e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4} - \frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4} \\
&\quad - \frac{840d^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4} - \frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4} \\
&\quad - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4} - \frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4} \\
&\quad - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4} \\
&\quad - \frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} \\
&\quad - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4} + \frac{(5040d^3)\int e^{-a-bx}\,dx}{b^3}
\end{aligned}
$$

$$= -\frac{5040d^3e^{-a-bx}}{b^4} - \frac{2160d^2(bc-ad)e^{-a-bx}}{b^4} - \frac{360d(bc-ad)^2e^{-a-bx}}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}}{b^4} - \frac{5040d^3e^{-a-bx}(a+bx)}{b^4} - \frac{2160d^2(bc-ad)e^{-a-bx}(a+bx)}{b^4} - \frac{360d(bc-ad)^2e^{-a-bx}(a+bx)}{b^4} - \frac{24(bc-ad)^3e^{-a-bx}(a+bx)}{b^4} - \frac{2520d^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{1080d^2(bc-ad)e^{-a-bx}(a+bx)^2}{b^4} - \frac{180d(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^4} - \frac{12(bc-ad)^3e^{-a-bx}(a+bx)^2}{b^4} - \frac{840d^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{360d^2(bc-ad)e^{-a-bx}(a+bx)^3}{b^4} - \frac{60d(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^4} - \frac{4(bc-ad)^3e^{-a-bx}(a+bx)^3}{b^4} - \frac{210d^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{90d^2(bc-ad)e^{-a-bx}(a+bx)^4}{b^4} - \frac{15d(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^4} - \frac{(bc-ad)^3e^{-a-bx}(a+bx)^4}{b^4} - \frac{42d^3e^{-a-bx}(a+bx)^5}{b^4} - \frac{18d^2(bc-ad)e^{-a-bx}(a+bx)^5}{b^4} - \frac{3d(bc-ad)^2e^{-a-bx}(a+bx)^5}{b^4} - \frac{7d^3e^{-a-bx}(a+bx)^6}{b^4} - \frac{3d^2(bc-ad)e^{-a-bx}(a+bx)^6}{b^4} - \frac{d^3e^{-a-bx}(a+bx)^7}{b^4}$$

Mathematica [A] (verified)

Time = 6.79 (sec) , antiderivative size = 458, normalized size of antiderivative = 0.61

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = \frac{e^{-a-bx}(-6(840+480a+120a^2+16a^3+a^4)\,d^3 - b^7x^4(c+dx)^3 - b^6x^3(c+dx)^2(4(1+a)c+(7+4a)dx) -}{}$$

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^3,x]
```

```
[Out] (E^(-a - b*x)*(-6*(840 + 480*a + 120*a^2 + 16*a^3 + a^4)*d^3 - b^7*x^4*(c +
 d*x)^3 - b^6*x^3*(c + d*x)^2*(4*(1 + a)*c + (7 + 4*a)*d*x) - 6*b*d^2*((360
 + 240*a + 72*a^2 + 12*a^3 + a^4)*c + (840 + 480*a + 120*a^2 + 16*a^3 + a^4
)*d*x) - 6*b^5*x^2*(c + d*x)*((2 + 2*a + a^2)*c^2 + 2*(4 + 3*a + a^2)*c*d*x
 + (7 + 4*a + a^2)*d^2*x^2) - 3*b^2*d*((120 + 96*a + 36*a^2 + 8*a^3 + a^4)*
c^2 + 2*(360 + 240*a + 72*a^2 + 12*a^3 + a^4)*c*d*x + (840 + 480*a + 120*a^
2 + 16*a^3 + a^4)*d^2*x^2) - 2*b^4*x*(2*(6 + 6*a + 3*a^2 + a^3)*c^3 + 3*(30
 + 24*a + 9*a^2 + 2*a^3)*c^2*d*x + 6*(30 + 20*a + 6*a^2 + a^3)*c*d^2*x^2 +
(105 + 60*a + 15*a^2 + 2*a^3)*d^3*x^3) - b^3*((24 + 24*a + 12*a^2 + 4*a^3 +
```

```
a^4)*c^3 + 3*(120 + 96*a + 36*a^2 + 8*a^3 + a^4)*c^2*d*x + 3*(360 + 240*a
+ 72*a^2 + 12*a^3 + a^4)*c*d^2*x^2 + (840 + 480*a + 120*a^2 + 16*a^3 + a^4)
*d^3*x^3)))/b^4
```

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 900, normalized size of antiderivative = 1.19

method	result
norman	$(-4a\,b^2d^3 - 3c\,d^2b^3 - 7b^2d^3)\,x^6\mathrm{e}^{-bx-a} + (-4a^3d^3 - 18a^2bc\,d^2 - 12a\,b^2c^2d - b^3c^3 - 30a$
meijerg	Expression too large to display
gosper	Expression too large to display
risch	Expression too large to display
derivativedivides	Expression too large to display
default	Expression too large to display
parts	Expression too large to display
parallelrisch	Expression too large to display

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x,method=_RETURNVERBOSE)
```

```
[Out] (-4*a*b^2*d^3-3*b^3*c*d^2-7*b^2*d^3)*x^6*exp(-b*x-a)+(-4*a^3*d^3-18*a^2*b*c
*d^2-12*a*b^2*c^2*d-b^3*c^3-30*a^2*d^3-60*a*b*c*d^2-15*b^2*c^2*d-120*a*d^3-
90*b*c*d^2-210*d^3)*x^4*exp(-b*x-a)-(a^4*b^3*c^3+3*a^4*b^2*c^2*d+4*a^3*b^3*
c^3+6*a^4*b*c*d^2+24*a^3*b^2*c^2*d+12*a^2*b^3*c^3+6*a^4*d^3+72*a^3*b*c*d^2+
108*a^2*b^2*c^2*d+24*a*b^3*c^3+96*a^3*d^3+432*a^2*b*c*d^2+288*a*b^2*c^2*d+2
4*b^3*c^3+720*a^2*d^3+1440*a*b*c*d^2+360*b^2*c^2*d+2880*a*d^3+2160*b*c*d^2+
5040*d^3)/b^4*exp(-b*x-a)-d^3*b^3*x^7*exp(-b*x-a)-(a^4*d^3+12*a^3*b*c*d^2+1
8*a^2*b^2*c^2*d+4*a*b^3*c^3+16*a^3*d^3+72*a^2*b*c*d^2+48*a*b^2*c^2*d+4*b^3*
c^3+120*a^2*d^3+240*a*b*c*d^2+60*b^2*c^2*d+480*a*d^3+360*b*c*d^2+840*d^3)/b
*x^3*exp(-b*x-a)-3*(a^4*b*c*d^2+4*a^3*b^2*c^2*d+2*a^2*b^3*c^3+a^4*d^3+12*a^
3*b*c*d^2+18*a^2*b^2*c^2*d+4*a*b^3*c^3+16*a^3*d^3+72*a^2*b*c*d^2+48*a*b^2*c
^2*d+4*b^3*c^3+120*a^2*d^3+240*a*b*c*d^2+60*b^2*c^2*d+480*a*d^3+360*b*c*d^2
+840*d^3)/b^2*x^2*exp(-b*x-a)-(3*a^4*b^2*c^2*d+4*a^3*b^3*c^3+6*a^4*b*c*d^2+
24*a^3*b^2*c^2*d+12*a^2*b^3*c^3+6*a^4*d^3+72*a^3*b*c*d^2+108*a^2*b^2*c^2*d+
24*a*b^3*c^3+96*a^3*d^3+432*a^2*b*c*d^2+288*a*b^2*c^2*d+24*b^3*c^3+720*a^2*
d^3+1440*a*b*c*d^2+360*b^2*c^2*d+2880*a*d^3+2160*b*c*d^2+5040*d^3)/b^3*x*ex
p(-b*x-a)-3*b*d*(2*a^2*d^2+4*a*b*c*d+b^2*c^2+8*a*d^2+6*b*c*d+14*d^2)*x^5*ex
p(-b*x-a)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 544, normalized size of antiderivative = 0.72

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = -\frac{(b^7d^3x^7 + (a^4 + 4\,a^3 + 12\,a^2 + 24\,a + 24)b^3c^3 + (3\,b^7cd^2 + (4\,a + 7)b^6d^3)x^6 + 3\,(a^4 + 8\,a^3 + 36\,a^2 + 96\,a}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="fricas")
```

```
[Out] -(b^7*d^3*x^7 + (a^4 + 4*a^3 + 12*a^2 + 24*a + 24)*b^3*c^3 + (3*b^7*c*d^2 +
 (4*a + 7)*b^6*d^3)*x^6 + 3*(a^4 + 8*a^3 + 36*a^2 + 96*a + 120)*b^2*c^2*d +
 3*(b^7*c^2*d + 2*(2*a + 3)*b^6*c*d^2 + 2*(a^2 + 4*a + 7)*b^5*d^3)*x^5 + 6*
(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b*c*d^2 + (b^7*c^3 + 3*(4*a + 5)*b^6*
c^2*d + 6*(3*a^2 + 10*a + 15)*b^5*c*d^2 + 2*(2*a^3 + 15*a^2 + 60*a + 105)*b
^4*d^3)*x^4 + 6*(a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*d^3 + (4*(a + 1)*b^6
*c^3 + 6*(3*a^2 + 8*a + 10)*b^5*c^2*d + 12*(a^3 + 6*a^2 + 20*a + 30)*b^4*c*
d^2 + (a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b^3*d^3)*x^3 + 3*(2*(a^2 + 2*a
 + 2)*b^5*c^3 + 2*(2*a^3 + 9*a^2 + 24*a + 30)*b^4*c^2*d + (a^4 + 12*a^3 + 7
2*a^2 + 240*a + 360)*b^3*c*d^2 + (a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b^2
*d^3)*x^2 + (4*(a^3 + 3*a^2 + 6*a + 6)*b^4*c^3 + 3*(a^4 + 8*a^3 + 36*a^2 +
96*a + 120)*b^3*c^2*d + 6*(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b^2*c*d^2 +
 6*(a^4 + 16*a^3 + 120*a^2 + 480*a + 840)*b*d^3)*x)*e^(-b*x - a)/b^4
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1445 vs. $2(695) = 1390$.

Time = 0.29 (sec) , antiderivative size = 1445, normalized size of antiderivative = 1.92

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = \begin{cases} \frac{(-a^4b^3c^3-3a^4b^3c^2dx-3a^4b^3cd^2x^2-a^4b^3d^3x^3-3a^4b^2c^2d-6a^4b^2cd^2x-3a^4b^2d^3x^2-6a^4bcd^2-6a^4bd^3x-6a^4d^3-4a^3b^4c^3x-12a^3b^4c^2dx^2-12a^3b^4}{} \\ a^4c^3x + \frac{b^4d^3x^8}{8} + x^7\cdot\left(\frac{4ab^3d^3}{7} + \frac{3b^4cd^2}{7}\right) + x^6\left(a^2b^2d^3 + 2ab^3cd^2 + \frac{b^4c^2d}{2}\right) + x^5\cdot\left(\frac{4a^3bd^3}{5} + \frac{18a^2b^2cd^2}{5} + \frac{12ab^3c^2d}{5}\right. \end{cases}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c)**3,x)
```

```
[Out] Piecewise(((-a**4*b**3*c**3 - 3*a**4*b**3*c**2*d*x - 3*a**4*b**3*c*d**2*x**
2 - a**4*b**3*d**3*x**3 - 3*a**4*b**2*c**2*d - 6*a**4*b**2*c*d**2*x - 3*a**
4*b**2*d**3*x**2 - 6*a**4*b*c*d**2 - 6*a**4*b*d**3*x - 6*a**4*d**3 - 4*a**3
*b**4*c**3*x - 12*a**3*b**4*c**2*d*x**2 - 12*a**3*b**4*c*d**2*x**3 - 4*a**3
*b**4*d**3*x**4 - 4*a**3*b**3*c**3 - 24*a**3*b**3*c**2*d*x - 36*a**3*b**3*c
```

```
*d**2*x**2 - 16*a**3*b**3*d**3*x**3 - 24*a**3*b**2*c**2*d - 72*a**3*b**2*c*
d**2*x - 48*a**3*b**2*d**3*x**2 - 72*a**3*b*c*d**2 - 96*a**3*b*d**3*x - 96*
a**3*d**3 - 6*a**2*b**5*c**3*x**2 - 18*a**2*b**5*c**2*d*x**3 - 18*a**2*b**5
*c*d**2*x**4 - 6*a**2*b**5*d**3*x**5 - 12*a**2*b**4*c**3*x - 54*a**2*b**4*c
**2*d*x**2 - 72*a**2*b**4*c*d**2*x**3 - 30*a**2*b**4*d**3*x**4 - 12*a**2*b*
*3*c**3 - 108*a**2*b**3*c**2*d*x - 216*a**2*b**3*c*d**2*x**2 - 120*a**2*b**
3*d**3*x**3 - 108*a**2*b**2*c**2*d - 432*a**2*b**2*c*d**2*x - 360*a**2*b**2
*d**3*x**2 - 432*a**2*b*c*d**2 - 720*a**2*b*d**3*x - 720*a**2*d**3 - 4*a*b*
*6*c**3*x**3 - 12*a*b**6*c**2*d*x**4 - 12*a*b**6*c*d**2*x**5 - 4*a*b**6*d**
3*x**6 - 12*a*b**5*c**3*x**2 - 48*a*b**5*c**2*d*x**3 - 60*a*b**5*c*d**2*x**
4 - 24*a*b**5*d**3*x**5 - 24*a*b**4*c**3*x - 144*a*b**4*c**2*d*x**2 - 240*a
*b**4*c*d**2*x**3 - 120*a*b**4*d**3*x**4 - 24*a*b**3*c**3 - 288*a*b**3*c**2
*d*x - 720*a*b**3*c*d**2*x**2 - 480*a*b**3*d**3*x**3 - 288*a*b**2*c**2*d -
1440*a*b**2*c*d**2*x - 1440*a*b**2*d**3*x**2 - 1440*a*b*c*d**2 - 2880*a*b*d
**3*x - 2880*a*d**3 - b**7*c**3*x**4 - 3*b**7*c**2*d*x**5 - 3*b**7*c*d**2*x
**6 - b**7*d**3*x**7 - 4*b**6*c**3*x**3 - 15*b**6*c**2*d*x**4 - 18*b**6*c*d
**2*x**5 - 7*b**6*d**3*x**6 - 12*b**5*c**3*x**2 - 60*b**5*c**2*d*x**3 - 90*
b**5*c*d**2*x**4 - 42*b**5*d**3*x**5 - 24*b**4*c**3*x - 180*b**4*c**2*d*x**
2 - 360*b**4*c*d**2*x**3 - 210*b**4*d**3*x**4 - 24*b**3*c**3 - 360*b**3*c**
2*d*x - 1080*b**3*c*d**2*x**2 - 840*b**3*d**3*x**3 - 360*b**2*c**2*d - 2160
*b**2*c*d**2*x - 2520*b**2*d**3*x**2 - 2160*b*c*d**2 - 5040*b*d**3*x - 5040
*d**3)*exp(-a - b*x)/b**4, Ne(b**4, 0)), (a**4*c**3*x + b**4*d**3*x**8/8 +
x**7*(4*a*b**3*d**3/7 + 3*b**4*c*d**2/7) + x**6*(a**2*b**2*d**3 + 2*a*b**3*
c*d**2 + b**4*c**2*d/2) + x**5*(4*a**3*b*d**3/5 + 18*a**2*b**2*c*d**2/5 + 1
2*a*b**3*c**2*d/5 + b**4*c**3/5) + x**4*(a**4*d**3/4 + 3*a**3*b*c*d**2 + 9*
a**2*b**2*c**2*d/2 + a*b**3*c**3) + x**3*(a**4*c*d**2 + 4*a**3*b*c**2*d + 2
*a**2*b**2*c**3) + x**2*(3*a**4*c**2*d/2 + 2*a**3*b*c**3), True))
```

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 894, normalized size of antiderivative = 1.19

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx$$
$$= -\frac{4\,(bx+1)a^3c^3e^{(-bx-a)}}{b} - \frac{a^4c^3e^{(-bx-a)}}{b} - \frac{3\,(bx+1)a^4c^2de^{(-bx-a)}}{b^2} - \frac{6\,(b^2x^2+2\,bx+2)a^2c^3e^{(-bx-a)}}{b} - \frac{12\,(b^2x^2+2\,bx+2)a^3c^2de^{(-bx-a)}}{b^2} - \frac{3\,(b^2x^2+2\,bx+2)a^4cd^2e^{(-bx-a)}}{b^3} - \frac{4\,(b^3x^3+3\,b^2x^2+6\,bx+6)ac^3e^{(-bx-a)}}{b} - \frac{18\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^2c^2de^{(-bx-a)}}{b^2} - \frac{12\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^3cd^2e^{(-bx-a)}}{b^3} - \frac{(b^3x^3+3\,b^2x^2+6\,bx+6)a^4d^3e^{(-bx-a)}}{b^4} - \frac{(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)c^3e^{(-bx-a)}}{b} - \frac{12\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)ac^2de^{(-bx-a)}}{b^2} - \frac{18\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)a^2cd^2e^{(-bx-a)}}{b^3} - \frac{4\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)a^3d^3e^{(-bx-a)}}{b^4} - \frac{3\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)c^2de^{(-bx-a)}}{b^2} - \frac{12\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)acd^2e^{(-bx-a)}}{b^3} - \frac{6\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)a^2d^3e^{(-bx-a)}}{b^4} - \frac{3\,(b^6x^6+6\,b^5x^5+30\,b^4x^4+120\,b^3x^3+360\,b^2x^2+720\,bx+720)cd^2e^{(-bx-a)}}{b^3} - \frac{4\,(b^6x^6+6\,b^5x^5+30\,b^4x^4+120\,b^3x^3+360\,b^2x^2+720\,bx+720)ad^3e^{(-bx-a)}}{b^4} - \frac{(b^7x^7+7\,b^6x^6+42\,b^5x^5+210\,b^4x^4+840\,b^3x^3+2520\,b^2x^2+5040\,bx+5040)d^3e^{(-bx-a)}}{b^4}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c^3*e^(-b*x - a)/b - a^4*c^3*e^(-b*x - a)/b - 3*(b*x + 1)*
a^4*c^2*d*e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c^3*e^(-b*x - a)/b
 - 12*(b^2*x^2 + 2*b*x + 2)*a^3*c^2*d*e^(-b*x - a)/b^2 - 3*(b^2*x^2 + 2*b*x
 + 2)*a^4*c*d^2*e^(-b*x - a)/b^3 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*c^
3*e^(-b*x - a)/b - 18*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*c^2*d*e^(-b*x -
 a)/b^2 - 12*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*c*d^2*e^(-b*x - a)/b^3 -
 (b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^4*d^3*e^(-b*x - a)/b^4 - (b^4*x^4 + 4*
```

```
b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c^3*e^(-b*x - a)/b - 12*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*c^2*d*e^(-b*x - a)/b^2 - 18*(b^4*x^4 +
4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*c*d^2*e^(-b*x - a)/b^3 - 4*(b^4*x
^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^3*d^3*e^(-b*x - a)/b^4 - 3*(b^
5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*c^2*d*e^(-b*x
- a)/b^2 - 12*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 12
0)*a*c*d^2*e^(-b*x - a)/b^3 - 6*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*
x^2 + 120*b*x + 120)*a^2*d^3*e^(-b*x - a)/b^4 - 3*(b^6*x^6 + 6*b^5*x^5 + 30
*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b*x + 720)*c*d^2*e^(-b*x - a)/b^
3 - 4*(b^6*x^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x^2 + 720*b
*x + 720)*a*d^3*e^(-b*x - a)/b^4 - (b^7*x^7 + 7*b^6*x^6 + 42*b^5*x^5 + 210*
b^4*x^4 + 840*b^3*x^3 + 2520*b^2*x^2 + 5040*b*x + 5040)*d^3*e^(-b*x - a)/b^
4
```

Giac [A] (verification not implemented)

none

Time = 0.38 (sec) , antiderivative size = 1096, normalized size of antiderivative = 1.45

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx = -\frac{(b^{11}d^3x^7+3\,b^{11}cd^2x^6+4\,ab^{10}d^3x^6+3\,b^{11}c^2dx^5+12\,ab^{10}cd^2x^5+6\,a^2b^9d^3x^5+7\,b^{10}d^3x^6+b^{11}c^3x^4+12}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^3,x, algorithm="giac")
```

```
[Out] -(b^11*d^3*x^7 + 3*b^11*c*d^2*x^6 + 4*a*b^10*d^3*x^6 + 3*b^11*c^2*d*x^5 + 1
2*a*b^10*c*d^2*x^5 + 6*a^2*b^9*d^3*x^5 + 7*b^10*d^3*x^6 + b^11*c^3*x^4 + 12
*a*b^10*c^2*d*x^4 + 18*a^2*b^9*c*d^2*x^4 + 4*a^3*b^8*d^3*x^4 + 18*b^10*c*d^
2*x^5 + 24*a*b^9*d^3*x^5 + 4*a*b^10*c^3*x^3 + 18*a^2*b^9*c^2*d*x^3 + 12*a^3
*b^8*c*d^2*x^3 + a^4*b^7*d^3*x^3 + 15*b^10*c^2*d*x^4 + 60*a*b^9*c*d^2*x^4 +
 30*a^2*b^8*d^3*x^4 + 42*b^9*d^3*x^5 + 6*a^2*b^9*c^3*x^2 + 12*a^3*b^8*c^2*d
*x^2 + 3*a^4*b^7*c*d^2*x^2 + 4*b^10*c^3*x^3 + 48*a*b^9*c^2*d*x^3 + 72*a^2*b
^8*c*d^2*x^3 + 16*a^3*b^7*d^3*x^3 + 90*b^9*c*d^2*x^4 + 120*a*b^8*d^3*x^4 +
4*a^3*b^8*c^3*x + 3*a^4*b^7*c^2*d*x + 12*a*b^9*c^3*x^2 + 54*a^2*b^8*c^2*d*x
^2 + 36*a^3*b^7*c*d^2*x^2 + 3*a^4*b^6*d^3*x^2 + 60*b^9*c^2*d*x^3 + 240*a*b^
8*c*d^2*x^3 + 120*a^2*b^7*d^3*x^3 + 210*b^8*d^3*x^4 + a^4*b^7*c^3 + 12*a^2*
b^8*c^3*x + 24*a^3*b^7*c^2*d*x + 6*a^4*b^6*c*d^2*x + 12*b^9*c^3*x^2 + 144*a
*b^8*c^2*d*x^2 + 216*a^2*b^7*c*d^2*x^2 + 48*a^3*b^6*d^3*x^2 + 360*b^8*c*d^2
*x^3 + 480*a*b^7*d^3*x^3 + 4*a^3*b^7*c^3 + 3*a^4*b^6*c^2*d + 24*a*b^8*c^3*x
 + 108*a^2*b^7*c^2*d*x + 72*a^3*b^6*c*d^2*x + 6*a^4*b^5*d^3*x + 180*b^8*c^2
*d*x^2 + 720*a*b^7*c*d^2*x^2 + 360*a^2*b^6*d^3*x^2 + 840*b^7*d^3*x^3 + 12*a
^2*b^7*c^3 + 24*a^3*b^6*c^2*d + 6*a^4*b^5*c*d^2 + 24*b^8*c^3*x + 288*a*b^7*
c^2*d*x + 432*a^2*b^6*c*d^2*x + 96*a^3*b^5*d^3*x + 1080*b^7*c*d^2*x^2 + 144
0*a*b^6*d^3*x^2 + 24*a*b^7*c^3 + 108*a^2*b^6*c^2*d + 72*a^3*b^5*c*d^2 + 6*a
```

```
^4*b^4*d^3 + 360*b^7*c^2*d*x + 1440*a*b^6*c*d^2*x + 720*a^2*b^5*d^3*x + 252
0*b^6*d^3*x^2 + 24*b^7*c^3 + 288*a*b^6*c^2*d + 432*a^2*b^5*c*d^2 + 96*a^3*b
^4*d^3 + 2160*b^6*c*d^2*x + 2880*a*b^5*d^3*x + 360*b^6*c^2*d + 1440*a*b^5*c
*d^2 + 720*a^2*b^4*d^3 + 5040*b^5*d^3*x + 2160*b^5*c*d^2 + 2880*a*b^4*d^3 +
 5040*b^4*d^3)*e^(-b*x - a)/b^8
```

Mupad [B] (verification not implemented)

Time = 0.49 (sec) , antiderivative size = 803, normalized size of antiderivative = 1.06

$$\int e^{-a-bx}(a+bx)^4(c+dx)^3\,dx$$

$$= -x^3\,e^{-a-b\,x}\left(b^2\left(4\,a\,c^3+4\,c^3\right)+360\,c\,d^2+\frac{a^4\,d^3+16\,a^3\,d^3+120\,a^2\,d^3+480\,a\,d^3+840\,d^3}{b}\right.$$
$$\left.+b\left(18\,d\,a^2\,c^2+48\,d\,a\,c^2+60\,d\,c^2\right)+72\,a^2\,c\,d^2+12\,a^3\,c\,d^2+240\,a\,c\,d^2\right)$$
$$-x^4\,e^{-a-b\,x}\left(4\,a^3\,d^3+18\,a^2\,b\,c\,d^2+30\,a^2\,d^3+12\,a\,b^2\,c^2\,d+60\,a\,b\,c\,d^2+120\,a\,d^3+b^3\,c^3\right.$$
$$\left.+15\,b^2\,c^2\,d+90\,b\,c\,d^2+210\,d^3\right)$$
$$-\frac{e^{-a-b\,x}\left(a^4\,b^3\,c^3+3\,a^4\,b^2\,c^2\,d+6\,a^4\,b\,c\,d^2+6\,a^4\,d^3+4\,a^3\,b^3\,c^3+24\,a^3\,b^2\,c^2\,d+72\,a^3\,b\,c\,d^2+96\,a^3\,d^3+12\cdots\right.}{\cdots}$$
$$-x\,e^{-a-b\,x}\left(4\,c^3\left(a^3+3\,a^2+6\,a+6\right)+\frac{6\,d^3\left(a^4+16\,a^3+120\,a^2+480\,a+840\right)}{b^3}\right.$$
$$\left.+\frac{3\,c^2\,d\left(a^4+8\,a^3+36\,a^2+96\,a+120\right)}{b}+\frac{6\,c\,d^2\left(a^4+12\,a^3+72\,a^2+240\,a+360\right)}{b^2}\right)$$
$$-\frac{3\,x^2\,e^{-a-b\,x}\left(a^4\,b\,c\,d^2+a^4\,d^3+4\,a^3\,b^2\,c^2\,d+12\,a^3\,b\,c\,d^2+16\,a^3\,d^3+2\,a^2\,b^3\,c^3+18\,a^2\,b^2\,c^2\,d+72\,a^2\,b\,c\,d^2\cdots\right.}{b^2}$$
$$-b^3\,d^3\,x^7\,e^{-a-b\,x}-b^2\,d^2\,x^6\,e^{-a-b\,x}\left(7\,d+4\,a\,d+3\,b\,c\right)$$
$$-3\,b\,d\,x^5\,e^{-a-b\,x}\left(2\,a^2\,d^2+4\,a\,b\,c\,d+8\,a\,d^2+b^2\,c^2+6\,b\,c\,d+14\,d^2\right)$$

```
[In] int(exp(- a - b*x)*(a + b*x)^4*(c + d*x)^3,x)
```

```
[Out] - x^3*exp(- a - b*x)*(b^2*(4*a*c^3 + 4*c^3) + 360*c*d^2 + (480*a*d^3 + 840*
d^3 + 120*a^2*d^3 + 16*a^3*d^3 + a^4*d^3)/b + b*(60*c^2*d + 18*a^2*c^2*d +
48*a*c^2*d) + 72*a^2*c*d^2 + 12*a^3*c*d^2 + 240*a*c*d^2) - x^4*exp(- a - b*
x)*(120*a*d^3 + 210*d^3 + 30*a^2*d^3 + 4*a^3*d^3 + b^3*c^3 + 15*b^2*c^2*d +
 90*b*c*d^2 + 60*a*b*c*d^2 + 12*a*b^2*c^2*d + 18*a^2*b*c*d^2) - (exp(- a -
b*x)*(2880*a*d^3 + 5040*d^3 + 720*a^2*d^3 + 96*a^3*d^3 + 24*b^3*c^3 + 6*a^4
*d^3 + 24*a*b^3*c^3 + 360*b^2*c^2*d + 12*a^2*b^3*c^3 + 4*a^3*b^3*c^3 + a^4*
b^3*c^3 + 2160*b*c*d^2 + 108*a^2*b^2*c^2*d + 24*a^3*b^2*c^2*d + 3*a^4*b^2*c
^2*d + 1440*a*b*c*d^2 + 288*a*b^2*c^2*d + 432*a^2*b*c*d^2 + 72*a^3*b*c*d^2
+ 6*a^4*b*c*d^2))/b^4 - x*exp(- a - b*x)*(4*c^3*(6*a + 3*a^2 + a^3 + 6) + (
6*d^3*(480*a + 120*a^2 + 16*a^3 + a^4 + 840))/b^3 + (3*c^2*d*(96*a + 36*a^2
 + 8*a^3 + a^4 + 120))/b + (6*c*d^2*(240*a + 72*a^2 + 12*a^3 + a^4 + 360))/
```

```
b^2) - (3*x^2*exp(- a - b*x)*(480*a*d^3 + 840*d^3 + 120*a^2*d^3 + 16*a^3*d^
3 + 4*b^3*c^3 + a^4*d^3 + 4*a*b^3*c^3 + 60*b^2*c^2*d + 2*a^2*b^3*c^3 + 360*
b*c*d^2 + 18*a^2*b^2*c^2*d + 4*a^3*b^2*c^2*d + 240*a*b*c*d^2 + 48*a*b^2*c^2
*d + 72*a^2*b*c*d^2 + 12*a^3*b*c*d^2 + a^4*b*c*d^2))/b^2 - b^3*d^3*x^7*exp(
- a - b*x) - b^2*d^2*x^6*exp(- a - b*x)*(7*d + 4*a*d + 3*b*c) - 3*b*d*x^5*e
xp(- a - b*x)*(8*a*d^2 + 14*d^2 + 2*a^2*d^2 + b^2*c^2 + 6*b*c*d + 4*a*b*c*d
)
```

3.75 $\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx$

Optimal result

Integrand size = 25, antiderivative size = 495

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = -\frac{720d^2e^{-a-bx}}{b^3}-\frac{240d(bc-ad)e^{-a-bx}}{b^3}-\frac{24(bc-ad)^2e^{-a-bx}}{b^3} -\frac{720d^2e^{-a-bx}(a+bx)}{b^3}-\frac{240d(bc-ad)e^{-a-bx}(a+bx)}{b^3} -\frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}-\frac{360d^2e^{-a-bx}(a+bx)^2}{b^3} -\frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3} -\frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3}-\frac{120d^2e^{-a-bx}(a+bx)^3}{b^3} -\frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} -\frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3} -\frac{30d^2e^{-a-bx}(a+bx)^4}{b^3}-\frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} -\frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3}-\frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} -\frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3}-\frac{d^2e^{-a-bx}(a+bx)^6}{b^3}$$

```
[Out] -720*d^2*exp(-b*x-a)/b^3-240*d*(-a*d+b*c)*exp(-b*x-a)/b^3-24*(-a*d+b*c)^2*e
xp(-b*x-a)/b^3-720*d^2*exp(-b*x-a)*(b*x+a)/b^3-240*d*(-a*d+b*c)*exp(-b*x-a)
*(b*x+a)/b^3-24*(-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)/b^3-360*d^2*exp(-b*x-a)*(b
*x+a)^2/b^3-120*d*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^2/b^3-12*(-a*d+b*c)^2*exp(
-b*x-a)*(b*x+a)^2/b^3-120*d^2*exp(-b*x-a)*(b*x+a)^3/b^3-40*d*(-a*d+b*c)*exp
(-b*x-a)*(b*x+a)^3/b^3-4*(-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)^3/b^3-30*d^2*exp(
```

```
-b*x-a)*(b*x+a)^4/b^3-10*d*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^4/b^3-(-a*d+b*c)^
2*exp(-b*x-a)*(b*x+a)^4/b^3-6*d^2*exp(-b*x-a)*(b*x+a)^5/b^3-2*d*(-a*d+b*c)*
exp(-b*x-a)*(b*x+a)^5/b^3-d^2*exp(-b*x-a)*(b*x+a)^6/b^3
```

Rubi [A] (verified)

Time = 0.41 (sec) , antiderivative size = 495, normalized size of antiderivative = 1.00, number of steps used = 20, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.120, Rules used = {2227, 2207, 2225}

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = -\frac{2de^{-a-bx}(a+bx)^5(bc-ad)}{b^3}-\frac{e^{-a-bx}(a+bx)^4(bc-ad)^2}{b^3}-\frac{10de^{-a-bx}(a+bx)^4(bc-ad)}{b^3}-\frac{4e^{-a-bx}(a+bx)^3(bc-ad)^2}{b^3}-\frac{40de^{-a-bx}(a+bx)^3(bc-ad)}{b^3}-\frac{12e^{-a-bx}(a+bx)^2(bc-ad)^2}{b^3}-\frac{120de^{-a-bx}(a+bx)^2(bc-ad)}{b^3}-\frac{24e^{-a-bx}(a+bx)(bc-ad)^2}{b^3}-\frac{240de^{-a-bx}(a+bx)(bc-ad)}{b^3}-\frac{24e^{-a-bx}(bc-ad)^2}{b^3}-\frac{240de^{-a-bx}(bc-ad)}{b^3}-\frac{d^2e^{-a-bx}(a+bx)^6}{b^3}-\frac{6d^2e^{-a-bx}(a+bx)^5}{b^3}-\frac{30d^2e^{-a-bx}(a+bx)^4}{b^3}-\frac{120d^2e^{-a-bx}(a+bx)^3}{b^3}-\frac{360d^2e^{-a-bx}(a+bx)^2}{b^3}-\frac{720d^2e^{-a-bx}(a+bx)}{b^3}-\frac{720d^2e^{-a-bx}}{b^3}$$

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^2,x]
```

```
[Out] (-720*d^2*E^(-a - b*x))/b^3 - (240*d*(b*c - a*d)*E^(-a - b*x))/b^3 - (24*(b
*c - a*d)^2*E^(-a - b*x))/b^3 - (720*d^2*E^(-a - b*x)*(a + b*x))/b^3 - (240
*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^3 - (24*(b*c - a*d)^2*E^(-a - b*x)
*(a + b*x))/b^3 - (360*d^2*E^(-a - b*x)*(a + b*x)^2)/b^3 - (120*d*(b*c - a*
d)*E^(-a - b*x)*(a + b*x)^2)/b^3 - (12*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)
^2)/b^3 - (120*d^2*E^(-a - b*x)*(a + b*x)^3)/b^3 - (40*d*(b*c - a*d)*E^(-a
- b*x)*(a + b*x)^3)/b^3 - (4*(b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^3)/b^3 -
(30*d^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (10*d*(b*c - a*d)*E^(-a - b*x)*(a +
```

```
b*x)^4)/b^3 - ((b*c - a*d)^2*E^(-a - b*x)*(a + b*x)^4)/b^3 - (6*d^2*E^(-a
- b*x)*(a + b*x)^5)/b^3 - (2*d*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^5)/b^3 -
(d^2*E^(-a - b*x)*(a + b*x)^6)/b^3
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
x] && !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(\frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^2}+\frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^2}+\frac{d^2e^{-a-bx}(a+bx)^6}{b^2}\right)dx$$

$$=\frac{d^2\int e^{-a-bx}(a+bx)^6\,dx}{b^2}+\frac{(2d(bc-ad))\int e^{-a-bx}(a+bx)^5\,dx}{b^2}+\frac{(bc-ad)^2\int e^{-a-bx}(a+bx)^4\,dx}{b^2}$$

$$=-\frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3}-\frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3}-\frac{d^2e^{-a-bx}(a+bx)^6}{b^3}+\frac{(6d^2)\int e^{-a-bx}(a+bx)^5\,dx}{b^2}+\frac{(10d(bc-ad))\int e^{-a-bx}(a+bx)^4\,dx}{b^2}+\frac{(4(bc-ad)^2)\int e^{-a-bx}(a+bx)^3\,dx}{b^2}$$

$$
\begin{aligned}
&= -\frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3} - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} \\
&\quad - \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} - \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} \\
&\quad - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3} + \frac{(30d^2)\int e^{-a-bx}(a+bx)^4\,dx}{b^2} \\
&\quad + \frac{(40d(bc-ad))\int e^{-a-bx}(a+bx)^3\,dx}{b^2} + \frac{(12(bc-ad)^2)\int e^{-a-bx}(a+bx)^2\,dx}{b^2} \\
&= -\frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} \\
&\quad - \frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3} - \frac{30d^2e^{-a-bx}(a+bx)^4}{b^3} \\
&\quad - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} \\
&\quad - \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3} + \frac{(120d^2)\int e^{-a-bx}(a+bx)^3\,dx}{b^2} \\
&\quad + \frac{(120d(bc-ad))\int e^{-a-bx}(a+bx)^2\,dx}{b^2} + \frac{(24(bc-ad)^2)\int e^{-a-bx}(a+bx)\,dx}{b^2} \\
&= -\frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3} - \frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3} \\
&\quad - \frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d^2e^{-a-bx}(a+bx)^3}{b^3} \\
&\quad - \frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} - \frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3} \\
&\quad - \frac{30d^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} \\
&\quad - \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} - \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} \\
&\quad - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3} + \frac{(360d^2)\int e^{-a-bx}(a+bx)^2\,dx}{b^2} \\
&\quad + \frac{(240d(bc-ad))\int e^{-a-bx}(a+bx)\,dx}{b^2} + \frac{(24(bc-ad)^2)\int e^{-a-bx}\,dx}{b^2}
\end{aligned}
$$

$$= -\frac{24(bc-ad)^2e^{-a-bx}}{b^3} - \frac{240d(bc-ad)e^{-a-bx}(a+bx)}{b^3} - \frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}$$
$$- \frac{360d^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3}$$
$$- \frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} - \frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{30d^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3}$$
$$- \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} - \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3}$$
$$+ \frac{(720d^2)\int e^{-a-bx}(a+bx)\,dx}{b^2} + \frac{(240d(bc-ad))\int e^{-a-bx}\,dx}{b^2}$$

$$= -\frac{240d(bc-ad)e^{-a-bx}}{b^3} - \frac{24(bc-ad)^2e^{-a-bx}}{b^3} - \frac{720d^2e^{-a-bx}(a+bx)}{b^3}$$
$$- \frac{240d(bc-ad)e^{-a-bx}(a+bx)}{b^3} - \frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}$$
$$- \frac{360d^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3}$$
$$- \frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} - \frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{30d^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3}$$
$$- \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3}$$
$$- \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3} + \frac{(720d^2)\int e^{-a-bx}\,dx}{b^2}$$

$$= -\frac{720d^2e^{-a-bx}}{b^3} - \frac{240d(bc-ad)e^{-a-bx}}{b^3} - \frac{24(bc-ad)^2e^{-a-bx}}{b^3} - \frac{720d^2e^{-a-bx}(a+bx)}{b^3}$$
$$- \frac{240d(bc-ad)e^{-a-bx}(a+bx)}{b^3} - \frac{24(bc-ad)^2e^{-a-bx}(a+bx)}{b^3}$$
$$- \frac{360d^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d(bc-ad)e^{-a-bx}(a+bx)^2}{b^3}$$
$$- \frac{12(bc-ad)^2e^{-a-bx}(a+bx)^2}{b^3} - \frac{120d^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{40d(bc-ad)e^{-a-bx}(a+bx)^3}{b^3} - \frac{4(bc-ad)^2e^{-a-bx}(a+bx)^3}{b^3}$$
$$- \frac{30d^2e^{-a-bx}(a+bx)^4}{b^3} - \frac{10d(bc-ad)e^{-a-bx}(a+bx)^4}{b^3} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)^4}{b^3}$$
$$- \frac{6d^2e^{-a-bx}(a+bx)^5}{b^3} - \frac{2d(bc-ad)e^{-a-bx}(a+bx)^5}{b^3} - \frac{d^2e^{-a-bx}(a+bx)^6}{b^3}$$

Mathematica [A] (verified)

Time = 2.07 (sec) , antiderivative size = 320, normalized size of antiderivative = 0.65

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx$$
$$= \frac{e^{-a-bx}(-2(360+240a+72a^2+12a^3+a^4)\,d^2-b^6x^4(c+dx)^2-2b^5x^3(c+dx)(2(1+a)c+(3+2a)dx)}{}$$

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x)^2,x]
```

```
[Out] (E^(-a - b*x)*(-2*(360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d^2 - b^6*x^4*(c +
d*x)^2 - 2*b^5*x^3*(c + d*x)*(2*(1 + a)*c + (3 + 2*a)*d*x) - 2*b*d*((120 +
96*a + 36*a^2 + 8*a^3 + a^4)*c + (360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d*x)
 - 2*b^4*x^2*(3*(2 + 2*a + a^2)*c^2 + 2*(10 + 8*a + 3*a^2)*c*d*x + (15 + 10
*a + 3*a^2)*d^2*x^2) - 4*b^3*x*((6 + 6*a + 3*a^2 + a^3)*c^2 + (30 + 24*a +
9*a^2 + 2*a^3)*c*d*x + (30 + 20*a + 6*a^2 + a^3)*d^2*x^2) - b^2*((24 + 24*a
 + 12*a^2 + 4*a^3 + a^4)*c^2 + 2*(120 + 96*a + 36*a^2 + 8*a^3 + a^4)*c*d*x
+ (360 + 240*a + 72*a^2 + 12*a^3 + a^4)*d^2*x^2)))/b^3
```

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 560, normalized size of antiderivative = 1.13

method	result
norman	$(-4a\,b^2d^2-2cd\,b^3-6b^2d^2)\,x^5\mathrm{e}^{-bx-a}+(-6a^2b\,d^2-8a\,b^2cd-c^2b^3-20ab\,d^2-10b^2cd$
gosper	$-\frac{(d^2b^6x^6+4a\,b^5d^2x^5+2b^6cd\,x^5+6a^2b^4d^2x^4+8a\,b^5cd\,x^4+b^6c^2x^4+6b^5d^2x^5+4a^3b^3d^2x^3+12a^2b^4cd\,x^3+4a\,b^5c^2x^3+20a}{}$
risch	$-\frac{(d^2b^6x^6+4a\,b^5d^2x^5+2b^6cd\,x^5+6a^2b^4d^2x^4+8a\,b^5cd\,x^4+b^6c^2x^4+6b^5d^2x^5+4a^3b^3d^2x^3+12a^2b^4cd\,x^3+4a\,b^5c^2x^3+20a}{}$
meijerg	$\frac{\mathrm{e}^{-a}d^2\left(720-\frac{(7b^6x^6+42b^5x^5+210b^4x^4+840b^3x^3+2520b^2x^2+5040bx+5040)\mathrm{e}^{-bx}}{7}\right)}{b^3}+\frac{2\,\mathrm{e}^{-a}dc\left(120-\frac{(6b^5x^5+30b^4x^4+120b^3}{}\right.}{b^2}$
derivativedivides	$-\frac{c^2\left((-bx-a)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}(-bx-a)^3+12(-bx-a)^2\mathrm{e}^{-bx-a}-24(-bx-a)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}\right)+\frac{d^2\left(\mathrm{e}^{-bx-a}(-bx\right.}{}}{}$
default	$-\frac{c^2\left((-bx-a)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}(-bx-a)^3+12(-bx-a)^2\mathrm{e}^{-bx-a}-24(-bx-a)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}\right)+\frac{d^2\left(\mathrm{e}^{-bx-a}(-bx\right.}{}}{}$
parts	$-d^2b^3x^6\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}b^2a\,d^2x^5-2\,\mathrm{e}^{-bx-a}b^3cd\,x^5-6\,\mathrm{e}^{-bx-a}b\,a^2d^2x^4-8\,\mathrm{e}^{-bx-a}b^2acd$
parallelrisch	Expression too large to display

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x,method=_RETURNVERBOSE)
```

```
[Out] (-4*a*b^2*d^2-2*b^3*c*d-6*b^2*d^2)*x^5*exp(-b*x-a)+(-6*a^2*b*d^2-8*a*b^2*c*
d-b^3*c^2-20*a*b*d^2-10*b^2*c*d-30*b*d^2)*x^4*exp(-b*x-a)+(-4*a^3*d^2-12*a^
```

```
2*b*c*d-4*a*b^2*c^2-24*a^2*d^2-32*a*b*c*d-4*b^2*c^2-80*a*d^2-40*b*c*d-120*d
^2)*x^3*exp(-b*x-a)-(a^4*b^2*c^2+2*a^4*b*c*d+4*a^3*b^2*c^2+2*a^4*d^2+16*a^3
*b*c*d+12*a^2*b^2*c^2+24*a^3*d^2+72*a^2*b*c*d+24*a*b^2*c^2+144*a^2*d^2+192*
a*b*c*d+24*b^2*c^2+480*a*d^2+240*b*c*d+720*d^2)/b^3*exp(-b*x-a)-d^2*b^3*x^6
*exp(-b*x-a)-(a^4*d^2+8*a^3*b*c*d+6*a^2*b^2*c^2+12*a^3*d^2+36*a^2*b*c*d+12*
a*b^2*c^2+72*a^2*d^2+96*a*b*c*d+12*b^2*c^2+240*a*d^2+120*b*c*d+360*d^2)/b*x
^2*exp(-b*x-a)-2*(a^4*b*c*d+2*a^3*b^2*c^2+a^4*d^2+8*a^3*b*c*d+6*a^2*b^2*c^2
+12*a^3*d^2+36*a^2*b*c*d+12*a*b^2*c^2+72*a^2*d^2+96*a*b*c*d+12*b^2*c^2+240*
a*d^2+120*b*c*d+360*d^2)/b^2*x*exp(-b*x-a)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 354, normalized size of antiderivative = 0.72

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = -\frac{(b^6d^2x^6+2\,(b^6cd+(2\,a+3)b^5d^2)x^5+(a^4+4\,a^3+12\,a^2+24\,a+24)b^2c^2+(b^6c^2+2\,(4\,a+5)b^5cd+2\,(\cdots}{\cdots}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="fricas")
```

```
[Out] -(b^6*d^2*x^6 + 2*(b^6*c*d + (2*a + 3)*b^5*d^2)*x^5 + (a^4 + 4*a^3 + 12*a^2
 + 24*a + 24)*b^2*c^2 + (b^6*c^2 + 2*(4*a + 5)*b^5*c*d + 2*(3*a^2 + 10*a +
15)*b^4*d^2)*x^4 + 2*(a^4 + 8*a^3 + 36*a^2 + 96*a + 120)*b*c*d + 4*((a + 1)
*b^5*c^2 + (3*a^2 + 8*a + 10)*b^4*c*d + (a^3 + 6*a^2 + 20*a + 30)*b^3*d^2)*
x^3 + 2*(a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*d^2 + (6*(a^2 + 2*a + 2)*b^4*
c^2 + 4*(2*a^3 + 9*a^2 + 24*a + 30)*b^3*c*d + (a^4 + 12*a^3 + 72*a^2 + 240*
a + 360)*b^2*d^2)*x^2 + 2*(2*(a^3 + 3*a^2 + 6*a + 6)*b^3*c^2 + (a^4 + 8*a^3
 + 36*a^2 + 96*a + 120)*b^2*c*d + (a^4 + 12*a^3 + 72*a^2 + 240*a + 360)*b*d
^2)*x)*e^(-b*x - a)/b^3
```

Sympy [A] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 899, normalized size of antiderivative = 1.82

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = \begin{cases} \frac{(-a^4b^2c^2-2a^4b^2cdx-a^4b^2d^2x^2-2a^4bcd-2a^4bd^2x-2a^4d^2-4a^3b^3c^2x-8a^3b^3cdx^2-4a^3b^3d^2x^3-4a^3b^2c^2-16a^3b^2cdx-12a^3b^2d^2x^2-16a^3bcd-24\cdots}{\cdots} \\ a^4c^2x+\frac{b^4d^2x^7}{7}+x^6\cdot\left(\frac{2ab^3d^2}{3}+\frac{b^4cd}{3}\right)+x^5\cdot\left(\frac{6a^2b^2d^2}{5}+\frac{8ab^3cd}{5}+\frac{b^4c^2}{5}\right)+x^4(a^3bd^2+3a^2b^2cd+ab^3c^2)+x^3\Big(\cdots \end{cases}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c)**2,x)
```

```
[Out] Piecewise(((-a**4*b**2*c**2 - 2*a**4*b**2*c*d*x - a**4*b**2*d**2*x**2 - 2*a
**4*b*c*d - 2*a**4*b*d**2*x - 2*a**4*d**2 - 4*a**3*b**3*c**2*x - 8*a**3*b**
3*c*d*x**2 - 4*a**3*b**3*d**2*x**3 - 4*a**3*b**2*c**2 - 16*a**3*b**2*c*d*x
- 12*a**3*b**2*d**2*x**2 - 16*a**3*b*c*d - 24*a**3*b*d**2*x - 24*a**3*d**2
- 6*a**2*b**4*c**2*x**2 - 12*a**2*b**4*c*d*x**3 - 6*a**2*b**4*d**2*x**4 - 1
2*a**2*b**3*c**2*x - 36*a**2*b**3*c*d*x**2 - 24*a**2*b**3*d**2*x**3 - 12*a*
*2*b**2*c**2 - 72*a**2*b**2*c*d*x - 72*a**2*b**2*d**2*x**2 - 72*a**2*b*c*d
- 144*a**2*b*d**2*x - 144*a**2*d**2 - 4*a*b**5*c**2*x**3 - 8*a*b**5*c*d*x**
4 - 4*a*b**5*d**2*x**5 - 12*a*b**4*c**2*x**2 - 32*a*b**4*c*d*x**3 - 20*a*b*
*4*d**2*x**4 - 24*a*b**3*c**2*x - 96*a*b**3*c*d*x**2 - 80*a*b**3*d**2*x**3
- 24*a*b**2*c**2 - 192*a*b**2*c*d*x - 240*a*b**2*d**2*x**2 - 192*a*b*c*d -
480*a*b*d**2*x - 480*a*d**2 - b**6*c**2*x**4 - 2*b**6*c*d*x**5 - b**6*d**2*
x**6 - 4*b**5*c**2*x**3 - 10*b**5*c*d*x**4 - 6*b**5*d**2*x**5 - 12*b**4*c**
2*x**2 - 40*b**4*c*d*x**3 - 30*b**4*d**2*x**4 - 24*b**3*c**2*x - 120*b**3*c
*d*x**2 - 120*b**3*d**2*x**3 - 24*b**2*c**2 - 240*b**2*c*d*x - 360*b**2*d**
2*x**2 - 240*b*c*d - 720*b*d**2*x - 720*d**2)*exp(-a - b*x)/b**3, Ne(b**3,
0)), (a**4*c**2*x + b**4*d**2*x**7/7 + x**6*(2*a*b**3*d**2/3 + b**4*c*d/3)
+ x**5*(6*a**2*b**2*d**2/5 + 8*a*b**3*c*d/5 + b**4*c**2/5) + x**4*(a**3*b*d
**2 + 3*a**2*b**2*c*d + a*b**3*c**2) + x**3*(a**4*d**2/3 + 8*a**3*b*c*d/3 +
 2*a**2*b**2*c**2) + x**2*(a**4*c*d + 2*a**3*b*c**2), True))
```

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 599, normalized size of antiderivative = 1.21

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx$$
$$= -\frac{4\,(bx+1)a^3c^2e^{(-bx-a)}}{b} - \frac{a^4c^2e^{(-bx-a)}}{b} - \frac{2\,(bx+1)a^4cde^{(-bx-a)}}{b^2} - \frac{6\,(b^2x^2+2\,bx+2)a^2c^2e^{(-bx-a)}}{b} - \frac{8\,(b^2x^2+2\,bx+2)a^3cde^{(-bx-a)}}{b^2} - \frac{(b^2x^2+2\,bx+2)a^4d^2e^{(-bx-a)}}{b^3} - \frac{4\,(b^3x^3+3\,b^2x^2+6\,bx+6)ac^2e^{(-bx-a)}}{b} - \frac{12\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^2cde^{(-bx-a)}}{b^2} - \frac{4\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^3d^2e^{(-bx-a)}}{b^3} - \frac{(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)c^2e^{(-bx-a)}}{b} - \frac{8\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)acde^{(-bx-a)}}{b^2} - \frac{6\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)a^2d^2e^{(-bx-a)}}{b^3} - \frac{2\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)cde^{(-bx-a)}}{b^2} - \frac{4\,(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)ad^2e^{(-bx-a)}}{b^3} - \frac{(b^6x^6+6\,b^5x^5+30\,b^4x^4+120\,b^3x^3+360\,b^2x^2+720\,bx+720)d^2e^{(-bx-a)}}{b^3}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c^2*e^(-b*x - a)/b - a^4*c^2*e^(-b*x - a)/b - 2*(b*x + 1)*
a^4*c*d*e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c^2*e^(-b*x - a)/b -
 8*(b^2*x^2 + 2*b*x + 2)*a^3*c*d*e^(-b*x - a)/b^2 - (b^2*x^2 + 2*b*x + 2)*a
^4*d^2*e^(-b*x - a)/b^3 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*c^2*e^(-b*x
 - a)/b - 12*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*c*d*e^(-b*x - a)/b^2 - 4
*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^3*d^2*e^(-b*x - a)/b^3 - (b^4*x^4 + 4*
b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c^2*e^(-b*x - a)/b - 8*(b^4*x^4 + 4*b^3
*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*c*d*e^(-b*x - a)/b^2 - 6*(b^4*x^4 + 4*b^
3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a^2*d^2*e^(-b*x - a)/b^3 - 2*(b^5*x^5 + 5
*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*c*d*e^(-b*x - a)/b^2 -
4*(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*a*d^2*e^(
-b*x - a)/b^3 - (b^6*x^6 + 6*b^5*x^5 + 30*b^4*x^4 + 120*b^3*x^3 + 360*b^2*x
^2 + 720*b*x + 720)*d^2*e^(-b*x - a)/b^3
```

Giac [A] (verification not implemented)

none

Time = 0.39 (sec) , antiderivative size = 674, normalized size of antiderivative = 1.36

$$\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx = -\frac{(b^{10}d^2x^6+2\,b^{10}cdx^5+4\,ab^9d^2x^5+b^{10}c^2x^4+8\,ab^9cdx^4+6\,a^2b^8d^2x^4+6\,b^9d^2x^5+4\,ab^9c^2x^3+12\,a^2b^8cd$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c)^2,x, algorithm="giac")
[Out] -(b^10*d^2*x^6 + 2*b^10*c*d*x^5 + 4*a*b^9*d^2*x^5 + b^10*c^2*x^4 + 8*a*b^9*
c*d*x^4 + 6*a^2*b^8*d^2*x^4 + 6*b^9*d^2*x^5 + 4*a*b^9*c^2*x^3 + 12*a^2*b^8*
c*d*x^3 + 4*a^3*b^7*d^2*x^3 + 10*b^9*c*d*x^4 + 20*a*b^8*d^2*x^4 + 6*a^2*b^8
*c^2*x^2 + 8*a^3*b^7*c*d*x^2 + a^4*b^6*d^2*x^2 + 4*b^9*c^2*x^3 + 32*a*b^8*c
*d*x^3 + 24*a^2*b^7*d^2*x^3 + 30*b^8*d^2*x^4 + 4*a^3*b^7*c^2*x + 2*a^4*b^6*
c*d*x + 12*a*b^8*c^2*x^2 + 36*a^2*b^7*c*d*x^2 + 12*a^3*b^6*d^2*x^2 + 40*b^8
*c*d*x^3 + 80*a*b^7*d^2*x^3 + a^4*b^6*c^2 + 12*a^2*b^7*c^2*x + 16*a^3*b^6*c
*d*x + 2*a^4*b^5*d^2*x + 12*b^8*c^2*x^2 + 96*a*b^7*c*d*x^2 + 72*a^2*b^6*d^2
*x^2 + 120*b^7*d^2*x^3 + 4*a^3*b^6*c^2 + 2*a^4*b^5*c*d + 24*a*b^7*c^2*x + 7
2*a^2*b^6*c*d*x + 24*a^3*b^5*d^2*x + 120*b^7*c*d*x^2 + 240*a*b^6*d^2*x^2 +
12*a^2*b^6*c^2 + 16*a^3*b^5*c*d + 2*a^4*b^4*d^2 + 24*b^7*c^2*x + 192*a*b^6*
c*d*x + 144*a^2*b^5*d^2*x + 360*b^6*d^2*x^2 + 24*a*b^6*c^2 + 72*a^2*b^5*c*d
 + 24*a^3*b^4*d^2 + 240*b^6*c*d*x + 480*a*b^5*d^2*x + 24*b^6*c^2 + 192*a*b^
5*c*d + 144*a^2*b^4*d^2 + 720*b^5*d^2*x + 240*b^5*c*d + 480*a*b^4*d^2 + 720
*b^4*d^2)*e^(-b*x - a)/b^7
```

Mupad [B] (verification not implemented)

Time = 0.31 (sec) , antiderivative size = 537, normalized size of antiderivative = 1.08

$$\begin{aligned}\int e^{-a-bx}(a+bx)^4(c+dx)^2\,dx &= -x^2\,\mathrm{e}^{-a-b\,x}\,\Bigg(120\,c\,d+b\,\left(6\,a^2\,c^2+12\,a\,c^2+12\,c^2\right)\\&\quad+\frac{a^4\,d^2+12\,a^3\,d^2+72\,a^2\,d^2+240\,a\,d^2+360\,d^2}{b}+96\,a\,c\,d+36\,a^2\,c\,d+8\,a^3\,c\,d\Bigg)\\&\quad-x^3\,\mathrm{e}^{-a-b\,x}\,\left(4\,a^3\,d^2+12\,a^2\,b\,c\,d+24\,a^2\,d^2+4\,a\,b^2\,c^2+32\,a\,b\,c\,d+80\,a\,d^2+4\,b^2\,c^2\right.\\&\quad\left.+40\,b\,c\,d+120\,d^2\right)\\&\quad-\frac{\mathrm{e}^{-a-b\,x}\,\left(a^4\,b^2\,c^2+2\,a^4\,b\,c\,d+2\,a^4\,d^2+4\,a^3\,b^2\,c^2+16\,a^3\,b\,c\,d+24\,a^3\,d^2+12\,a^2\,b^2\,c^2+72\,a^2\,b\,c\,d+144\,a\right.}{b^3}\\&\quad-b^3\,d^2\,x^6\,\mathrm{e}^{-a-b\,x}-b\,x^4\,\mathrm{e}^{-a-b\,x}\,\left(6\,a^2\,d^2+8\,a\,b\,c\,d+20\,a\,d^2+b^2\,c^2+10\,b\,c\,d+30\,d^2\right)\\&\quad-\frac{2\,x\,\mathrm{e}^{-a-b\,x}\,\left(a^4\,b\,c\,d+a^4\,d^2+2\,a^3\,b^2\,c^2+8\,a^3\,b\,c\,d+12\,a^3\,d^2+6\,a^2\,b^2\,c^2+36\,a^2\,b\,c\,d+72\,a^2\,d^2+12\,a\,b^2\right.}{b^2}\\&\quad-2\,b^2\,d\,x^5\,\mathrm{e}^{-a-b\,x}\,\left(3\,d+2\,a\,d+b\,c\right)\end{aligned}$$

```
[In] int(exp(- a - b*x)*(a + b*x)^4*(c + d*x)^2,x)
```

```
[Out] - x^2*exp(- a - b*x)*(120*c*d + b*(12*a*c^2 + 12*c^2 + 6*a^2*c^2) + (240*a*
d^2 + 360*d^2 + 72*a^2*d^2 + 12*a^3*d^2 + a^4*d^2)/b + 96*a*c*d + 36*a^2*c*
d + 8*a^3*c*d) - x^3*exp(- a - b*x)*(80*a*d^2 + 120*d^2 + 24*a^2*d^2 + 4*b^
2*c^2 + 4*a^3*d^2 + 4*a*b^2*c^2 + 40*b*c*d + 12*a^2*b*c*d + 32*a*b*c*d) - (
exp(- a - b*x)*(480*a*d^2 + 720*d^2 + 144*a^2*d^2 + 24*b^2*c^2 + 24*a^3*d^2
 + 2*a^4*d^2 + 24*a*b^2*c^2 + 240*b*c*d + 12*a^2*b^2*c^2 + 4*a^3*b^2*c^2 +
a^4*b^2*c^2 + 72*a^2*b*c*d + 16*a^3*b*c*d + 2*a^4*b*c*d + 192*a*b*c*d))/b^3
 - b^3*d^2*x^6*exp(- a - b*x) - b*x^4*exp(- a - b*x)*(20*a*d^2 + 30*d^2 + 6
*a^2*d^2 + b^2*c^2 + 10*b*c*d + 8*a*b*c*d) - (2*x*exp(- a - b*x)*(240*a*d^2
 + 360*d^2 + 72*a^2*d^2 + 12*b^2*c^2 + 12*a^3*d^2 + a^4*d^2 + 12*a*b^2*c^2
+ 120*b*c*d + 6*a^2*b^2*c^2 + 2*a^3*b^2*c^2 + 36*a^2*b*c*d + 8*a^3*b*c*d +
a^4*b*c*d + 96*a*b*c*d))/b^2 - 2*b^2*d*x^5*exp(- a - b*x)*(3*d + 2*a*d + b*
c)
```

3.76 $\int e^{-a-bx}(a+bx)^4(c+dx)\,dx$

Optimal result

Integrand size = 23, antiderivative size = 271

$$\begin{aligned}\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = &-\frac{120de^{-a-bx}}{b^2}-\frac{24(bc-ad)e^{-a-bx}}{b^2}-\frac{120de^{-a-bx}(a+bx)}{b^2}\\&-\frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2}-\frac{60de^{-a-bx}(a+bx)^2}{b^2}\\&-\frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2}-\frac{20de^{-a-bx}(a+bx)^3}{b^2}\\&-\frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2}-\frac{5de^{-a-bx}(a+bx)^4}{b^2}\\&-\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2}-\frac{de^{-a-bx}(a+bx)^5}{b^2}\end{aligned}$$

```
[Out] -120*d*exp(-b*x-a)/b^2-24*(-a*d+b*c)*exp(-b*x-a)/b^2-120*d*exp(-b*x-a)*(b*x
+a)/b^2-24*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)/b^2-60*d*exp(-b*x-a)*(b*x+a)^2/b^
2-12*(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^2/b^2-20*d*exp(-b*x-a)*(b*x+a)^3/b^2-4*
(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^3/b^2-5*d*exp(-b*x-a)*(b*x+a)^4/b^2-(-a*d+b*
c)*exp(-b*x-a)*(b*x+a)^4/b^2-d*exp(-b*x-a)*(b*x+a)^5/b^2
```

Rubi [A] (verified)

Time = 0.22 (sec) , antiderivative size = 271, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used

$= \{2227, 2207, 2225\}$

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = -\frac{e^{-a-bx}(a+bx)^4(bc-ad)}{b^2} - \frac{4e^{-a-bx}(a+bx)^3(bc-ad)}{b^2} - \frac{12e^{-a-bx}(a+bx)^2(bc-ad)}{b^2} - \frac{24e^{-a-bx}(a+bx)(bc-ad)}{b^2} - \frac{24e^{-a-bx}(bc-ad)}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{20de^{-a-bx}(a+bx)^3}{b^2} - \frac{60de^{-a-bx}(a+bx)^2}{b^2} - \frac{120de^{-a-bx}(a+bx)}{b^2} - \frac{120de^{-a-bx}}{b^2}$$

```
[In] Int[E^(-a - b*x)*(a + b*x)^4*(c + d*x),x]
```

```
[Out] (-120*d*E^(-a - b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x))/b^2 - (120*d*E^(-
a - b*x)*(a + b*x))/b^2 - (24*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/b^2 - (60
*d*E^(-a - b*x)*(a + b*x)^2)/b^2 - (12*(b*c - a*d)*E^(-a - b*x)*(a + b*x)^2
)/b^2 - (20*d*E^(-a - b*x)*(a + b*x)^3)/b^2 - (4*(b*c - a*d)*E^(-a - b*x)*(
a + b*x)^3)/b^2 - (5*d*E^(-a - b*x)*(a + b*x)^4)/b^2 - ((b*c - a*d)*E^(-a -
 b*x)*(a + b*x)^4)/b^2 - (d*E^(-a - b*x)*(a + b*x)^5)/b^2
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] :> Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
 x] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b} + \frac{de^{-a-bx}(a+bx)^5}{b}\right) dx$$

$$= \frac{d\int e^{-a-bx}(a+bx)^5\,dx}{b} + \frac{(bc-ad)\int e^{-a-bx}(a+bx)^4\,dx}{b}$$

$$= -\frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} + \frac{(5d)\int e^{-a-bx}(a+bx)^4\,dx}{b} + \frac{(4(bc-ad))\int e^{-a-bx}(a+bx)^3\,dx}{b}$$

$$= -\frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} + \frac{(20d)\int e^{-a-bx}(a+bx)^3\,dx}{b} + \frac{(12(bc-ad))\int e^{-a-bx}(a+bx)^2\,dx}{b}$$

$$= -\frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2} - \frac{20de^{-a-bx}(a+bx)^3}{b^2} - \frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} + \frac{(60d)\int e^{-a-bx}(a+bx)^2\,dx}{b} + \frac{(24(bc-ad))\int e^{-a-bx}(a+bx)\,dx}{b}$$

$$= -\frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2} - \frac{60de^{-a-bx}(a+bx)^2}{b^2} - \frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2} - \frac{20de^{-a-bx}(a+bx)^3}{b^2} - \frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} + \frac{(120d)\int e^{-a-bx}(a+bx)\,dx}{b} + \frac{(24(bc-ad))\int e^{-a-bx}\,dx}{b}$$

$$= -\frac{24(bc-ad)e^{-a-bx}}{b^2} - \frac{120de^{-a-bx}(a+bx)}{b^2} - \frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2} - \frac{60de^{-a-bx}(a+bx)^2}{b^2} - \frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2} - \frac{20de^{-a-bx}(a+bx)^3}{b^2} - \frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2} + \frac{(120d)\int e^{-a-bx}\,dx}{b}$$

$$= -\frac{120de^{-a-bx}}{b^2} - \frac{24(bc-ad)e^{-a-bx}}{b^2} - \frac{120de^{-a-bx}(a+bx)}{b^2} - \frac{24(bc-ad)e^{-a-bx}(a+bx)}{b^2} - \frac{60de^{-a-bx}(a+bx)^2}{b^2} - \frac{12(bc-ad)e^{-a-bx}(a+bx)^2}{b^2} - \frac{20de^{-a-bx}(a+bx)^3}{b^2} - \frac{4(bc-ad)e^{-a-bx}(a+bx)^3}{b^2} - \frac{5de^{-a-bx}(a+bx)^4}{b^2} - \frac{(bc-ad)e^{-a-bx}(a+bx)^4}{b^2} - \frac{de^{-a-bx}(a+bx)^5}{b^2}$$

Mathematica [A] (verified)

Time = 0.73 (sec) , antiderivative size = 191, normalized size of antiderivative = 0.70

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx$$
$$= \frac{e^{-a-bx}(-((120+96a+36a^2+8a^3+a^4)\,d)-b^5x^4(c+dx)-b^4x^3(4(1+a)c+(5+4a)dx)-2b^3x^2(3(2+\cdots}{\cdots}$$

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4*(c + d*x),x]
```

```
[Out] (E^(-a - b*x)*(-((120 + 96*a + 36*a^2 + 8*a^3 + a^4)*d) - b^5*x^4*(c + d*x)
 - b^4*x^3*(4*(1 + a)*c + (5 + 4*a)*d*x) - 2*b^3*x^2*(3*(2 + 2*a + a^2)*c +
 (10 + 8*a + 3*a^2)*d*x) - 2*b^2*x*(2*(6 + 6*a + 3*a^2 + a^3)*c + (30 + 24*
a + 9*a^2 + 2*a^3)*d*x) - b*((24 + 24*a + 12*a^2 + 4*a^3 + a^4)*c + (120 +
96*a + 36*a^2 + 8*a^3 + a^4)*d*x)))/b^2
```

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 276, normalized size of antiderivative = 1.02

method	result
norman	$\left(-4a\,b^2d-c\,b^3-5b^2d\right)x^4\mathrm{e}^{-bx-a}+\left(-6a^2bd-4a\,b^2c-16abd-4b^2c-20bd\right)x^3\mathrm{e}^{-bx-a}+\cdots$
gosper	$-\frac{\left(d\,b^5x^5+4a\,b^4d\,x^4+b^5c\,x^4+6a^2b^3d\,x^3+4a\,b^4c\,x^3+5d\,b^4x^4+4a^3b^2d\,x^2+6a^2b^3c\,x^2+16a\,b^3d\,x^3+4b^4c\,x^3+a^4dxb+4a^3b^2c\cdots\right.}{\cdots}$
risch	$-\frac{\left(d\,b^5x^5+4a\,b^4d\,x^4+b^5c\,x^4+6a^2b^3d\,x^3+4a\,b^4c\,x^3+5d\,b^4x^4+4a^3b^2d\,x^2+6a^2b^3c\,x^2+16a\,b^3d\,x^3+4b^4c\,x^3+a^4dxb+4a^3b^2c\cdots\right.}{\cdots}$
derivativedivides	$-\frac{c\left(\left(-bx-a\right)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}\left(-bx-a\right)^3+12\left(-bx-a\right)^2\mathrm{e}^{-bx-a}-24\left(-bx-a\right)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}\right)-\frac{d\left(\left(-bx-a\right)^5\mathrm{e}^{-bx-a}\cdots\right.}{\cdots}}{\cdots}$
default	$-\frac{c\left(\left(-bx-a\right)^4\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}\left(-bx-a\right)^3+12\left(-bx-a\right)^2\mathrm{e}^{-bx-a}-24\left(-bx-a\right)\mathrm{e}^{-bx-a}+24\,\mathrm{e}^{-bx-a}\right)-\frac{d\left(\left(-bx-a\right)^5\mathrm{e}^{-bx-a}\cdots\right.}{\cdots}}{\cdots}$
meijerg	$\frac{\mathrm{e}^{-a}d\left(120-\frac{\left(6b^5x^5+30b^4x^4+120b^3x^3+360b^2x^2+720bx+720\right)\mathrm{e}^{-bx}}{6}\right)}{b^2}+\frac{\mathrm{e}^{-a}c\left(24-\frac{\left(5b^4x^4+20b^3x^3+60b^2x^2+120bx+120\right)\mathrm{e}^{-bx}}{5}\cdots\right.}{b}$
parts	$-d\,b^3x^5\mathrm{e}^{-bx-a}-4\,\mathrm{e}^{-bx-a}b^2ad\,x^4-\mathrm{e}^{-bx-a}b^3c\,x^4-6\,\mathrm{e}^{-bx-a}b\,a^2d\,x^3-4\,\mathrm{e}^{-bx-a}b^2ac\,x^3-4\cdots$
parallelrisch	$-\frac{8x\,\mathrm{e}^{-bx-a}a^3bd+12x\,\mathrm{e}^{-bx-a}a^2b^2c+36x\,\mathrm{e}^{-bx-a}a^2bd+24x\,\mathrm{e}^{-bx-a}a\,b^2c+96x\,\mathrm{e}^{-bx-a}abd+120\,\mathrm{e}^{-bx-a}d+4x^4\mathrm{e}^{-bx-a}a\,b^4\cdots}{\cdots}$

```
[In] int(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x,method=_RETURNVERBOSE)
```

```
[Out] (-4*a*b^2*d-b^3*c-5*b^2*d)*x^4*exp(-b*x-a)+(-6*a^2*b*d-4*a*b^2*c-16*a*b*d-4
*b^2*c-20*b*d)*x^3*exp(-b*x-a)+(-4*a^3*d-6*a^2*b*c-18*a^2*d-12*a*b*c-48*a*d
-12*b*c-60*d)*x^2*exp(-b*x-a)-(a^4*b*c+a^4*d+4*a^3*b*c+8*a^3*d+12*a^2*b*c+3
6*a^2*d+24*a*b*c+96*a*d+24*b*c+120*d)/b^2*exp(-b*x-a)-d*b^3*x^5*exp(-b*x-a)
```

```
-(a^4*d+4*a^3*b*c+8*a^3*d+12*a^2*b*c+36*a^2*d+24*a*b*c+96*a*d+24*b*c+120*d)
/b*x*exp(-b*x-a)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 197, normalized size of antiderivative = 0.73

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = -\frac{(b^5dx^5 + (b^5c + (4\,a+5)b^4d)x^4 + 2\,(2\,(a+1)b^4c + (3\,a^2+8\,a+10)b^3d)x^3 + (a^4+4\,a^3+12\,a^2+24\,a\cdots}{\cdots}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="fricas")
```

```
[Out] -(b^5*d*x^5 + (b^5*c + (4*a + 5)*b^4*d)*x^4 + 2*(2*(a + 1)*b^4*c + (3*a^2 +
 8*a + 10)*b^3*d)*x^3 + (a^4 + 4*a^3 + 12*a^2 + 24*a + 24)*b*c + 2*(3*(a^2
+ 2*a + 2)*b^3*c + (2*a^3 + 9*a^2 + 24*a + 30)*b^2*d)*x^2 + (a^4 + 8*a^3 +
36*a^2 + 96*a + 120)*d + (4*(a^3 + 3*a^2 + 6*a + 6)*b^2*c + (a^4 + 8*a^3 +
36*a^2 + 96*a + 120)*b*d)*x)*e^(-b*x - a)/b^2
```

Sympy [A] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 447, normalized size of antiderivative = 1.65

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = \begin{cases} \frac{(-a^4bc-a^4bdx-a^4d-4a^3b^2cx-4a^3b^2dx^2-4a^3bc-8a^3bdx-8a^3d-6a^2b^3cx^2-6a^2b^3dx^3-12a^2b^2cx-18a^2b^2dx^2-12a^2bc-36a^2bdx-36a^2d-4a\cdots}{\cdots} \\ a^4cx + \frac{b^4dx^6}{6} + x^5\cdot\left(\frac{4ab^3d}{5}+\frac{b^4c}{5}\right) + x^4\cdot\left(\frac{3a^2b^2d}{2}+ab^3c\right) + x^3\cdot\left(\frac{4a^3bd}{3}+2a^2b^2c\right) + x^2\left(\frac{a^4d}{2}+2a^3bc\right) \end{cases}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4*(d*x+c),x)
```

```
[Out] Piecewise(((-a**4*b*c - a**4*b*d*x - a**4*d - 4*a**3*b**2*c*x - 4*a**3*b**2
*d*x**2 - 4*a**3*b*c - 8*a**3*b*d*x - 8*a**3*d - 6*a**2*b**3*c*x**2 - 6*a**
2*b**3*d*x**3 - 12*a**2*b**2*c*x - 18*a**2*b**2*d*x**2 - 12*a**2*b*c - 36*a
**2*b*d*x - 36*a**2*d - 4*a*b**4*c*x**3 - 4*a*b**4*d*x**4 - 12*a*b**3*c*x**
2 - 16*a*b**3*d*x**3 - 24*a*b**2*c*x - 48*a*b**2*d*x**2 - 24*a*b*c - 96*a*b
*d*x - 96*a*d - b**5*c*x**4 - b**5*d*x**5 - 4*b**4*c*x**3 - 5*b**4*d*x**4 -
 12*b**3*c*x**2 - 20*b**3*d*x**3 - 24*b**2*c*x - 60*b**2*d*x**2 - 24*b*c -
120*b*d*x - 120*d)*exp(-a - b*x)/b**2, Ne(b**2, 0)), (a**4*c*x + b**4*d*x**
6/6 + x**5*(4*a*b**3*d/5 + b**4*c/5) + x**4*(3*a**2*b**2*d/2 + a*b**3*c) +
x**3*(4*a**3*b*d/3 + 2*a**2*b**2*c) + x**2*(a**4*d/2 + 2*a**3*b*c), True))
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 344, normalized size of antiderivative = 1.27

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx$$
$$= -\frac{4\,(bx+1)a^3ce^{(-bx-a)}}{b} - \frac{a^4ce^{(-bx-a)}}{b} - \frac{(bx+1)a^4de^{(-bx-a)}}{b^2}$$
$$- \frac{6\,(b^2x^2+2\,bx+2)a^2ce^{(-bx-a)}}{b} - \frac{4\,(b^2x^2+2\,bx+2)a^3de^{(-bx-a)}}{b^2}$$
$$- \frac{4\,(b^3x^3+3\,b^2x^2+6\,bx+6)ace^{(-bx-a)}}{b} - \frac{6\,(b^3x^3+3\,b^2x^2+6\,bx+6)a^2de^{(-bx-a)}}{b^2}$$
$$- \frac{(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)ce^{(-bx-a)}}{b}$$
$$- \frac{4\,(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)ade^{(-bx-a)}}{b^2}$$
$$- \frac{(b^5x^5+5\,b^4x^4+20\,b^3x^3+60\,b^2x^2+120\,bx+120)de^{(-bx-a)}}{b^2}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*c*e^(-b*x - a)/b - a^4*c*e^(-b*x - a)/b - (b*x + 1)*a^4*d*
e^(-b*x - a)/b^2 - 6*(b^2*x^2 + 2*b*x + 2)*a^2*c*e^(-b*x - a)/b - 4*(b^2*x^
2 + 2*b*x + 2)*a^3*d*e^(-b*x - a)/b^2 - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)
*a*c*e^(-b*x - a)/b - 6*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a^2*d*e^(-b*x - a
)/b^2 - (b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*c*e^(-b*x - a)/b -
 4*(b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*a*d*e^(-b*x - a)/b^2 -
(b^5*x^5 + 5*b^4*x^4 + 20*b^3*x^3 + 60*b^2*x^2 + 120*b*x + 120)*d*e^(-b*x -
 a)/b^2
```

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 331, normalized size of antiderivative = 1.22

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx =$$
$$-\frac{(b^9dx^5+b^9cx^4+4\,ab^8dx^4+4\,ab^8cx^3+6\,a^2b^7dx^3+5\,b^8dx^4+6\,a^2b^7cx^2+4\,a^3b^6dx^2+4\,b^8cx^3+16\,ab^7dx}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4*(d*x+c),x, algorithm="giac")
```

```
[Out] -(b^9*d*x^5 + b^9*c*x^4 + 4*a*b^8*d*x^4 + 4*a*b^8*c*x^3 + 6*a^2*b^7*d*x^3 +
 5*b^8*d*x^4 + 6*a^2*b^7*c*x^2 + 4*a^3*b^6*d*x^2 + 4*b^8*c*x^3 + 16*a*b^7*d
```

```
*x^3 + 4*a^3*b^6*c*x + a^4*b^5*d*x + 12*a*b^7*c*x^2 + 18*a^2*b^6*d*x^2 + 20
*b^7*d*x^3 + a^4*b^5*c + 12*a^2*b^6*c*x + 8*a^3*b^5*d*x + 12*b^7*c*x^2 + 48
*a*b^6*d*x^2 + 4*a^3*b^5*c + a^4*b^4*d + 24*a*b^6*c*x + 36*a^2*b^5*d*x + 60
*b^6*d*x^2 + 12*a^2*b^5*c + 8*a^3*b^4*d + 24*b^6*c*x + 96*a*b^5*d*x + 24*a*
b^5*c + 36*a^2*b^4*d + 120*b^5*d*x + 24*b^5*c + 96*a*b^4*d + 120*b^4*d)*e^(
-b*x - a)/b^6
```

Mupad [B] (verification not implemented)

Time = 0.21 (sec) , antiderivative size = 264, normalized size of antiderivative = 0.97

$$\int e^{-a-bx}(a+bx)^4(c+dx)\,dx = -\frac{e^{-a-b\,x}\,\left(120\,d+96\,a\,d+24\,b\,c+36\,a^2\,d+8\,a^3\,d+a^4\,d+24\,a\,b\,c+12\,a^2\,b\,c+4\,a^3\,b\,c+a^4\,b\,c\right)}{b^2} - x^2\,e^{-a-b\,x}\,\left(60\,d+48\,a\,d+12\,b\,c+18\,a^2\,d+4\,a^3\,d+12\,a\,b\,c+6\,a^2\,b\,c\right) - x\,e^{-a-b\,x}\,\left(24\,c+24\,a\,c+12\,a^2\,c+4\,a^3\,c+\frac{d\,a^4+8\,d\,a^3+36\,d\,a^2+96\,d\,a+120\,d}{b}\right) - b^3\,d\,x^5\,e^{-a-b\,x} - b^2\,x^4\,e^{-a-b\,x}\,\left(5\,d+4\,a\,d+b\,c\right) - 2\,b\,x^3\,e^{-a-b\,x}\,\left(10\,d+8\,a\,d+2\,b\,c+3\,a^2\,d+2\,a\,b\,c\right)$$

```
[In] int(exp(- a - b*x)*(a + b*x)^4*(c + d*x),x)
```

```
[Out] - (exp(- a - b*x)*(120*d + 96*a*d + 24*b*c + 36*a^2*d + 8*a^3*d + a^4*d + 2
4*a*b*c + 12*a^2*b*c + 4*a^3*b*c + a^4*b*c))/b^2 - x^2*exp(- a - b*x)*(60*d
 + 48*a*d + 12*b*c + 18*a^2*d + 4*a^3*d + 12*a*b*c + 6*a^2*b*c) - x*exp(- a
 - b*x)*(24*c + 24*a*c + 12*a^2*c + 4*a^3*c + (120*d + 96*a*d + 36*a^2*d +
8*a^3*d + a^4*d)/b) - b^3*d*x^5*exp(- a - b*x) - b^2*x^4*exp(- a - b*x)*(5*
d + 4*a*d + b*c) - 2*b*x^3*exp(- a - b*x)*(10*d + 8*a*d + 2*b*c + 3*a^2*d +
 2*a*b*c)
```

3.77 $\int e^{-a-bx}(a+bx)^4\,dx$

Optimal result

Integrand size = 18, antiderivative size = 102

$$\int e^{-a-bx}(a+bx)^4\,dx = -\frac{24e^{-a-bx}}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}$$

```
[Out] -24*exp(-b*x-a)/b-24*exp(-b*x-a)*(b*x+a)/b-12*exp(-b*x-a)*(b*x+a)^2/b-4*exp
(-b*x-a)*(b*x+a)^3/b-exp(-b*x-a)*(b*x+a)^4/b
```

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 102, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.111, Rules used = {2207, 2225}

$$\int e^{-a-bx}(a+bx)^4\,dx = -\frac{e^{-a-bx}(a+bx)^4}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{24e^{-a-bx}}{b}$$

```
[In] Int[E^(-a - b*x)*(a + b*x)^4,x]
```

```
[Out] (-24*E^(-a - b*x))/b - (24*E^(-a - b*x)*(a + b*x))/b - (12*E^(-a - b*x)*(a
+ b*x)^2)/b - (4*E^(-a - b*x)*(a + b*x)^3)/b - (E^(-a - b*x)*(a + b*x)^4)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
```

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= -\frac{e^{-a-bx}(a+bx)^4}{b}+4\int e^{-a-bx}(a+bx)^3\,dx \\
&= -\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+12\int e^{-a-bx}(a+bx)^2\,dx \\
&= -\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+24\int e^{-a-bx}(a+bx)\,dx \\
&= -\frac{24e^{-a-bx}(a+bx)}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b} \\
&\quad -\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}+24\int e^{-a-bx}\,dx \\
&= -\frac{24e^{-a-bx}}{b}-\frac{24e^{-a-bx}(a+bx)}{b}-\frac{12e^{-a-bx}(a+bx)^2}{b}-\frac{4e^{-a-bx}(a+bx)^3}{b}-\frac{e^{-a-bx}(a+bx)^4}{b}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 50, normalized size of antiderivative = 0.49

$$\int e^{-a-bx}(a+bx)^4\,dx=\frac{e^{-a-bx}(-24-24(a+bx)-12(a+bx)^2-4(a+bx)^3-(a+bx)^4)}{b}$$

```
[In] Integrate[E^(-a - b*x)*(a + b*x)^4,x]
[Out] (E^(-a - b*x)*(-24 - 24*(a + b*x) - 12*(a + b*x)^2 - 4*(a + b*x)^3 - (a + b
*x)^4))/b
```

Maple [A] (verified)

Time = 0.15 (sec) , antiderivative size = 99, normalized size of antiderivative = 0.97

method	result
derivativedivides	$-\frac{(-bx-a)^4 e^{-bx-a}-4 e^{-bx-a}(-bx-a)^3+12(-bx-a)^2 e^{-bx-a}-24(-bx-a) e^{-bx-a}+24 e^{-bx-a}}{b}$
default	$-\frac{(-bx-a)^4 e^{-bx-a}-4 e^{-bx-a}(-bx-a)^3+12(-bx-a)^2 e^{-bx-a}-24(-bx-a) e^{-bx-a}+24 e^{-bx-a}}{b}$
gosper	$-\frac{(b^4x^4+4a b^3x^3+6a^2b^2x^2+4b^3x^3+4a^3bx+12a b^2x^2+a^4+12a^2bx+12b^2x^2+4a^3+24abx+12a^2+24bx+24a+24) e^{-bx-a}}{b}$
risch	$-\frac{(b^4x^4+4a b^3x^3+6a^2b^2x^2+4b^3x^3+4a^3bx+12a b^2x^2+a^4+12a^2bx+12b^2x^2+4a^3+24abx+12a^2+24bx+24a+24) e^{-bx-a}}{b}$
norman	$(-4b^2a-4b^2)\, x^3 e^{-bx-a}+(-4a^3-12a^2-24a-24)\, x\, e^{-bx-a}-b^3x^4 e^{-bx-a}-\frac{(a^4+4a^3+12a}{}$
parts	$-b^3x^4 e^{-bx-a}-4\, e^{-bx-a} b^2 a\, x^3-6\, e^{-bx-a} b\, a^2 x^2-4\, e^{-bx-a} a^3 x-\frac{e^{-bx-a} a^4}{b}+\frac{4\, e^{-bx-a}(-bx-a)^3}{}$
meijerg	$\frac{e^{-a}\left(24-\frac{(5b^4x^4+20b^3x^3+60b^2x^2+120bx+120) e^{-bx}}{5}\right)}{b}+\frac{4\, e^{-a} a\left(6-\frac{(4b^3x^3+12b^2x^2+24bx+24) e^{-bx}}{4}\right)}{b}+\frac{6\, e^{-a} a^2\left(2-\frac{(3b}{}\right.}{}$
parallelrisch	$-\frac{e^{-bx-a} b^4x^4+4\, e^{-bx-a} a\, b^3x^3+4\, e^{-bx-a} x^3b^3+6\, e^{-bx-a} a^2b^2x^2+12x^2 e^{-bx-a} a\, b^2+4\, e^{-bx-a} a^3bx+12b^2 e^{-bx-a} x^2+12a}{b}$

[In] int(exp(-b*x-a)*(b*x+a)^4,x,method=_RETURNVERBOSE)

[Out] -1/b*((-b*x-a)^4*exp(-b*x-a)-4*exp(-b*x-a)*(-b*x-a)^3+12*(-b*x-a)^2*exp(-b*x-a)-24*(-b*x-a)*exp(-b*x-a)+24*exp(-b*x-a))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 83, normalized size of antiderivative = 0.81

$$\int e^{-a-bx}(a+bx)^4\,dx = -\frac{(b^4x^4+4\,(a+1)b^3x^3+6\,(a^2+2\,a+2)b^2x^2+a^4+4\,a^3+4\,(a^3+3\,a^2+6\,a+6)bx+12\,a^2+24\,a+24)}{b}$$

[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="fricas")

[Out] -(b^4*x^4 + 4*(a + 1)*b^3*x^3 + 6*(a^2 + 2*a + 2)*b^2*x^2 + a^4 + 4*a^3 + 4*(a^3 + 3*a^2 + 6*a + 6)*b*x + 12*a^2 + 24*a + 24)*e^(-b*x - a)/b

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 158, normalized size of antiderivative = 1.55

$$\int e^{-a-bx}(a+bx)^4\,dx$$
$$=\begin{cases}\frac{(-a^4-4a^3bx-4a^3-6a^2b^2x^2-12a^2bx-12a^2-4ab^3x^3-12ab^2x^2-24abx-24a-b^4x^4-4b^3x^3-12b^2x^2-24bx-24)e^{-a-bx}}{b} & \text{for } b\neq 0\\ a^4x+2a^3bx^2+2a^2b^2x^3+ab^3x^4+\frac{b^4x^5}{5} & \text{otherwise}\end{cases}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4,x)
```

```
[Out] Piecewise(((-a**4 - 4*a**3*b*x - 4*a**3 - 6*a**2*b**2*x**2 - 12*a**2*b*x -
12*a**2 - 4*a*b**3*x**3 - 12*a*b**2*x**2 - 24*a*b*x - 24*a - b**4*x**4 - 4*
b**3*x**3 - 12*b**2*x**2 - 24*b*x - 24)*exp(-a - b*x)/b, Ne(b, 0)), (a**4*x
 + 2*a**3*b*x**2 + 2*a**2*b**2*x**3 + a*b**3*x**4 + b**4*x**5/5, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 149, normalized size of antiderivative = 1.46

$$\int e^{-a-bx}(a+bx)^4\,dx=-\frac{4\,(bx+1)a^3e^{(-bx-a)}}{b}-\frac{a^4e^{(-bx-a)}}{b}-\frac{6\,(b^2x^2+2\,bx+2)a^2e^{(-bx-a)}}{b}-\frac{4\,(b^3x^3+3\,b^2x^2+6\,bx+6)ae^{(-bx-a)}}{b}-\frac{(b^4x^4+4\,b^3x^3+12\,b^2x^2+24\,bx+24)e^{(-bx-a)}}{b}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="maxima")
```

```
[Out] -4*(b*x + 1)*a^3*e^(-b*x - a)/b - a^4*e^(-b*x - a)/b - 6*(b^2*x^2 + 2*b*x +
 2)*a^2*e^(-b*x - a)/b - 4*(b^3*x^3 + 3*b^2*x^2 + 6*b*x + 6)*a*e^(-b*x - a)
/b - (b^4*x^4 + 4*b^3*x^3 + 12*b^2*x^2 + 24*b*x + 24)*e^(-b*x - a)/b
```

Giac [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 132, normalized size of antiderivative = 1.29

$$\int e^{-a-bx}(a+bx)^4\,dx=$$
$$-\frac{(b^8x^4+4\,ab^7x^3+6\,a^2b^6x^2+4\,b^7x^3+4\,a^3b^5x+12\,ab^6x^2+a^4b^4+12\,a^2b^5x+12\,b^6x^2+4\,a^3b^4+24\,ab^5x}{b^5}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4,x, algorithm="giac")
```

```
[Out] -(b^8*x^4 + 4*a*b^7*x^3 + 6*a^2*b^6*x^2 + 4*b^7*x^3 + 4*a^3*b^5*x + 12*a*b^
6*x^2 + a^4*b^4 + 12*a^2*b^5*x + 12*b^6*x^2 + 4*a^3*b^4 + 24*a*b^5*x + 12*a
^2*b^4 + 24*b^5*x + 24*a*b^4 + 24*b^4)*e^(-b*x - a)/b^5
```

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 120, normalized size of antiderivative = 1.18

$$\int e^{-a-bx}(a+bx)^4\,dx = -b^3\,x^4\,\mathrm{e}^{-a-b\,x} - x\,\mathrm{e}^{-a-b\,x}\,\left(4\,a^3+12\,a^2+24\,a+24\right) - \frac{\mathrm{e}^{-a-b\,x}\,\left(a^4+4\,a^3+12\,a^2+24\,a+24\right)}{b} - 6\,b\,x^2\,\mathrm{e}^{-a-b\,x}\,\left(a^2+2\,a+2\right) - 4\,b^2\,x^3\,\mathrm{e}^{-a-b\,x}\,(a+1)$$

```
[In] int(exp(- a - b*x)*(a + b*x)^4,x)
```

```
[Out] - b^3*x^4*exp(- a - b*x) - x*exp(- a - b*x)*(24*a + 12*a^2 + 4*a^3 + 24) -
(exp(- a - b*x)*(24*a + 12*a^2 + 4*a^3 + a^4 + 24))/b - 6*b*x^2*exp(- a - b
*x)*(2*a + a^2 + 2) - 4*b^2*x^3*exp(- a - b*x)*(a + 1)
```

3.78 $\int \frac{e^{-a-bx}(a+bx)^4}{c+dx} \, dx$

Optimal result

Integrand size = 25, antiderivative size = 277

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^4}{c+dx} \, dx = & -\frac{6e^{-a-bx}}{d}+\frac{2(bc-ad)e^{-a-bx}}{d^2}-\frac{(bc-ad)^2e^{-a-bx}}{d^3} \\ & +\frac{(bc-ad)^3e^{-a-bx}}{d^4}-\frac{6e^{-a-bx}(a+bx)}{d}+\frac{2(bc-ad)e^{-a-bx}(a+bx)}{d^2} \\ & -\frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3}-\frac{3e^{-a-bx}(a+bx)^2}{d} \\ & +\frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2}-\frac{e^{-a-bx}(a+bx)^3}{d} \\ & +\frac{(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}\end{aligned}$$

```
[Out] -6*exp(-b*x-a)/d+2*(-a*d+b*c)*exp(-b*x-a)/d^2-(-a*d+b*c)^2*exp(-b*x-a)/d^3+
(-a*d+b*c)^3*exp(-b*x-a)/d^4-6*exp(-b*x-a)*(b*x+a)/d+2*(-a*d+b*c)*exp(-b*x-
a)*(b*x+a)/d^2-(-a*d+b*c)^2*exp(-b*x-a)*(b*x+a)/d^3-3*exp(-b*x-a)*(b*x+a)^2
/d+(-a*d+b*c)*exp(-b*x-a)*(b*x+a)^2/d^2-exp(-b*x-a)*(b*x+a)^3/d+(-a*d+b*c)^
4*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^5
```

Rubi [A] (verified)

Time = 0.22 (sec) , antiderivative size = 277, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.160, Rules used = {2230, 2225, 2207, 2209}

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = \frac{e^{\frac{bc}{d}-a}(bc-ad)^4\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{e^{-a-bx}(bc-ad)^3}{d^4} -\frac{e^{-a-bx}(bc-ad)^2}{d^3}-\frac{e^{-a-bx}(a+bx)(bc-ad)^2}{d^3}+\frac{2e^{-a-bx}(bc-ad)}{d^2} +\frac{e^{-a-bx}(a+bx)^2(bc-ad)}{d^2}+\frac{2e^{-a-bx}(a+bx)(bc-ad)}{d^2}-\frac{6e^{-a-bx}}{d} -\frac{e^{-a-bx}(a+bx)^3}{d}-\frac{3e^{-a-bx}(a+bx)^2}{d}-\frac{6e^{-a-bx}(a+bx)}{d}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x),x]
```

```
[Out] (-6*E^(-a - b*x))/d + (2*(b*c - a*d)*E^(-a - b*x))/d^2 - ((b*c - a*d)^2*E^(
-a - b*x))/d^3 + ((b*c - a*d)^3*E^(-a - b*x))/d^4 - (6*E^(-a - b*x)*(a + b*
x))/d + (2*(b*c - a*d)*E^(-a - b*x)*(a + b*x))/d^2 - ((b*c - a*d)^2*E^(-a -
 b*x)*(a + b*x))/d^3 - (3*E^(-a - b*x)*(a + b*x)^2)/d + ((b*c - a*d)*E^(-a
- b*x)*(a + b*x)^2)/d^2 - (E^(-a - b*x)*(a + b*x)^3)/d + ((b*c - a*d)^4*E^(
-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
```

```
c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(-\frac{b(bc-ad)^3e^{-a-bx}}{d^4}+\frac{b(bc-ad)^2e^{-a-bx}(a+bx)}{d^3}-\frac{b(bc-ad)e^{-a-bx}(a+bx)^2}{d^2}+\frac{be^{-a-bx}(a+bx)^3}{d}+\frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)}\right)dx \\
&= \frac{b\int e^{-a-bx}(a+bx)^3\,dx}{d}-\frac{(b(bc-ad))\int e^{-a-bx}(a+bx)^2\,dx}{d^2}+\frac{(b(bc-ad)^2)\int e^{-a-bx}(a+bx)\,dx}{d^3}-\frac{(b(bc-ad)^3)\int e^{-a-bx}\,dx}{d^4}+\frac{(bc-ad)^4\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} \\
&= \frac{(bc-ad)^3e^{-a-bx}}{d^4}-\frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3}+\frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2}-\frac{e^{-a-bx}(a+bx)^3}{d}+\frac{(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{(3b)\int e^{-a-bx}(a+bx)^2\,dx}{d}-\frac{(2b(bc-ad))\int e^{-a-bx}(a+bx)\,dx}{d^2}+\frac{(b(bc-ad)^2)\int e^{-a-bx}\,dx}{d^3} \\
&= -\frac{(bc-ad)^2e^{-a-bx}}{d^3}+\frac{(bc-ad)^3e^{-a-bx}}{d^4}+\frac{2(bc-ad)e^{-a-bx}(a+bx)}{d^2}-\frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3}-\frac{3e^{-a-bx}(a+bx)^2}{d}+\frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2}-\frac{e^{-a-bx}(a+bx)^3}{d}+\frac{(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{(6b)\int e^{-a-bx}(a+bx)\,dx}{d}-\frac{(2b(bc-ad))\int e^{-a-bx}\,dx}{d^2} \\
&= \frac{2(bc-ad)e^{-a-bx}}{d^2}-\frac{(bc-ad)^2e^{-a-bx}}{d^3}+\frac{(bc-ad)^3e^{-a-bx}}{d^4}-\frac{6e^{-a-bx}(a+bx)}{d}+\frac{2(bc-ad)e^{-a-bx}(a+bx)}{d^2}-\frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3}-\frac{3e^{-a-bx}(a+bx)^2}{d}+\frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2}-\frac{e^{-a-bx}(a+bx)^3}{d}+\frac{(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{(6b)\int e^{-a-bx}\,dx}{d}
\end{aligned}$$

$$
\begin{aligned}
&= -\frac{6e^{-a-bx}}{d} + \frac{2(bc-ad)e^{-a-bx}}{d^2} - \frac{(bc-ad)^2e^{-a-bx}}{d^3} + \frac{(bc-ad)^3e^{-a-bx}}{d^4} \\
&\quad - \frac{6e^{-a-bx}(a+bx)}{d} + \frac{2(bc-ad)e^{-a-bx}(a+bx)}{d^2} - \frac{(bc-ad)^2e^{-a-bx}(a+bx)}{d^3} \\
&\quad - \frac{3e^{-a-bx}(a+bx)^2}{d} + \frac{(bc-ad)e^{-a-bx}(a+bx)^2}{d^2} - \frac{e^{-a-bx}(a+bx)^3}{d} \\
&\quad + \frac{(bc-ad)^4e^{-a+\frac{bc}{d}}\,\mathrm{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 0.74 (sec) , antiderivative size = 175, normalized size of antiderivative = 0.63

$$
\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx
$$

$$
= \frac{e^{-a-bx}\Big(-d(2(3+4a+3a^2+2a^3)\,d^3+2bd^2(-((1+2a+3a^2)\,c)+(3+4a+3a^2)\,dx)+b^2d((1+4a)c^2-2}{}
$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x),x]
```

```
[Out] (E^(-a - b*x)*(-(d*(2*(3 + 4*a + 3*a^2 + 2*a^3)*d^3 + 2*b*d^2*(-((1 + 2*a +
 3*a^2)*c) + (3 + 4*a + 3*a^2)*d*x) + b^2*d*((1 + 4*a)*c^2 - 2*(1 + 2*a)*c*
d*x + (3 + 4*a)*d^2*x^2) + b^3*(-c^3 + c^2*d*x - c*d^2*x^2 + d^3*x^3))) + (
b*c - a*d)^4*E^(b*(c/d + x))*ExpIntegralEi[-((b*(c + d*x))/d)]))/d^5
```

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 489, normalized size of antiderivative = 1.77

method	result
derivativedivides	$-\frac{\frac{b\,a^3 e^{-bx-a}}{d}-\frac{3b^2a^2c\,e^{-bx-a}}{d^2}-\frac{b\,a^2\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d}+\frac{3b^3a\,c^2e^{-bx-a}}{d^3}+\frac{2b^2ac\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^2}+\frac{ba\left((\right.}{}}{}$
default	$-\frac{\frac{b\,a^3 e^{-bx-a}}{d}-\frac{3b^2a^2c\,e^{-bx-a}}{d^2}-\frac{b\,a^2\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d}+\frac{3b^3a\,c^2e^{-bx-a}}{d^3}+\frac{2b^2ac\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^2}+\frac{ba\left((\right.}{}}{}$
risch	$-\frac{6a^2e^{-bx-a}}{d}-\frac{8a\,e^{-bx-a}}{d}-\frac{4a^3e^{-bx-a}}{d}+\frac{4b^2ca\,e^{-bx-a}x}{d^2}+\frac{4b\,e^{-\frac{ad-cb}{d}}\,\mathrm{Ei}_1\left(bx+a-\frac{ad-cb}{d}\right)a^3c}{d^2}-\frac{6b^2e^{-\frac{ad-cb}{d}}}{}$

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x,method=_RETURNVERBOSE)
```

```
[Out] -1/b*(b/d*a^3*exp(-b*x-a)-3*b^2/d^2*a^2*c*exp(-b*x-a)-b/d*a^2*((-b*x-a)*exp
(-b*x-a)-exp(-b*x-a))+3*b^3/d^3*a*c^2*exp(-b*x-a)+2*b^2/d^2*a*c*((-b*x-a)*e
xp(-b*x-a)-exp(-b*x-a))+b/d*a*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*exp(-b*x-a
)+2*exp(-b*x-a))-b^4/d^4*c^3*exp(-b*x-a)-b^3/d^3*c^2*((-b*x-a)*exp(-b*x-a)-
```

```
exp(-b*x-a))-b^2/d^2*c*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*exp(-b*x-a)+2*exp
(-b*x-a))-1/d*b*(exp(-b*x-a)*(-b*x-a)^3-3*(-b*x-a)^2*exp(-b*x-a)+6*(-b*x-a)
*exp(-b*x-a)-6*exp(-b*x-a))+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^
3*c^3*d+b^4*c^4)*b/d^5*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 235, normalized size of antiderivative = 0.85

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx$$
$$= \frac{(b^4c^4 - 4\,ab^3c^3d + 6\,a^2b^2c^2d^2 - 4\,a^3bcd^3 + a^4d^4)\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(\frac{bc-ad}{d}\right)} - (b^3d^4x^3 - b^3c^3d + (4\,a+1)b^2c^2d^2}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="fricas")
```

```
[Out] ((b^4*c^4 - 4*a*b^3*c^3*d + 6*a^2*b^2*c^2*d^2 - 4*a^3*b*c*d^3 + a^4*d^4)*Ei
(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) - (b^3*d^4*x^3 - b^3*c^3*d + (4*a + 1)
*b^2*c^2*d^2 - 2*(3*a^2 + 2*a + 1)*b*c*d^3 + 2*(2*a^3 + 3*a^2 + 4*a + 3)*d^
4 - (b^3*c*d^3 - (4*a + 3)*b^2*d^4)*x^2 + (b^3*c^2*d^2 - 2*(2*a + 1)*b^2*c*
d^3 + 2*(3*a^2 + 4*a + 3)*b*d^4)*x)*e^(-b*x - a))/d^5
```

Sympy [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = \left(\int \frac{a^4}{ce^{bx}+dxe^{bx}}\,dx + \int \frac{b^4x^4}{ce^{bx}+dxe^{bx}}\,dx + \int \frac{4ab^3x^3}{ce^{bx}+dxe^{bx}}\,dx + \int \frac{6a^2b^2x^2}{ce^{bx}+dxe^{bx}}\,dx + \int \frac{4a^3bx}{ce^{bx}+dxe^{bx}}\,dx\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c),x)
```

```
[Out] (Integral(a**4/(c*exp(b*x) + d*x*exp(b*x)), x) + Integral(b**4*x**4/(c*exp(
b*x) + d*x*exp(b*x)), x) + Integral(4*a*b**3*x**3/(c*exp(b*x) + d*x*exp(b*x
)), x) + Integral(6*a**2*b**2*x**2/(c*exp(b*x) + d*x*exp(b*x)), x) + Integr
al(4*a**3*b*x/(c*exp(b*x) + d*x*exp(b*x)), x))*exp(-a)
```

Maxima [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = \int \frac{(bx+a)^4 e^{(-bx-a)}}{dx+c}\,dx$$

[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="maxima")

[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(1, (d*x + c)*b/d)/d - (b^3*d^2*x^4 + (4*a*b^2*d^2 + 3*b^2*d^2)*x^3 + (6*a^2*b*d^2 + b^2*c*d + 8*a*b*d^2 + 6*b*d^2)*x^2 + (4*a^3*d^2 - b^2*c^2 + 6*a^2*d^2 + 4*b*c*d + 4*(b*c*d + 2*d^2)*a + 6*d^2)*x)*e^(-b*x)/(d^3*x*e^a + c*d^2*e^a) + integrate((4*a^3*c*d^2 - b^2*c^3 + 6*a^2*c*d^2 + 4*b*c^2*d + 6*c*d^2 + 4*(b*c^2*d + 2*c*d^2)*a + (b^3*c^3 + 6*a^2*b*c*d^2 - 2*b^2*c^2*d + 6*b*c*d^2 - 4*(b^2*c^2*d - 2*b*c*d^2)*a)*x)*e^(-b*x)/(d^4*x^2*e^a + 2*c*d^3*x*e^a + c^2*d^2*e^a), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 546 vs. $2(266) = 532$.

Time = 0.35 (sec) , antiderivative size = 546, normalized size of antiderivative = 1.97

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = -\frac{b^3d^4x^3e^{(-bx-a)} - b^3cd^3x^2e^{(-bx-a)} + 4\,ab^2d^4x^2e^{(-bx-a)} - b^4c^4\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)e^{\left(-a+\frac{bc}{d}\right)} + 4\,ab^3c^3d\mathrm{Ei}\left(-\frac{bdx+bc}{d}\right)}{}$$

[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c),x, algorithm="giac")

[Out] -(b^3*d^4*x^3*e^(-b*x - a) - b^3*c*d^3*x^2*e^(-b*x - a) + 4*a*b^2*d^4*x^2*e^(-b*x - a) - b^4*c^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 4*a*b^3*c^3*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 6*a^2*b^2*c^2*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 4*a^3*b*c*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - a^4*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^3*c^2*d^2*x*e^(-b*x - a) - 4*a*b^2*c*d^3*x*e^(-b*x - a) + 6*a^2*b*d^4*x*e^(-b*x - a) + 3*b^2*d^4*x^2*e^(-b*x - a) - b^3*c^3*d*e^(-b*x - a) + 4*a*b^2*c^2*d^2*e^(-b*x - a) - 6*a^2*b*c*d^3*e^(-b*x - a) + 4*a^3*d^4*e^(-b*x - a) - 2*b^2*c*d^3*x*e^(-b*x - a) + 8*a*b*d^4*x*e^(-b*x - a) + b^2*c^2*d^2*e^(-b*x - a) - 4*a*b*c*d^3*e^(-b*x - a) + 6*a^2*d^4*e^(-b*x - a) + 6*b*d^4*x*e^(-b*x - a) - 2*b*c*d^3*e^(-b*x - a) + 8*a*d^4*e^(-b*x - a) + 6*d^4*e^(-b*x - a))/d^5

Mupad [F(-1)]

Timed out.

$$\int \frac{e^{-a-bx}(a+bx)^4}{c+dx}\,dx = \int \frac{\mathrm{e}^{-a-b\,x}\,(a+b\,x)^4}{c+d\,x}\,dx$$

```
[In] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x),x)
[Out] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x), x)
```

3.79 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx$

Optimal result

Integrand size = 25, antiderivative size = 258

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = &-\frac{2be^{-a-bx}}{d^2}+\frac{4b(bc-ad)e^{-a-bx}}{d^3}-\frac{6b(bc-ad)^2e^{-a-bx}}{d^4}\\ &-\frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)}-\frac{2b^2e^{-a-bx}(c+dx)}{d^3}\\ &+\frac{4b^2(bc-ad)e^{-a-bx}(c+dx)}{d^4}-\frac{b^3e^{-a-bx}(c+dx)^2}{d^4}\\ &-\frac{4b(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}\\ &-\frac{b(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6}\end{aligned}$$

```
[Out] -2*b*exp(-b*x-a)/d^2+4*b*(-a*d+b*c)*exp(-b*x-a)/d^3-6*b*(-a*d+b*c)^2*exp(-b
*x-a)/d^4-(-a*d+b*c)^4*exp(-b*x-a)/d^5/(d*x+c)-2*b^2*exp(-b*x-a)*(d*x+c)/d^
3+4*b^2*(-a*d+b*c)*exp(-b*x-a)*(d*x+c)/d^4-b^3*exp(-b*x-a)*(d*x+c)^2/d^4-4*
b*(-a*d+b*c)^3*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^5-b*(-a*d+b*c)^4*exp(-a+b*c
/d)*Ei(-b*(d*x+c)/d)/d^6
```

Rubi [A] (verified)

Time = 0.24 (sec) , antiderivative size = 258, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.200, Rules used = {2230, 2225, 2208, 2209, 2207}

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = -\frac{b^3e^{-a-bx}(c+dx)^2}{d^4}+\frac{4b^2e^{-a-bx}(c+dx)(bc-ad)}{d^4} -\frac{2b^2e^{-a-bx}(c+dx)}{d^3}-\frac{be^{\frac{bc}{d}-a}(bc-ad)^4\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6} -\frac{4be^{\frac{bc}{d}-a}(bc-ad)^3\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}-\frac{e^{-a-bx}(bc-ad)^4}{d^5(c+dx)} -\frac{6be^{-a-bx}(bc-ad)^2}{d^4}+\frac{4be^{-a-bx}(bc-ad)}{d^3}-\frac{2be^{-a-bx}}{d^2}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^2,x]
```

```
[Out] (-2*b*E^(-a - b*x))/d^2 + (4*b*(b*c - a*d)*E^(-a - b*x))/d^3 - (6*b*(b*c -
a*d)^2*E^(-a - b*x))/d^4 - ((b*c - a*d)^4*E^(-a - b*x))/(d^5*(c + d*x)) - (
2*b^2*E^(-a - b*x)*(c + d*x))/d^3 + (4*b^2*(b*c - a*d)*E^(-a - b*x)*(c + d*
x))/d^4 - (b^3*E^(-a - b*x)*(c + d*x)^2)/d^4 - (4*b*(b*c - a*d)^3*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (b*(b*c - a*d)^4*E^(-a + (
b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\text{integral} = \int \left(\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4} + \frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^2} - \frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)} - \frac{4b^3(bc-ad)e^{-a-bx}(c+dx)}{d^4} + \frac{b^4e^{-a-bx}(c+dx)^2}{d^4}\right) dx$$

$$= \frac{b^4\int e^{-a-bx}(c+dx)^2\,dx}{d^4} - \frac{(4b^3(bc-ad))\int e^{-a-bx}(c+dx)\,dx}{d^4} + \frac{(6b^2(bc-ad)^2)\int e^{-a-bx}\,dx}{d^4} - \frac{(4b(bc-ad)^3)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} + \frac{(bc-ad)^4\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4}$$

$$= -\frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} + \frac{4b^2(bc-ad)e^{-a-bx}(c+dx)}{d^4} - \frac{b^3e^{-a-bx}(c+dx)^2}{d^4} - \frac{4b(bc-ad)^3e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} + \frac{(2b^3)\int e^{-a-bx}(c+dx)\,dx}{d^3} - \frac{(4b^2(bc-ad))\int e^{-a-bx}\,dx}{d^3} - \frac{(b(bc-ad)^4)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^5}$$

$$= \frac{4b(bc-ad)e^{-a-bx}}{d^3} - \frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2e^{-a-bx}(c+dx)}{d^3} + \frac{4b^2(bc-ad)e^{-a-bx}(c+dx)}{d^4} - \frac{b^3e^{-a-bx}(c+dx)^2}{d^4} - \frac{4b(bc-ad)^3e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} - \frac{b(bc-ad)^4e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{(2b^2)\int e^{-a-bx}\,dx}{d^2}$$

$$= -\frac{2be^{-a-bx}}{d^2} + \frac{4b(bc-ad)e^{-a-bx}}{d^3} - \frac{6b(bc-ad)^2e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2e^{-a-bx}(c+dx)}{d^3} + \frac{4b^2(bc-ad)e^{-a-bx}(c+dx)}{d^4} - \frac{b^3e^{-a-bx}(c+dx)^2}{d^4} - \frac{4b(bc-ad)^3e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} - \frac{b(bc-ad)^4e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}$$

Mathematica [A] (verified)

Time = 1.18 (sec) , antiderivative size = 163, normalized size of antiderivative = 0.63

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \frac{e^{-a}\left(-\frac{de^{-bx}((bc-ad)^4+bd(3b^2c^2-2(1+4a)bcd+2(1+2a+3a^2)d^2)(c+dx)-2b^2d^2(bc-(1+2a)d)x(c+dx)+b^3d^3x^2(c+dx))}{c+dx} - b(bc-(-4\right.}{d^6}$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^2,x]
```

```
[Out] (-((d*((b*c - a*d)^4 + b*d*(3*b^2*c^2 - 2*(1 + 4*a)*b*c*d + 2*(1 + 2*a + 3*
a^2)*d^2)*(c + d*x) - 2*b^2*d^2*(b*c - (1 + 2*a)*d)*x*(c + d*x) + b^3*d^3*x
^2*(c + d*x)))/(E^(b*x)*(c + d*x))) - b*(b*c - (-4 + a)*d)*(b*c - a*d)^3*E^
((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(d^6*E^a)
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 406, normalized size of antiderivative = 1.57

method	result
derivativedivides	$-\frac{\frac{3b^2a^2e^{-bx-a}}{d^2} - \frac{6b^3ac\,e^{-bx-a}}{d^3} - \frac{2b^2a\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^2} + \frac{3b^4c^2e^{-bx-a}}{d^4} + \frac{2b^3c\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^3} + \frac{b^2(}{}}{}$
default	$-\frac{\frac{3b^2a^2e^{-bx-a}}{d^2} - \frac{6b^3ac\,e^{-bx-a}}{d^3} - \frac{2b^2a\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^2} + \frac{3b^4c^2e^{-bx-a}}{d^4} + \frac{2b^3c\left((-bx-a)e^{-bx-a}-e^{-bx-a}\right)}{d^3} + \frac{b^2(}{}}{}$
risch	$-\frac{4b\,e^{-\frac{ad-cb}{d}}\,\text{Ei}_1\left(bx+a-\frac{ad-cb}{d}\right)a^3}{d^2} + \frac{4b^4e^{-\frac{ad-cb}{d}}\,\text{Ei}_1\left(bx+a-\frac{ad-cb}{d}\right)c^3}{d^5} - \frac{2b\,e^{-bx-a}}{d^2} + \frac{2b^3c\,e^{-bx-a}x}{d^3} + \frac{b\,e^{-}}{d^2(-}$

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x,method=_RETURNVERBOSE)
```

```
[Out] -1/b*(3*b^2/d^2*a^2*exp(-b*x-a)-6*b^3/d^3*a*c*exp(-b*x-a)-2*b^2/d^2*a*((-b*
x-a)*exp(-b*x-a)-exp(-b*x-a))+3*b^4/d^4*c^2*exp(-b*x-a)+2*b^3/d^3*c*((-b*x-
a)*exp(-b*x-a)-exp(-b*x-a))+1/d^2*b^2*((-b*x-a)^2*exp(-b*x-a)-2*(-b*x-a)*ex
p(-b*x-a)+2*exp(-b*x-a))+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^3*c
```

```
^3*d+b^4*c^4)*b^2/d^6*(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*
Ei(1,b*x+a-(a*d-b*c)/d))+4/d^5*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^3
)*b^2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 353, normalized size of antiderivative = 1.37

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx =$$

$$-\frac{(b^5c^5 - 4\,(a-1)b^4c^4d + 6\,(a^2-2\,a)b^3c^3d^2 - 4\,(a^3-3\,a^2)b^2c^2d^3 + (a^4-4\,a^3)bcd^4 + (b^5c^4d - 4\,(a-1)b^4$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="fricas")
```

```
[Out] -((b^5*c^5 - 4*(a - 1)*b^4*c^4*d + 6*(a^2 - 2*a)*b^3*c^3*d^2 - 4*(a^3 - 3*a
^2)*b^2*c^2*d^3 + (a^4 - 4*a^3)*b*c*d^4 + (b^5*c^4*d - 4*(a - 1)*b^4*c^3*d^
2 + 6*(a^2 - 2*a)*b^3*c^2*d^3 - 4*(a^3 - 3*a^2)*b^2*c*d^4 + (a^4 - 4*a^3)*b
*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) + (b^3*d^5*x^3 + b^4*c^4*d
- (4*a - 3)*b^3*c^3*d^2 + a^4*d^5 + 2*(3*a^2 - 4*a - 1)*b^2*c^2*d^3 - 2*(2*
a^3 - 3*a^2 - 2*a - 1)*b*c*d^4 - (b^3*c*d^4 - 2*(2*a + 1)*b^2*d^5)*x^2 + (b
^3*c^2*d^3 - 4*a*b^2*c*d^4 + 2*(3*a^2 + 2*a + 1)*b*d^5)*x)*e^(-b*x - a))/(d
^7*x + c*d^6)
```

Sympy [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \left(\int \frac{a^4}{c^2e^{bx}+2cdxe^{bx}+d^2x^2e^{bx}}\,dx + \int \frac{b^4x^4}{c^2e^{bx}+2cdxe^{bx}+d^2x^2e^{bx}}\,dx + \int \frac{4ab^3x^3}{c^2e^{bx}+2cdxe^{bx}+d^2x^2e^{bx}}\,dx + \int \frac{6a^2b^2x^2}{c^2e^{bx}+2cdxe^{bx}+d^2x^2e^{bx}}\,dx + \int \frac{4a^3bx}{c^2e^{bx}+2cdxe^{bx}+d^2x^2e^{bx}}\,dx\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**2,x)
```

```
[Out] (Integral(a**4/(c**2*exp(b*x) + 2*c*d*x*exp(b*x) + d**2*x**2*exp(b*x)), x)
+ Integral(b**4*x**4/(c**2*exp(b*x) + 2*c*d*x*exp(b*x) + d**2*x**2*exp(b*x)
), x) + Integral(4*a*b**3*x**3/(c**2*exp(b*x) + 2*c*d*x*exp(b*x) + d**2*x**
2*exp(b*x)), x) + Integral(6*a**2*b**2*x**2/(c**2*exp(b*x) + 2*c*d*x*exp(b*
x) + d**2*x**2*exp(b*x)), x) + Integral(4*a**3*b*x/(c**2*exp(b*x) + 2*c*d*x
*exp(b*x) + d**2*x**2*exp(b*x)), x))*exp(-a)
```

Maxima [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \int \frac{(bx+a)^4 e^{(-bx-a)}}{(dx+c)^2}\,dx$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(2, (d*x + c)*b/d)/((d*x + c)*d) - (b^3*d
^2*x^4 + 2*(2*a*b^2*d^2 + b^2*d^2)*x^3 + 2*(3*a^2*b*d^2 + b^2*c*d + 2*a*b*d
^2 + b*d^2)*x^2 + 2*(2*a^3*d^2 - b^2*c^2 + 4*a*b*c*d + 2*b*c*d)*x)*e^(-b*x)
/(d^4*x^2*e^a + 2*c*d^3*x*e^a + c^2*d^2*e^a) - integrate(-2*(2*a^3*c*d^2 -
b^2*c^3 + 4*a*b*c^2*d + 2*b*c^2*d + (b^3*c^3 - 4*a*b^2*c^2*d + 6*a^2*b*c*d^
2 - 2*a^3*d^3 + b^2*c^2*d)*x)*e^(-b*x)/(d^5*x^3*e^a + 3*c*d^4*x^2*e^a + 3*c
^2*d^3*x*e^a + c^3*d^2*e^a), x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2861 vs. $2(249) = 498$.

Time = 0.37 (sec) , antiderivative size = 2861, normalized size of antiderivative = 11.09

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \text{Too large to display}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^2,x, algorithm="giac")
```

```
[Out] -((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c^4*Ei(-((d*x + c)*(b -
 b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + b^7*c^5
*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c
 - a*d)/d) - 4*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*c^3*d*Ei
(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c -
a*d)/d) - 5*a*b^6*c^4*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))
+ b*c - a*d)/d)*e^((b*c - a*d)/d) + 6*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*
d/(d*x + c))*b^4*c^2*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))
 + b*c - a*d)/d)*e^((b*c - a*d)/d) + 10*a^2*b^5*c^3*d^2*Ei(-((d*x + c)*(b -
 b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 4*(d*x
+ c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^3*c*d^3*Ei(-((d*x + c)*(b -
b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 10*a^3*b
^4*c^2*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/
d)*e^((b*c - a*d)/d) + (d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^
2*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^
((b*c - a*d)/d) + 5*a^4*b^3*c*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(
d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - a^5*b^2*d^5*Ei(-((d*x + c)*(b
 - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 4*(d*
```

```
x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*c^3*d*Ei(-((d*x + c)*(b - b*
c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 4*b^6*c^4*
d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*
c - a*d)/d) - 12*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^4*c^2*d^
2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*
c - a*d)/d) - 16*a*b^5*c^3*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 12*(d*x + c)*a^2*(b - b*c/(d*x +
 c) + a*d/(d*x + c))*b^3*c*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 24*a^2*b^4*c^2*d^3*Ei(-((d*x + c
)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 4
*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^2*d^4*Ei(-((d*x + c)*(
b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 16*a
^3*b^3*c*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d
)/d)*e^((b*c - a*d)/d) + 4*a^4*b^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) +
a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + b^6*c^4*d*e^(-(d*x + c)*
(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 4*a*b^5*c^3*d^2*e^(-(d*x + c)*(b -
 b*c/(d*x + c) + a*d/(d*x + c))/d) + 6*a^2*b^4*c^2*d^3*e^(-(d*x + c)*(b - b
*c/(d*x + c) + a*d/(d*x + c))/d) - 4*a^3*b^3*c*d^4*e^(-(d*x + c)*(b - b*c/(
d*x + c) + a*d/(d*x + c))/d) + a^4*b^2*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c)
 + a*d/(d*x + c))/d) + (d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^
2*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - (d*x + c)^2*(b
 - b*c/(d*x + c) + a*d/(d*x + c))^2*b^3*c*d^2*e^(-(d*x + c)*(b - b*c/(d*x +
 c) + a*d/(d*x + c))/d) + (d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^4
*c^2*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 3*b^5*c^3*d
^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + (d*x + c)^2*a*(b
- b*c/(d*x + c) + a*d/(d*x + c))^2*b^2*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c)
 + a*d/(d*x + c))/d) - 2*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^
3*c*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 9*a*b^4*c^2*
d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + (d*x + c)*a^2*(b
 - b*c/(d*x + c) + a*d/(d*x + c))*b^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c)
+ a*d/(d*x + c))/d) + 9*a^2*b^3*c*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c))/d) - 3*a^3*b^2*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c))/d) + 2*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^2*d^3*e^(
-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 2*b^4*c^2*d^3*e^(-(d*x
+ c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 4*a*b^3*c*d^4*e^(-(d*x + c)*(
b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 2*a^2*b^2*d^5*e^(-(d*x + c)*(b - b*
c/(d*x + c) + a*d/(d*x + c))/d) + 2*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c))*b^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 2*b^3
*c*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 2*a*b^2*d^5*e
^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d))*d^2/(((d*x + c)*(b - b
*c/(d*x + c) + a*d/(d*x + c))*d^8 + b*c*d^8 - a*d^9)*b)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^2}\,dx = \int \frac{\mathrm{e}^{-a-b\,x}\,(a+b\,x)^4}{(c+d\,x)^2}\,dx$$

```
[In] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^2,x)
[Out] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^2, x)
```

3.80 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx$

Optimal result

Integrand size = 25, antiderivative size = 294

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = &-\frac{b^2e^{-a-bx}}{d^3}+\frac{b^2(3bc-4ad)e^{-a-bx}}{d^4}-\frac{b^3e^{-a-bx}x}{d^3}\\ &-\frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2}+\frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)}+\frac{b(bc-ad)^4e^{-a-bx}}{2d^6(c+dx)}\\ &+\frac{6b^2(bc-ad)^2e^{-a+\frac{bc}{d}}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}\\ &+\frac{4b^2(bc-ad)^3e^{-a+\frac{bc}{d}}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6}\\ &+\frac{b^2(bc-ad)^4e^{-a+\frac{bc}{d}}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{2d^7}\end{aligned}$$

```
[Out] -b^2*exp(-b*x-a)/d^3+b^2*(-4*a*d+3*b*c)*exp(-b*x-a)/d^4-b^3*exp(-b*x-a)*x/d
^3-1/2*(-a*d+b*c)^4*exp(-b*x-a)/d^5/(d*x+c)^2+4*b*(-a*d+b*c)^3*exp(-b*x-a)/
d^5/(d*x+c)+1/2*b*(-a*d+b*c)^4*exp(-b*x-a)/d^6/(d*x+c)+6*b^2*(-a*d+b*c)^2*e
xp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^5+4*b^2*(-a*d+b*c)^3*exp(-a+b*c/d)*Ei(-b*(d
*x+c)/d)/d^6+1/2*b^2*(-a*d+b*c)^4*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^7
```

Rubi [A] (verified)

Time = 0.26 (sec) , antiderivative size = 294, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.200, Rules used = {2230, 2225, 2207, 2208, 2209}

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = -\frac{b^3xe^{-a-bx}}{d^3}+\frac{b^2e^{\frac{bc}{d}-a}(bc-ad)^4\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{2d^7} + \frac{4b^2e^{\frac{bc}{d}-a}(bc-ad)^3\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{6b^2e^{\frac{bc}{d}-a}(bc-ad)^2\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5} + \frac{b^2e^{-a-bx}(3bc-4ad)}{d^4}-\frac{b^2e^{-a-bx}}{d^3}+\frac{be^{-a-bx}(bc-ad)^4}{2d^6(c+dx)} - \frac{e^{-a-bx}(bc-ad)^4}{2d^5(c+dx)^2}+\frac{4be^{-a-bx}(bc-ad)^3}{d^5(c+dx)}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^3,x]
```

```
[Out] -((b^2*E^(-a - b*x))/d^3) + (b^2*(3*b*c - 4*a*d)*E^(-a - b*x))/d^4 - (b^3*E
^(-a - b*x)*x)/d^3 - ((b*c - a*d)^4*E^(-a - b*x))/(2*d^5*(c + d*x)^2) + (4*
b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)) + (b*(b*c - a*d)^4*E^(-a - b*
x))/(2*d^6*(c + d*x)) + (6*b^2*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi
[-((b*(c + d*x))/d)])/d^5 + (4*b^2*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegr
alEi[-((b*(c + d*x))/d)])/d^6 + (b^2*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpInte
gralEi[-((b*(c + d*x))/d)])/(2*d^7)
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$
\begin{aligned}
\text{integral} &= \int \left(-\frac{b^3(3bc-4ad)e^{-a-bx}}{d^4}+\frac{b^4e^{-a-bx}x}{d^3}+\frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^3} -\frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)^2}+\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4(c+dx)}\right)dx\\
&= \frac{b^4\int e^{-a-bx}x\,dx}{d^3}-\frac{(b^3(3bc-4ad))\int e^{-a-bx}\,dx}{d^4}+\frac{(6b^2(bc-ad)^2)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} -\frac{(4b(bc-ad)^3)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4}+\frac{(bc-ad)^4\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{d^4}\\
&= \frac{b^2(3bc-4ad)e^{-a-bx}}{d^4}-\frac{b^3e^{-a-bx}x}{d^3}-\frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2}+\frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)} +\frac{6b^2(bc-ad)^2e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{b^3\int e^{-a-bx}\,dx}{d^3} +\frac{(4b^2(bc-ad)^3)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^5}-\frac{(b(bc-ad)^4)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{2d^5}\\
&= -\frac{b^2e^{-a-bx}}{d^3}+\frac{b^2(3bc-4ad)e^{-a-bx}}{d^4}-\frac{b^3e^{-a-bx}x}{d^3}-\frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2} +\frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)}+\frac{b(bc-ad)^4e^{-a-bx}}{2d^6(c+dx)}+\frac{6b^2(bc-ad)^2e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} +\frac{4b^2(bc-ad)^3e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}+\frac{(b^2(bc-ad)^4)\int \frac{e^{-a-bx}}{c+dx}\,dx}{2d^6}
\end{aligned}
$$

$$= -\frac{b^2e^{-a-bx}}{d^3} + \frac{b^2(3bc-4ad)e^{-a-bx}}{d^4} - \frac{b^3e^{-a-bx}x}{d^3} - \frac{(bc-ad)^4e^{-a-bx}}{2d^5(c+dx)^2} + \frac{4b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)} + \frac{b(bc-ad)^4e^{-a-bx}}{2d^6(c+dx)} + \frac{6b^2(bc-ad)^2e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} + \frac{4b^2(bc-ad)^3e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{b^2(bc-ad)^4e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{2d^7}$$

Mathematica [A] (verified)

Time = 1.89 (sec) , antiderivative size = 267, normalized size of antiderivative = 0.91

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \frac{e^{-a}\left(\frac{de^{-bx}(-a^4d^5+b^5c^4(c+dx)+a^3bd^4((-4+a)c+(-8+a)dx)+b^4c^3d((7-4a)c-4(-2+a)dx)-2b^2d^3((1+4a-9a^2+2a^3)c^2+2(1+4a-6a^2+a^3)}{(c+dx)^2}\right.}{}$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^3,x]
```

```
[Out] ((d*(-(a^4*d^5) + b^5*c^4*(c + d*x) + a^3*b*d^4*((-4 + a)*c + (-8 + a)*d*x)
 + b^4*c^3*d*((7 - 4*a)*c - 4*(-2 + a)*d*x) - 2*b^2*d^3*((1 + 4*a - 9*a^2 +
 2*a^3)*c^2 + 2*(1 + 4*a - 6*a^2 + a^3)*c*d*x + (1 + 4*a)*d^2*x^2) + 2*b^3*
d^2*((3 - 10*a + 3*a^2)*c^3 + (5 - 12*a + 3*a^2)*c^2*d*x + c*d^2*x^2 - d^3*
x^3)))/(E^(b*x)*(c + d*x)^2) + b^2*(b*c - a*d)^2*(b^2*c^2 - 2*(-4 + a)*b*c*
d + (12 - 8*a + a^2)*d^2)*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(2
*d^7*E^a)
```

Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 418, normalized size of antiderivative = 1.42

method	result
derivativedivides	$-\frac{\frac{3b^3a\,\mathrm{e}^{-bx-a}}{d^3}-\frac{3b^4c\,\mathrm{e}^{-bx-a}}{d^4}-\frac{b^3\left((-bx-a)\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}\right)}{d^3}+\frac{4\left(a^3d^3-3a^2bc\,d^2+3a\,b^2c^2d-b^3c^3\right)b^3\left(-\frac{\mathrm{e}^{-bx-a}}{-bx-a+\frac{ad-cb}{d}}-\mathrm{e}^{-}\right.}{d^6}}{}$
default	$-\frac{\frac{3b^3a\,\mathrm{e}^{-bx-a}}{d^3}-\frac{3b^4c\,\mathrm{e}^{-bx-a}}{d^4}-\frac{b^3\left((-bx-a)\mathrm{e}^{-bx-a}-\mathrm{e}^{-bx-a}\right)}{d^3}+\frac{4\left(a^3d^3-3a^2bc\,d^2+3a\,b^2c^2d-b^3c^3\right)b^3\left(-\frac{\mathrm{e}^{-bx-a}}{-bx-a+\frac{ad-cb}{d}}-\mathrm{e}^{-}\right.}{d^6}}{}$
risch	Expression too large to display

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x,method=_RETURNVERBOSE)
```

```
[Out] -1/b*(3*b^3/d^3*a*exp(-b*x-a)-3*b^4/d^4*c*exp(-b*x-a)-1/d^3*b^3*((-b*x-a)*e
xp(-b*x-a)-exp(-b*x-a))+4/d^6*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^3)
*b^3*(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b
*c)/d))-(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^3*c^3*d+b^4*c^4)*b^3
/d^7*(-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/2*exp(-b*x-a)/(-b*x-a+(a*d-
b*c)/d)-1/2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+6/d^5*(a^2*d^2-2*a*b
*c*d+b^2*c^2)*b^3*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 550, normalized size of antiderivative = 1.87

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \frac{(b^6c^6 - 4\,(a-2)b^5c^5d + 6\,(a^2-4\,a+2)b^4c^4d^2 - 4\,(a^3-6\,a^2+6\,a)b^3c^3d^3 + (a^4-8\,a^3+12\,a^2)b^2c^2d^4 + (b^6}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="fricas")
```

```
[Out] 1/2*((b^6*c^6 - 4*(a - 2)*b^5*c^5*d + 6*(a^2 - 4*a + 2)*b^4*c^4*d^2 - 4*(a^
3 - 6*a^2 + 6*a)*b^3*c^3*d^3 + (a^4 - 8*a^3 + 12*a^2)*b^2*c^2*d^4 + (b^6*c^
4*d^2 - 4*(a - 2)*b^5*c^3*d^3 + 6*(a^2 - 4*a + 2)*b^4*c^2*d^4 - 4*(a^3 - 6*
a^2 + 6*a)*b^3*c*d^5 + (a^4 - 8*a^3 + 12*a^2)*b^2*d^6)*x^2 + 2*(b^6*c^5*d -
 4*(a - 2)*b^5*c^4*d^2 + 6*(a^2 - 4*a + 2)*b^4*c^3*d^3 - 4*(a^3 - 6*a^2 + 6
*a)*b^3*c^2*d^4 + (a^4 - 8*a^3 + 12*a^2)*b^2*c*d^5)*x)*Ei(-(b*d*x + b*c)/d)
*e^((b*c - a*d)/d) - (2*b^3*d^6*x^3 - b^5*c^5*d + (4*a - 7)*b^4*c^4*d^2 - 2
*(3*a^2 - 10*a + 3)*b^3*c^3*d^3 + a^4*d^6 + 2*(2*a^3 - 9*a^2 + 4*a + 1)*b^2
*c^2*d^4 - (a^4 - 4*a^3)*b*c*d^5 - 2*(b^3*c*d^5 - (4*a + 1)*b^2*d^6)*x^2 -
(b^5*c^4*d^2 - 4*(a - 2)*b^4*c^3*d^3 + 2*(3*a^2 - 12*a + 5)*b^3*c^2*d^4 - 4
*(a^3 - 6*a^2 + 4*a + 1)*b^2*c*d^5 + (a^4 - 8*a^3)*b*d^6)*x)*e^(-b*x - a))/
(d^9*x^2 + 2*c*d^8*x + c^2*d^7)
```

Sympy [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \left(\int \frac{a^4}{c^3e^{bx}+3c^2dxe^{bx}+3cd^2x^2e^{bx}+d^3x^3e^{bx}}\,dx + \int \frac{b^4x^4}{c^3e^{bx}+3c^2dxe^{bx}+3cd^2x^2e^{bx}+d^3x^3e^{bx}}\,dx + \int \frac{4ab^3x^3}{c^3e^{bx}+3c^2dxe^{bx}+3cd^2x^2e^{bx}+d^3x^3e^{bx}}\,dx + \int \frac{6a^2b^2x^2}{c^3e^{bx}+3c^2dxe^{bx}+3cd^2x^2e^{bx}+d^3x^3e^{bx}}\,dx + \int \frac{4a^3bx}{c^3e^{bx}+3c^2dxe^{bx}+3cd^2x^2e^{bx}+d^3x^3e^{bx}}\,dx\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**3,x)
```

```
[Out] (Integral(a**4/(c**3*exp(b*x) + 3*c**2*d*x*exp(b*x) + 3*c*d**2*x**2*exp(b*x
) + d**3*x**3*exp(b*x)), x) + Integral(b**4*x**4/(c**3*exp(b*x) + 3*c**2*d*
x*exp(b*x) + 3*c*d**2*x**2*exp(b*x) + d**3*x**3*exp(b*x)), x) + Integral(4*
a*b**3*x**3/(c**3*exp(b*x) + 3*c**2*d*x*exp(b*x) + 3*c*d**2*x**2*exp(b*x) +
 d**3*x**3*exp(b*x)), x) + Integral(6*a**2*b**2*x**2/(c**3*exp(b*x) + 3*c**
2*d*x*exp(b*x) + 3*c*d**2*x**2*exp(b*x) + d**3*x**3*exp(b*x)), x) + Integra
l(4*a**3*b*x/(c**3*exp(b*x) + 3*c**2*d*x*exp(b*x) + 3*c*d**2*x**2*exp(b*x)
+ d**3*x**3*exp(b*x)), x))*exp(-a)
```

Maxima [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \int \frac{(bx+a)^4e^{(-bx-a)}}{(dx+c)^3}\,dx$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(3, (d*x + c)*b/d)/((d*x + c)^2*d) - (b^3
*d^2*x^4 + (4*a*b^2*d^2 + b^2*d^2)*x^3 + 3*(2*a^2*b*d^2 + b^2*c*d)*x^2 + (4
*a^3*d^2 - 3*b^2*c^2 + 12*a*b*c*d - 6*a^2*d^2)*x)*e^(-b*x)/(d^5*x^3*e^a + 3
*c*d^4*x^2*e^a + 3*c^2*d^3*x*e^a + c^3*d^2*e^a) - integrate(-(4*a^3*c*d^2 -
 3*b^2*c^3 + 12*a*b*c^2*d - 6*a^2*c*d^2 + (3*b^3*c^3 - 8*a^3*d^3 + 12*b^2*c
^2*d + 6*(3*b*c*d^2 + 2*d^3)*a^2 - 12*(b^2*c^2*d + 2*b*c*d^2)*a)*x)*e^(-b*x
)/(d^6*x^4*e^a + 4*c*d^5*x^3*e^a + 6*c^2*d^4*x^2*e^a + 4*c^3*d^3*x*e^a + c^
4*d^2*e^a), x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1995 vs. $2(279) = 558$.

Time = 0.41 (sec) , antiderivative size = 1995, normalized size of antiderivative = 6.79

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \text{Too large to display}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^3,x, algorithm="giac")
```

```
[Out] 1/2*(b^6*c^4*d^2*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^5*c^3*d^3*
x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^4*c^2*d^4*x^2*Ei(-(b*d*x
+ b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) + a^4*b^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*b^6*c^5*d
*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 8*a*b^5*c^4*d^2*x*Ei(-(b*d*x + b*c
)/d)*e^(-a + b*c/d) + 12*a^2*b^4*c^3*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c
/d) - 8*a^3*b^3*c^2*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*a^4*b^2*c
*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 8*b^5*c^3*d^3*x^2*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) - 24*a*b^4*c^2*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) + 24*a^2*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 8*a^3*
b^2*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^6*c^6*Ei(-(b*d*x + b*c)
/d)*e^(-a + b*c/d) - 4*a*b^5*c^5*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*
a^2*b^4*c^4*d^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^3*c^3*d^3*Ei(
-(b*d*x + b*c)/d)*e^(-a + b*c/d) + a^4*b^2*c^2*d^4*Ei(-(b*d*x + b*c)/d)*e^(
-a + b*c/d) + 16*b^5*c^4*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 48*a*b
^4*c^3*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 48*a^2*b^3*c^2*d^4*x*Ei(
-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 16*a^3*b^2*c*d^5*x*Ei(-(b*d*x + b*c)/d)*
e^(-a + b*c/d) + 12*b^4*c^2*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 2
4*a*b^3*c*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*a^2*b^2*d^6*x^2*
Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^5*c^4*d^2*x*e^(-b*x - a) - 4*a*b^4*
c^3*d^3*x*e^(-b*x - a) + 6*a^2*b^3*c^2*d^4*x*e^(-b*x - a) - 4*a^3*b^2*c*d^5
*x*e^(-b*x - a) + a^4*b*d^6*x*e^(-b*x - a) - 2*b^3*d^6*x^3*e^(-b*x - a) + 8
*b^5*c^5*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 24*a*b^4*c^4*d^2*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 24*a^2*b^3*c^3*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) - 8*a^3*b^2*c^2*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 24*b^4*c
^3*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 48*a*b^3*c^2*d^4*x*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 24*a^2*b^2*c*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + b^5*c^5*d*e^(-b*x - a) - 4*a*b^4*c^4*d^2*e^(-b*x - a) + 6*a^2*b^
3*c^3*d^3*e^(-b*x - a) - 4*a^3*b^2*c^2*d^4*e^(-b*x - a) + a^4*b*c*d^5*e^(-b
*x - a) + 8*b^4*c^3*d^3*x*e^(-b*x - a) - 24*a*b^3*c^2*d^4*x*e^(-b*x - a) +
24*a^2*b^2*c*d^5*x*e^(-b*x - a) - 8*a^3*b*d^6*x*e^(-b*x - a) + 2*b^3*c*d^5*
x^2*e^(-b*x - a) - 8*a*b^2*d^6*x^2*e^(-b*x - a) + 12*b^4*c^4*d^2*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d) - 24*a*b^3*c^3*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b
*c/d) + 12*a^2*b^2*c^2*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 7*b^4*c^4*
d^2*e^(-b*x - a) - 20*a*b^3*c^3*d^3*e^(-b*x - a) + 18*a^2*b^2*c^2*d^4*e^(-b
```

```
*x - a) - 4*a^3*b*c*d^5*e^(-b*x - a) - a^4*d^6*e^(-b*x - a) + 10*b^3*c^2*d^
4*x*e^(-b*x - a) - 16*a*b^2*c*d^5*x*e^(-b*x - a) - 2*b^2*d^6*x^2*e^(-b*x -
a) + 6*b^3*c^3*d^3*e^(-b*x - a) - 8*a*b^2*c^2*d^4*e^(-b*x - a) - 4*b^2*c*d^
5*x*e^(-b*x - a) - 2*b^2*c^2*d^4*e^(-b*x - a))/(d^9*x^2 + 2*c*d^8*x + c^2*d
^7)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^3}\,dx = \int \frac{\mathrm{e}^{-a-b\,x}\,{(a+b\,x)}^4}{{(c+d\,x)}^3}\,dx$$

```
[In] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^3,x)
[Out] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^3, x)
```

3.81 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx$

Optimal result

Integrand size = 25, antiderivative size = 396

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = -\frac{b^3e^{-a-bx}}{d^4}-\frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3}+\frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2}+\frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2}-\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}-\frac{2b^2(bc-ad)^3e^{-a-bx}}{d^6(c+dx)}-\frac{b^2(bc-ad)^4e^{-a-bx}}{6d^7(c+dx)}-\frac{4b^3(bc-ad)e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}-\frac{6b^3(bc-ad)^2e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{2b^3(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^7}-\frac{b^3(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{6d^8}$$

```
[Out] -b^3*exp(-b*x-a)/d^4-1/3*(-a*d+b*c)^4*exp(-b*x-a)/d^5/(d*x+c)^3+2*b*(-a*d+b
*c)^3*exp(-b*x-a)/d^5/(d*x+c)^2+1/6*b*(-a*d+b*c)^4*exp(-b*x-a)/d^6/(d*x+c)^
2-6*b^2*(-a*d+b*c)^2*exp(-b*x-a)/d^5/(d*x+c)-2*b^2*(-a*d+b*c)^3*exp(-b*x-a)
/d^6/(d*x+c)-1/6*b^2*(-a*d+b*c)^4*exp(-b*x-a)/d^7/(d*x+c)-4*b^3*(-a*d+b*c)*
exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^5-6*b^3*(-a*d+b*c)^2*exp(-a+b*c/d)*Ei(-b*(
d*x+c)/d)/d^6-2*b^3*(-a*d+b*c)^3*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^7-1/6*b^3
*(-a*d+b*c)^4*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^8
```

Rubi [A] (verified)

Time = 0.33 (sec) , antiderivative size = 396, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.160$, Rules used = {2230, 2225, 2208, 2209}

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = -\frac{b^3e^{\frac{bc}{d}-a}(bc-ad)^4\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{6d^8} - \frac{2b^3e^{\frac{bc}{d}-a}(bc-ad)^3\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^7} - \frac{6b^3e^{\frac{bc}{d}-a}(bc-ad)^2\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6} - \frac{4b^3e^{\frac{bc}{d}-a}(bc-ad)\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5} - \frac{b^3e^{-a-bx}}{d^4} - \frac{b^2e^{-a-bx}(bc-ad)^4}{6d^7(c+dx)} - \frac{2b^2e^{-a-bx}(bc-ad)^3}{d^6(c+dx)} - \frac{6b^2e^{-a-bx}(bc-ad)^2}{d^5(c+dx)} + \frac{be^{-a-bx}(bc-ad)^4}{6d^6(c+dx)^2} - \frac{e^{-a-bx}(bc-ad)^4}{3d^5(c+dx)^3} + \frac{2be^{-a-bx}(bc-ad)^3}{d^5(c+dx)^2}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^4,x]
```

```
[Out] -((b^3*E^(-a - b*x))/d^4) - ((b*c - a*d)^4*E^(-a - b*x))/(3*d^5*(c + d*x)^3
) + (2*b*(b*c - a*d)^3*E^(-a - b*x))/(d^5*(c + d*x)^2) + (b*(b*c - a*d)^4*E
^(-a - b*x))/(6*d^6*(c + d*x)^2) - (6*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*
(c + d*x)) - (2*b^2*(b*c - a*d)^3*E^(-a - b*x))/(d^6*(c + d*x)) - (b^2*(b*c
 - a*d)^4*E^(-a - b*x))/(6*d^7*(c + d*x)) - (4*b^3*(b*c - a*d)*E^(-a + (b*c
)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^5 - (6*b^3*(b*c - a*d)^2*E^(-a +
(b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^6 - (2*b^3*(b*c - a*d)^3*E^(-
a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/d^7 - (b^3*(b*c - a*d)^4*E^
(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(6*d^8)
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(\frac{b^4e^{-a-bx}}{d^4}+\frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^4}-\frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)^3}+\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4(c+dx)^2}-\frac{4b^3(bc-ad)e^{-a-bx}}{d^4(c+dx)}\right)dx\\
&= \frac{b^4\int e^{-a-bx}\,dx}{d^4}-\frac{\left(4b^3(bc-ad)\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4}+\frac{\left(6b^2(bc-ad)^2\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4}-\frac{\left(4b(bc-ad)^3\right)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{d^4}+\frac{(bc-ad)^4\int \frac{e^{-a-bx}}{(c+dx)^4}\,dx}{d^4}\\
&= -\frac{b^3e^{-a-bx}}{d^4}-\frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3}+\frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2}-\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}-\frac{4b^3(bc-ad)e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}-\frac{\left(6b^3(bc-ad)^2\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^5}+\frac{\left(2b^2(bc-ad)^3\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^5}-\frac{\left(b(bc-ad)^4\right)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{3d^5}\\
&= -\frac{b^3e^{-a-bx}}{d^4}-\frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3}+\frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2}+\frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2}-\frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)}-\frac{2b^2(bc-ad)^3e^{-a-bx}}{d^6(c+dx)}\\
&\quad -\frac{4b^3(bc-ad)e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5}-\frac{6b^3(bc-ad)^2e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6}-\frac{\left(2b^3(bc-ad)^3\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^6}+\frac{\left(b^2(bc-ad)^4\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{6d^6}
\end{aligned}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} + \frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2(bc-ad)^3e^{-a-bx}}{d^6(c+dx)} - \frac{b^2(bc-ad)^4e^{-a-bx}}{6d^7(c+dx)} - \frac{4b^3(bc-ad)e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} - \frac{6b^3(bc-ad)^2e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} - \frac{2b^3(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7} - \frac{(b^3(bc-ad)^4)\int\frac{e^{-a-bx}}{c+dx}\,dx}{6d^7}$$

$$= -\frac{b^3e^{-a-bx}}{d^4} - \frac{(bc-ad)^4e^{-a-bx}}{3d^5(c+dx)^3} + \frac{2b(bc-ad)^3e^{-a-bx}}{d^5(c+dx)^2} + \frac{b(bc-ad)^4e^{-a-bx}}{6d^6(c+dx)^2} - \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)} - \frac{2b^2(bc-ad)^3e^{-a-bx}}{d^6(c+dx)} - \frac{b^2(bc-ad)^4e^{-a-bx}}{6d^7(c+dx)} - \frac{4b^3(bc-ad)e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} - \frac{6b^3(bc-ad)^2e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} - \frac{2b^3(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7} - \frac{b^3(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{6d^8}$$

Mathematica [A] (verified)

Time = 2.26 (sec) , antiderivative size = 389, normalized size of antiderivative = 0.98

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx$$
$$= \frac{e^{-a}\left(-\frac{de^{-bx}(2a^4d^6+b^6c^4(c+dx)^2-a^3bd^5((-4+a)c+(-12+a)dx)-b^5c^3d(c+dx)((-11+4a)c+4(-3+a)dx)+a^2b^2d^4((12-8a+a^2)c^2+2(18-1\cdots}{\cdots}\right.}{\cdots}$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^4,x]
```

```
[Out] (-((d*(2*a^4*d^6 + b^6*c^4*(c + d*x)^2 - a^3*b*d^5*((-4 + a)*c + (-12 + a)*
d*x) - b^5*c^3*d*(c + d*x)*((-11 + 4*a)*c + 4*(-3 + a)*d*x) + a^2*b^2*d^4*(
(12 - 8*a + a^2)*c^2 + 2*(18 - 10*a + a^2)*c*d*x + (-6 + a)^2*d^2*x^2) + 2*
b^4*c^2*d^2*((13 - 16*a + 3*a^2)*c^2 + 2*(15 - 17*a + 3*a^2)*c*d*x + 3*(6 -
 6*a + a^2)*d^2*x^2) + 2*b^3*d^3*((3 - 22*a + 15*a^2 - 2*a^3)*c^3 + (9 - 54
*a + 33*a^2 - 4*a^3)*c^2*d*x + (9 - 36*a + 18*a^2 - 2*a^3)*c*d^2*x^2 + 3*d^
3*x^3)))/(E^(b*x)*(c + d*x)^3)) - b^3*(b^4*c^4 - 4*(-3 + a)*b^3*c^3*d + 6*(
6 - 6*a + a^2)*b^2*c^2*d^2 - 4*(-6 + 18*a - 9*a^2 + a^3)*b*c*d^3 + a*(-24 +
 36*a - 12*a^2 + a^3)*d^4)*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])/(
6*d^8*E^a)
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 511, normalized size of antiderivative = 1.29

method	result
derivativedivides	$-\frac{\frac{b^4 e^{-bx-a}}{d^4}+\frac{\left(a^4d^4-4a^3bc\,d^3+6a^2b^2c^2d^2-4a\,b^3c^3d+b^4c^4\right)b^4\left(-\frac{e^{-bx-a}}{3\left(-bx-a+\frac{ad-cb}{d}\right)^3}-\frac{e^{-bx-a}}{6\left(-bx-a+\frac{ad-cb}{d}\right)^2}-\frac{e^{-bx-a}}{6\left(-bx-a+\frac{ad-cb}{d}\right.}\right.}{d^8}$
default	$-\frac{\frac{b^4 e^{-bx-a}}{d^4}+\frac{\left(a^4d^4-4a^3bc\,d^3+6a^2b^2c^2d^2-4a\,b^3c^3d+b^4c^4\right)b^4\left(-\frac{e^{-bx-a}}{3\left(-bx-a+\frac{ad-cb}{d}\right)^3}-\frac{e^{-bx-a}}{6\left(-bx-a+\frac{ad-cb}{d}\right)^2}-\frac{e^{-bx-a}}{6\left(-bx-a+\frac{ad-cb}{d}\right.}\right.}{d^8}$
risch	Expression too large to display

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x,method=_RETURNVERBOSE)
```

```
[Out] -1/b*(b^4/d^4*exp(-b*x-a)+(a^4*d^4-4*a^3*b*c*d^3+6*a^2*b^2*c^2*d^2-4*a*b^3*
c^3*d+b^4*c^4)*b^4/d^8*(-1/3*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^3-1/6*exp(-b*
x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/6*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/6*exp(-(
a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+6/d^6*(a^2*d^2-2*a*b*c*d+b^2*c^2)*b^4*
(-exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d
))-4/d^7*(a^3*d^3-3*a^2*b*c*d^2+3*a*b^2*c^2*d-b^3*c^3)*b^4*(-1/2*exp(-b*x-a
)/(-b*x-a+(a*d-b*c)/d)^2-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/2*exp(-(a*d
-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+4/d^5*(a*d-b*c)*b^4*exp(-(a*d-b*c)/d)*Ei(
1,b*x+a-(a*d-b*c)/d))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 793 vs. 2(377) = 754.

Time = 0.28 (sec) , antiderivative size = 793, normalized size of antiderivative = 2.00

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx =$$

$$-\frac{(b^7c^7-4\,(a-3)b^6c^6d+6\,(a^2-6\,a+6)b^5c^5d^2-4\,(a^3-9\,a^2+18\,a-6)b^4c^4d^3+(a^4-12\,a^3+36\,a^2-2}{}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="fricas")
```

```
[Out] -1/6*((b^7*c^7 - 4*(a - 3)*b^6*c^6*d + 6*(a^2 - 6*a + 6)*b^5*c^5*d^2 - 4*(a
^3 - 9*a^2 + 18*a - 6)*b^4*c^4*d^3 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^3*c^3
*d^4 + (b^7*c^4*d^3 - 4*(a - 3)*b^6*c^3*d^4 + 6*(a^2 - 6*a + 6)*b^5*c^2*d^5
 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c*d^6 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^
3*d^7)*x^3 + 3*(b^7*c^5*d^2 - 4*(a - 3)*b^6*c^4*d^3 + 6*(a^2 - 6*a + 6)*b^5
*c^3*d^4 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c^2*d^5 + (a^4 - 12*a^3 + 36*a^2
- 24*a)*b^3*c*d^6)*x^2 + 3*(b^7*c^6*d - 4*(a - 3)*b^6*c^5*d^2 + 6*(a^2 - 6*
```

```
a + 6)*b^5*c^4*d^3 - 4*(a^3 - 9*a^2 + 18*a - 6)*b^4*c^3*d^4 + (a^4 - 12*a^3
 + 36*a^2 - 24*a)*b^3*c^2*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) +
(b^6*c^6*d - (4*a - 11)*b^5*c^5*d^2 + 6*b^3*d^7*x^3 + 2*(3*a^2 - 16*a + 13)
*b^4*c^4*d^3 - 2*(2*a^3 - 15*a^2 + 22*a - 3)*b^3*c^3*d^4 + 2*a^4*d^7 + (a^4
 - 8*a^3 + 12*a^2)*b^2*c^2*d^5 - (a^4 - 4*a^3)*b*c*d^6 + (b^6*c^4*d^3 - 4*(
a - 3)*b^5*c^3*d^4 + 6*(a^2 - 6*a + 6)*b^4*c^2*d^5 - 2*(2*a^3 - 18*a^2 + 36
*a - 9)*b^3*c*d^6 + (a^4 - 12*a^3 + 36*a^2)*b^2*d^7)*x^2 + (2*b^6*c^5*d^2 -
 (8*a - 23)*b^5*c^4*d^3 + 4*(3*a^2 - 17*a + 15)*b^4*c^3*d^4 - 2*(4*a^3 - 33
*a^2 + 54*a - 9)*b^3*c^2*d^5 + 2*(a^4 - 10*a^3 + 18*a^2)*b^2*c*d^6 - (a^4 -
 12*a^3)*b*d^7)*x)*e^(-b*x - a))/(d^11*x^3 + 3*c*d^10*x^2 + 3*c^2*d^9*x + c
^3*d^8)
```

Sympy [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = \left(\int \frac{a^4}{c^4e^{bx}+4c^3dxe^{bx}+6c^2d^2x^2e^{bx}+4cd^3x^3e^{bx}+d^4x^4e^{bx}}\,dx + \int \frac{b^4x^4}{c^4e^{bx}+4c^3dxe^{bx}+6c^2d^2x^2e^{bx}+4cd^3x^3e^{bx}+d^4x^4e^{bx}}\,dx + \int \frac{4ab^3x^3}{c^4e^{bx}+4c^3dxe^{bx}+6c^2d^2x^2e^{bx}+4cd^3x^3e^{bx}+d^4x^4e^{bx}}\,dx + \int \frac{6a^2b^2x^2}{c^4e^{bx}+4c^3dxe^{bx}+6c^2d^2x^2e^{bx}+4cd^3x^3e^{bx}+d^4x^4e^{bx}}\,dx + \int \frac{4a^3bx}{c^4e^{bx}+4c^3dxe^{bx}+6c^2d^2x^2e^{bx}+4cd^3x^3e^{bx}+d^4x^4e^{bx}}\,dx\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**4,x)
```

```
[Out] (Integral(a**4/(c**4*exp(b*x) + 4*c**3*d*x*exp(b*x) + 6*c**2*d**2*x**2*exp(
b*x) + 4*c*d**3*x**3*exp(b*x) + d**4*x**4*exp(b*x)), x) + Integral(b**4*x**
4/(c**4*exp(b*x) + 4*c**3*d*x*exp(b*x) + 6*c**2*d**2*x**2*exp(b*x) + 4*c*d*
*3*x**3*exp(b*x) + d**4*x**4*exp(b*x)), x) + Integral(4*a*b**3*x**3/(c**4*e
xp(b*x) + 4*c**3*d*x*exp(b*x) + 6*c**2*d**2*x**2*exp(b*x) + 4*c*d**3*x**3*e
xp(b*x) + d**4*x**4*exp(b*x)), x) + Integral(6*a**2*b**2*x**2/(c**4*exp(b*x
) + 4*c**3*d*x*exp(b*x) + 6*c**2*d**2*x**2*exp(b*x) + 4*c*d**3*x**3*exp(b*x
) + d**4*x**4*exp(b*x)), x) + Integral(4*a**3*b*x/(c**4*exp(b*x) + 4*c**3*d
*x*exp(b*x) + 6*c**2*d**2*x**2*exp(b*x) + 4*c*d**3*x**3*exp(b*x) + d**4*x**
4*exp(b*x)), x))*exp(-a)
```

Maxima [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = \int \frac{(bx+a)^4 e^{(-bx-a)}}{(dx+c)^4}\,dx$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="maxima")
```

```
[Out] -a^4*e^(-a + b*c/d)*exp_integral_e(4, (d*x + c)*b/d)/((d*x + c)^3*d) - (b^3
*d^2*x^4 + 4*a*b^2*d^2*x^3 + 2*(3*a^2*b*d^2 + 2*b^2*c*d - 2*a*b*d^2)*x^2 +
4*(a^3*d^2 - b^2*c^2 - 3*a^2*d^2 - 2*b*c*d + 2*(2*b*c*d + d^2)*a)*x)*e^(-b*
x)/(d^6*x^4*e^a + 4*c*d^5*x^3*e^a + 6*c^2*d^4*x^2*e^a + 4*c^3*d^3*x*e^a + c
^4*d^2*e^a) - integrate(-4*(a^3*c*d^2 - b^2*c^3 - 3*a^2*c*d^2 - 2*b*c^2*d +
 2*(2*b*c^2*d + c*d^2)*a + (b^3*c^3 - 3*a^3*d^3 + 7*b^2*c^2*d + 6*b*c*d^2 +
 3*(2*b*c*d^2 + 3*d^3)*a^2 - 2*(2*b^2*c^2*d + 8*b*c*d^2 + 3*d^3)*a)*x)*e^(-
b*x)/(d^7*x^5*e^a + 5*c*d^6*x^4*e^a + 10*c^2*d^5*x^3*e^a + 10*c^3*d^4*x^2*e
^a + 5*c^4*d^3*x*e^a + c^5*d^2*e^a), x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 3178 vs. 2(377) = 754.

Time = 0.40 (sec) , antiderivative size = 3178, normalized size of antiderivative = 8.03

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = \text{Too large to display}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^4,x, algorithm="giac")
```

```
[Out] -1/6*(b^7*c^4*d^3*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a*b^6*c^3*d^4
*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^5*c^2*d^5*x^3*Ei(-(b*d*x
 + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + a^4*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^7*c^5*
d^2*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^6*c^4*d^3*x^2*Ei(-(b*d
*x + b*c)/d)*e^(-a + b*c/d) + 18*a^2*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e
^(-a + b*c/d) - 12*a^3*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d)
+ 3*a^4*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 12*b^6*c^3*d^4*
x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 36*a*b^5*c^2*d^5*x^3*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 12*a^3*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*b^7*c^
6*d*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 12*a*b^6*c^5*d^2*x*Ei(-(b*d*x +
 b*c)/d)*e^(-a + b*c/d) + 18*a^2*b^5*c^4*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a +
 b*c/d) - 12*a^3*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 3*a^4*
b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^6*c^4*d^3*x^2*Ei(-
(b*d*x + b*c)/d)*e^(-a + b*c/d) - 108*a*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d
```

)*e^(-a + b*c/d) + 108*a^2*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c
/d) - 36*a^3*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^5*c^2
*d^5*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^4*c*d^6*x^3*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a
+ b*c/d) + b^6*c^4*d^3*x^2*e^(-b*x - a) - 4*a*b^5*c^3*d^4*x^2*e^(-b*x - a)
+ 6*a^2*b^4*c^2*d^5*x^2*e^(-b*x - a) - 4*a^3*b^3*c*d^6*x^2*e^(-b*x - a) + a
^4*b^2*d^7*x^2*e^(-b*x - a) + b^7*c^7*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) -
4*a*b^6*c^6*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 6*a^2*b^5*c^5*d^2*Ei(-
(b*d*x + b*c)/d)*e^(-a + b*c/d) - 4*a^3*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^
(-a + b*c/d) + a^4*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 36*b^6
*c^5*d^2*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 108*a*b^5*c^4*d^3*x*Ei(-(b
*d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^4*c^3*d^4*x*Ei(-(b*d*x + b*c)/d)*
e^(-a + b*c/d) - 36*a^3*b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) +
108*b^5*c^3*d^4*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 216*a*b^4*c^2*d^
5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^3*c*d^6*x^2*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 24*b^4*c*d^6*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a +
b*c/d) - 24*a*b^3*d^7*x^3*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 2*b^6*c^5*d
^2*x*e^(-b*x - a) - 8*a*b^5*c^4*d^3*x*e^(-b*x - a) + 12*a^2*b^4*c^3*d^4*x*e
^(-b*x - a) - 8*a^3*b^3*c^2*d^5*x*e^(-b*x - a) + 2*a^4*b^2*c*d^6*x*e^(-b*x
- a) + 12*b^5*c^3*d^4*x^2*e^(-b*x - a) - 36*a*b^4*c^2*d^5*x^2*e^(-b*x - a)
+ 36*a^2*b^3*c*d^6*x^2*e^(-b*x - a) - 12*a^3*b^2*d^7*x^2*e^(-b*x - a) + 12*
b^6*c^6*d*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 36*a*b^5*c^5*d^2*Ei(-(b*d*x
+ b*c)/d)*e^(-a + b*c/d) + 36*a^2*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a +
b*c/d) - 12*a^3*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 108*b^5*
c^4*d^3*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 216*a*b^4*c^3*d^4*x*Ei(-(b*
d*x + b*c)/d)*e^(-a + b*c/d) + 108*a^2*b^3*c^2*d^5*x*Ei(-(b*d*x + b*c)/d)*e
^(-a + b*c/d) + 72*b^4*c^2*d^5*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72
*a*b^3*c*d^6*x^2*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + b^6*c^6*d*e^(-b*x -
a) - 4*a*b^5*c^5*d^2*e^(-b*x - a) + 6*a^2*b^4*c^4*d^3*e^(-b*x - a) - 4*a^3*
b^3*c^3*d^4*e^(-b*x - a) + a^4*b^2*c^2*d^5*e^(-b*x - a) + 23*b^5*c^4*d^3*x*
e^(-b*x - a) - 68*a*b^4*c^3*d^4*x*e^(-b*x - a) + 66*a^2*b^3*c^2*d^5*x*e^(-b
*x - a) - 20*a^3*b^2*c*d^6*x*e^(-b*x - a) - a^4*b*d^7*x*e^(-b*x - a) + 36*b
^4*c^2*d^5*x^2*e^(-b*x - a) - 72*a*b^3*c*d^6*x^2*e^(-b*x - a) + 36*a^2*b^2*
d^7*x^2*e^(-b*x - a) + 6*b^3*d^7*x^3*e^(-b*x - a) + 36*b^5*c^5*d^2*Ei(-(b*d
*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^4*c^4*d^3*Ei(-(b*d*x + b*c)/d)*e^(-a +
b*c/d) + 36*a^2*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) + 72*b^4*c
^3*d^4*x*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c/d) - 72*a*b^3*c^2*d^5*x*Ei(-(b*d*
x + b*c)/d)*e^(-a + b*c/d) + 11*b^5*c^5*d^2*e^(-b*x - a) - 32*a*b^4*c^4*d^3
*e^(-b*x - a) + 30*a^2*b^3*c^3*d^4*e^(-b*x - a) - 8*a^3*b^2*c^2*d^5*e^(-b*x
- a) - a^4*b*c*d^6*e^(-b*x - a) + 60*b^4*c^3*d^4*x*e^(-b*x - a) - 108*a*b^
3*c^2*d^5*x*e^(-b*x - a) + 36*a^2*b^2*c*d^6*x*e^(-b*x - a) + 12*a^3*b*d^7*x
*e^(-b*x - a) + 18*b^3*c*d^6*x^2*e^(-b*x - a) + 24*b^4*c^4*d^3*Ei(-(b*d*x +
b*c)/d)*e^(-a + b*c/d) - 24*a*b^3*c^3*d^4*Ei(-(b*d*x + b*c)/d)*e^(-a + b*c
/d) + 26*b^4*c^4*d^3*e^(-b*x - a) - 44*a*b^3*c^3*d^4*e^(-b*x - a) + 12*a^2*
b^2*c^2*d^5*e^(-b*x - a) + 4*a^3*b*c*d^6*e^(-b*x - a) + 2*a^4*d^7*e^(-b*x -

```
a) + 18*b^3*c^2*d^5*x*e^(-b*x - a) + 6*b^3*c^3*d^4*e^(-b*x - a))/(d^11*x^3
+ 3*c*d^10*x^2 + 3*c^2*d^9*x + c^3*d^8)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^4}\,dx = \int \frac{\mathrm{e}^{-a-b\,x}\,{\left(a+b\,x\right)}^4}{{\left(c+d\,x\right)}^4}\,dx$$

```
[In] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^4,x)
[Out] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^4, x)
```

3.82 $\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5} dx$

Optimal result

Integrand size = 25, antiderivative size = 557

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = &-\frac{(bc-ad)^4e^{-a-bx}}{4d^5(c+dx)^4}+\frac{4b(bc-ad)^3e^{-a-bx}}{3d^5(c+dx)^3}+\frac{b(bc-ad)^4e^{-a-bx}}{12d^6(c+dx)^3}\\&-\frac{3b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)^2}-\frac{2b^2(bc-ad)^3e^{-a-bx}}{3d^6(c+dx)^2}-\frac{b^2(bc-ad)^4e^{-a-bx}}{24d^7(c+dx)^2}\\&+\frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)}+\frac{3b^3(bc-ad)^2e^{-a-bx}}{d^6(c+dx)}+\frac{2b^3(bc-ad)^3e^{-a-bx}}{3d^7(c+dx)}\\&+\frac{b^3(bc-ad)^4e^{-a-bx}}{24d^8(c+dx)}+\frac{b^4e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}\\&+\frac{4b^4(bc-ad)e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6}\\&+\frac{3b^4(bc-ad)^2e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^7}\\&+\frac{2b^4(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{3d^8}\\&+\frac{b^4(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{24d^9}\end{aligned}$$

```
[Out] -1/4*(-a*d+b*c)^4*exp(-b*x-a)/d^5/(d*x+c)^4+4/3*b*(-a*d+b*c)^3*exp(-b*x-a)/
d^5/(d*x+c)^3+1/12*b*(-a*d+b*c)^4*exp(-b*x-a)/d^6/(d*x+c)^3-3*b^2*(-a*d+b*c
)^2*exp(-b*x-a)/d^5/(d*x+c)^2-2/3*b^2*(-a*d+b*c)^3*exp(-b*x-a)/d^6/(d*x+c)^
2-1/24*b^2*(-a*d+b*c)^4*exp(-b*x-a)/d^7/(d*x+c)^2+4*b^3*(-a*d+b*c)*exp(-b*x
-a)/d^5/(d*x+c)+3*b^3*(-a*d+b*c)^2*exp(-b*x-a)/d^6/(d*x+c)+2/3*b^3*(-a*d+b*
c)^3*exp(-b*x-a)/d^7/(d*x+c)+1/24*b^3*(-a*d+b*c)^4*exp(-b*x-a)/d^8/(d*x+c)+
```

```
b^4*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^5+4*b^4*(-a*d+b*c)*exp(-a+b*c/d)*Ei(-b
*(d*x+c)/d)/d^6+3*b^4*(-a*d+b*c)^2*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^7+2/3*b
^4*(-a*d+b*c)^3*exp(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^8+1/24*b^4*(-a*d+b*c)^4*ex
p(-a+b*c/d)*Ei(-b*(d*x+c)/d)/d^9
```

Rubi [A] (verified)

Time = 0.44 (sec) , antiderivative size = 557, normalized size of antiderivative = 1.00, number of steps used = 17, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.120$, Rules used = {2230, 2208, 2209}

$$\begin{aligned}\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = {} & \frac{b^4(bc-ad)^4e^{\frac{bc}{d}-a}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{24d^9} \\ & +\frac{2b^4(bc-ad)^3e^{\frac{bc}{d}-a}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{3d^8} \\ & +\frac{3b^4(bc-ad)^2e^{\frac{bc}{d}-a}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^7} \\ & +\frac{4b^4(bc-ad)e^{\frac{bc}{d}-a}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^6} \\ & +\frac{b^4e^{\frac{bc}{d}-a}\,\text{ExpIntegralEi}\left(-\frac{b(c+dx)}{d}\right)}{d^5}+\frac{b^3e^{-a-bx}(bc-ad)^4}{24d^8(c+dx)} \\ & +\frac{2b^3e^{-a-bx}(bc-ad)^3}{3d^7(c+dx)}+\frac{3b^3e^{-a-bx}(bc-ad)^2}{d^6(c+dx)}+\frac{4b^3e^{-a-bx}(bc-ad)}{d^5(c+dx)} \\ & -\frac{b^2e^{-a-bx}(bc-ad)^4}{24d^7(c+dx)^2}-\frac{2b^2e^{-a-bx}(bc-ad)^3}{3d^6(c+dx)^2}-\frac{3b^2e^{-a-bx}(bc-ad)^2}{d^5(c+dx)^2} \\ & +\frac{be^{-a-bx}(bc-ad)^4}{12d^6(c+dx)^3}+\frac{4be^{-a-bx}(bc-ad)^3}{3d^5(c+dx)^3}-\frac{e^{-a-bx}(bc-ad)^4}{4d^5(c+dx)^4}\end{aligned}$$

```
[In] Int[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^5,x]
```

```
[Out] -1/4*((b*c - a*d)^4*E^(-a - b*x))/(d^5*(c + d*x)^4) + (4*b*(b*c - a*d)^3*E^
(-a - b*x))/(3*d^5*(c + d*x)^3) + (b*(b*c - a*d)^4*E^(-a - b*x))/(12*d^6*(c
 + d*x)^3) - (3*b^2*(b*c - a*d)^2*E^(-a - b*x))/(d^5*(c + d*x)^2) - (2*b^2*
(b*c - a*d)^3*E^(-a - b*x))/(3*d^6*(c + d*x)^2) - (b^2*(b*c - a*d)^4*E^(-a
- b*x))/(24*d^7*(c + d*x)^2) + (4*b^3*(b*c - a*d)*E^(-a - b*x))/(d^5*(c + d
*x)) + (3*b^3*(b*c - a*d)^2*E^(-a - b*x))/(d^6*(c + d*x)) + (2*b^3*(b*c - a
*d)^3*E^(-a - b*x))/(3*d^7*(c + d*x)) + (b^3*(b*c - a*d)^4*E^(-a - b*x))/(2
4*d^8*(c + d*x)) + (b^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)])
/d^5 + (4*b^4*(b*c - a*d)*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)
])/d^6 + (3*b^4*(b*c - a*d)^2*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c + d*x)
)/d)])/d^7 + (2*b^4*(b*c - a*d)^3*E^(-a + (b*c)/d)*ExpIntegralEi[-((b*(c +
```

```
d*x))/d)])/(3*d^8) + (b^4*(b*c - a*d)^4*E^(-a + (b*c)/d)*ExpIntegralEi[-((b
*(c + d*x))/d)])/(24*d^9)
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2230

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> Int[ExpandIntegrand[F^(
c*ExpandToSum[v, x]), w*NormalizePowerOfLinear[u, x]^m, x], x] /; FreeQ[{F,
 c}, x] && PolynomialQ[w, x] && LinearQ[v, x] && PowerOfLinearQ[u, x] && In
tegerQ[m] &&  !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(\frac{(-bc+ad)^4e^{-a-bx}}{d^4(c+dx)^5} - \frac{4b(bc-ad)^3e^{-a-bx}}{d^4(c+dx)^4} + \frac{6b^2(bc-ad)^2e^{-a-bx}}{d^4(c+dx)^3} - \frac{4b^3(bc-ad)e^{-a-bx}}{d^4(c+dx)^2} + \frac{b^4e^{-a-bx}}{d^4(c+dx)}\right)dx \\
&= \frac{b^4\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^4} - \frac{\left(4b^3(bc-ad)\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^4} + \frac{\left(6b^2(bc-ad)^2\right)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{d^4} \\
&\quad - \frac{\left(4b(bc-ad)^3\right)\int \frac{e^{-a-bx}}{(c+dx)^4}\,dx}{d^4} + \frac{(bc-ad)^4\int \frac{e^{-a-bx}}{(c+dx)^5}\,dx}{d^4} \\
&= -\frac{(bc-ad)^4e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3e^{-a-bx}}{3d^5(c+dx)^3} - \frac{3b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)^2} \\
&\quad + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} + \frac{b^4e^{-a+\frac{bc}{d}}\text{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} \\
&\quad + \frac{\left(4b^4(bc-ad)\right)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^5} - \frac{\left(3b^3(bc-ad)^2\right)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{d^5} \\
&\quad + \frac{\left(4b^2(bc-ad)^3\right)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{3d^5} - \frac{\left(b(bc-ad)^4\right)\int \frac{e^{-a-bx}}{(c+dx)^4}\,dx}{4d^5}
\end{aligned}$$

$$
\begin{aligned}
&= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} \\
&\quad - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad)^3 e^{-a-bx}}{3d^6(c+dx)^2} + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} \\
&\quad + \frac{3b^3(bc-ad)^2 e^{-a-bx}}{d^6(c+dx)} + \frac{b^4 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} \\
&\quad + \frac{4b^4(bc-ad)e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{(3b^4(bc-ad)^2)\int \frac{e^{-a-bx}}{c+dx}\,dx}{d^6} \\
&\quad - \frac{(2b^3(bc-ad)^3)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{3d^6} + \frac{(b^2(bc-ad)^4)\int \frac{e^{-a-bx}}{(c+dx)^3}\,dx}{12d^6} \\
&= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} \\
&\quad - \frac{2b^2(bc-ad)^3 e^{-a-bx}}{3d^6(c+dx)^2} - \frac{b^2(bc-ad)^4 e^{-a-bx}}{24d^7(c+dx)^2} + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} \\
&\quad + \frac{3b^3(bc-ad)^2 e^{-a-bx}}{d^6(c+dx)} + \frac{2b^3(bc-ad)^3 e^{-a-bx}}{3d^7(c+dx)} + \frac{b^4 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} \\
&\quad + \frac{4b^4(bc-ad)e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{3b^4(bc-ad)^2 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7} \\
&\quad + \frac{(2b^4(bc-ad)^3)\int \frac{e^{-a-bx}}{c+dx}\,dx}{3d^7} - \frac{(b^3(bc-ad)^4)\int \frac{e^{-a-bx}}{(c+dx)^2}\,dx}{24d^7} \\
&= -\frac{(bc-ad)^4 e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3 e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4 e^{-a-bx}}{12d^6(c+dx)^3} \\
&\quad - \frac{3b^2(bc-ad)^2 e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad)^3 e^{-a-bx}}{3d^6(c+dx)^2} - \frac{b^2(bc-ad)^4 e^{-a-bx}}{24d^7(c+dx)^2} \\
&\quad + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} + \frac{3b^3(bc-ad)^2 e^{-a-bx}}{d^6(c+dx)} + \frac{2b^3(bc-ad)^3 e^{-a-bx}}{3d^7(c+dx)} \\
&\quad + \frac{b^3(bc-ad)^4 e^{-a-bx}}{24d^8(c+dx)} + \frac{b^4 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} \\
&\quad + \frac{4b^4(bc-ad)e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{3b^4(bc-ad)^2 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7} \\
&\quad + \frac{2b^4(bc-ad)^3 e^{-a+\frac{bc}{d}} \operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{3d^8} + \frac{(b^4(bc-ad)^4)\int \frac{e^{-a-bx}}{c+dx}\,dx}{24d^8}
\end{aligned}
$$

$$
\begin{aligned}
&= -\frac{(bc-ad)^4e^{-a-bx}}{4d^5(c+dx)^4} + \frac{4b(bc-ad)^3e^{-a-bx}}{3d^5(c+dx)^3} + \frac{b(bc-ad)^4e^{-a-bx}}{12d^6(c+dx)^3} \\
&\quad - \frac{3b^2(bc-ad)^2e^{-a-bx}}{d^5(c+dx)^2} - \frac{2b^2(bc-ad)^3e^{-a-bx}}{3d^6(c+dx)^2} - \frac{b^2(bc-ad)^4e^{-a-bx}}{24d^7(c+dx)^2} \\
&\quad + \frac{4b^3(bc-ad)e^{-a-bx}}{d^5(c+dx)} + \frac{3b^3(bc-ad)^2e^{-a-bx}}{d^6(c+dx)} + \frac{2b^3(bc-ad)^3e^{-a-bx}}{3d^7(c+dx)} \\
&\quad + \frac{b^3(bc-ad)^4e^{-a-bx}}{24d^8(c+dx)} + \frac{b^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^5} \\
&\quad + \frac{4b^4(bc-ad)e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^6} + \frac{3b^4(bc-ad)^2e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{d^7} \\
&\quad + \frac{2b^4(bc-ad)^3e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{3d^8} + \frac{b^4(bc-ad)^4e^{-a+\frac{bc}{d}}\operatorname{Ei}\left(-\frac{b(c+dx)}{d}\right)}{24d^9}
\end{aligned}
$$

Mathematica [A] (verified)

Time = 2.30 (sec) , antiderivative size = 669, normalized size of antiderivative = 1.20

$$
\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx
= \frac{e^{-a}\left(\frac{de^{-bx}(-6d^3(bc-ad)^4+2bd^2(bc-(-16+a)d)(bc-ad)^3(c+dx)-b^2d(bc-ad)^2(b^2c^2-2(-8+a)bcd+(72-16a+a^2)d^2)(c+dx)^2+b^3(b^4c^4-4(-}{(c+dx)^4}\right.}{}
$$

```
[In] Integrate[(E^(-a - b*x)*(a + b*x)^4)/(c + d*x)^5,x]
```

```
[Out] ((d*(-6*d^3*(b*c - a*d)^4 + 2*b*d^2*(b*c - (-16 + a)*d)*(b*c - a*d)^3*(c +
d*x) - b^2*d*(b*c - a*d)^2*(b^2*c^2 - 2*(-8 + a)*b*c*d + (72 - 16*a + a^2)*
d^2)*(c + d*x)^2 + b^3*(b^4*c^4 - 4*(-4 + a)*b^3*c^3*d + 6*(12 - 8*a + a^2)
*b^2*c^2*d^2 - 4*(-24 + 36*a - 12*a^2 + a^3)*b*c*d^3 + a*(-96 + 72*a - 16*a
^2 + a^3)*d^4)*(c + d*x)^3))/(E^(b*x)*(c + d*x)^4) + b^8*c^4*E^((b*c)/d)*Ex
pIntegralEi[-((b*(c + d*x))/d)] + 16*b^7*c^3*d*E^((b*c)/d)*ExpIntegralEi[-(
(b*(c + d*x))/d)] - 4*a*b^7*c^3*d*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))
/d)] + 72*b^6*c^2*d^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] - 48*a*
b^6*c^2*d^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 6*a^2*b^6*c^2*d
^2*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 96*b^5*c*d^3*E^((b*c)/d)
*ExpIntegralEi[-((b*(c + d*x))/d)] - 144*a*b^5*c*d^3*E^((b*c)/d)*ExpIntegra
lEi[-((b*(c + d*x))/d)] + 48*a^2*b^5*c*d^3*E^((b*c)/d)*ExpIntegralEi[-((b*(
c + d*x))/d)] - 4*a^3*b^5*c*d^3*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d
)] + 24*b^4*d^4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] - 96*a*b^4*d^
4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d*x))/d)] + 72*a^2*b^4*d^4*E^((b*c)/d
)*ExpIntegralEi[-((b*(c + d*x))/d)] - 16*a^3*b^4*d^4*E^((b*c)/d)*ExpIntegra
lEi[-((b*(c + d*x))/d)] + a^4*b^4*d^4*E^((b*c)/d)*ExpIntegralEi[-((b*(c + d
*x))/d)])/(24*d^9*E^a)
```

Maple [A] (verified)

Time = 0.27 (sec) , antiderivative size = 596, normalized size of antiderivative = 1.07

method	result
derivativedivides	$-\frac{-\frac{(ad-cb)^4 b^5\left(-\frac{e^{-bx-a}}{4\left(-bx-a+\frac{ad-cb}{d}\right)^4}-\frac{e^{-bx-a}}{12\left(-bx-a+\frac{ad-cb}{d}\right)^3}-\frac{e^{-bx-a}}{24\left(-bx-a+\frac{ad-cb}{d}\right)^2}-\frac{e^{-bx-a}}{24\left(-bx-a+\frac{ad-cb}{d}\right)}-\frac{e^{-\frac{ad-cb}{d}}\,\mathrm{Ei}_1\left(bx-\right.}{24}\right.}{d^9}}{}$
default	$-\frac{-\frac{(ad-cb)^4 b^5\left(-\frac{e^{-bx-a}}{4\left(-bx-a+\frac{ad-cb}{d}\right)^4}-\frac{e^{-bx-a}}{12\left(-bx-a+\frac{ad-cb}{d}\right)^3}-\frac{e^{-bx-a}}{24\left(-bx-a+\frac{ad-cb}{d}\right)^2}-\frac{e^{-bx-a}}{24\left(-bx-a+\frac{ad-cb}{d}\right)}-\frac{e^{-\frac{ad-cb}{d}}\,\mathrm{Ei}_1\left(bx-\right.}{24}\right.}{d^9}}{}$
risch	Expression too large to display

```
[In] int(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x,method=_RETURNVERBOSE)
```

```
[Out] -1/b*(-(a*d-b*c)^4/d^9*b^5*(-1/4*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^4-1/12*ex
p(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^3-1/24*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/
24*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/24*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-
b*c)/d))+4*(a*d-b*c)^3/d^8*b^5*(-1/3*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^3-1/6
*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/6*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)-1/
6*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+4*(a*d-b*c)/d^6*b^5*(-exp(-b*x
-a)/(-b*x-a+(a*d-b*c)/d)-exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))-6*(a*d-
b*c)^2/d^7*b^5*(-1/2*exp(-b*x-a)/(-b*x-a+(a*d-b*c)/d)^2-1/2*exp(-b*x-a)/(-b
*x-a+(a*d-b*c)/d)-1/2*exp(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))+b^5/d^5*ex
p(-(a*d-b*c)/d)*Ei(1,b*x+a-(a*d-b*c)/d))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1084 vs. $2(524) = 1048$.

Time = 0.28 (sec) , antiderivative size = 1084, normalized size of antiderivative = 1.95

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \text{Too large to display}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="fricas")
```

```
[Out] 1/24*((b^8*c^8 - 4*(a - 4)*b^7*c^7*d + 6*(a^2 - 8*a + 12)*b^6*c^6*d^2 - 4*(
a^3 - 12*a^2 + 36*a - 24)*b^5*c^5*d^3 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)
*b^4*c^4*d^4 + (b^8*c^4*d^4 - 4*(a - 4)*b^7*c^3*d^5 + 6*(a^2 - 8*a + 12)*b^
6*c^2*d^6 - 4*(a^3 - 12*a^2 + 36*a - 24)*b^5*c*d^7 + (a^4 - 16*a^3 + 72*a^2
 - 96*a + 24)*b^4*d^8)*x^4 + 4*(b^8*c^5*d^3 - 4*(a - 4)*b^7*c^4*d^4 + 6*(a^
2 - 8*a + 12)*b^6*c^3*d^5 - 4*(a^3 - 12*a^2 + 36*a - 24)*b^5*c^2*d^6 + (a^4
 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4*c*d^7)*x^3 + 6*(b^8*c^6*d^2 - 4*(a - 4)
*b^7*c^5*d^3 + 6*(a^2 - 8*a + 12)*b^6*c^4*d^4 - 4*(a^3 - 12*a^2 + 36*a - 24
```

```
)*b^5*c^3*d^5 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4*c^2*d^6)*x^2 + 4*(b
^8*c^7*d - 4*(a - 4)*b^7*c^6*d^2 + 6*(a^2 - 8*a + 12)*b^6*c^5*d^3 - 4*(a^3
- 12*a^2 + 36*a - 24)*b^5*c^4*d^4 + (a^4 - 16*a^3 + 72*a^2 - 96*a + 24)*b^4
*c^3*d^5)*x)*Ei(-(b*d*x + b*c)/d)*e^((b*c - a*d)/d) + (b^7*c^7*d - (4*a - 1
5)*b^6*c^6*d^2 + 2*(3*a^2 - 22*a + 29)*b^5*c^5*d^3 - 2*(2*a^3 - 21*a^2 + 52
*a - 25)*b^4*c^4*d^4 + (a^4 - 12*a^3 + 36*a^2 - 24*a)*b^3*c^3*d^5 - 6*a^4*d
^8 - (a^4 - 8*a^3 + 12*a^2)*b^2*c^2*d^6 + 2*(a^4 - 4*a^3)*b*c*d^7 + (b^7*c^
4*d^4 - 4*(a - 4)*b^6*c^3*d^5 + 6*(a^2 - 8*a + 12)*b^5*c^2*d^6 - 4*(a^3 - 1
2*a^2 + 36*a - 24)*b^4*c*d^7 + (a^4 - 16*a^3 + 72*a^2 - 96*a)*b^3*d^8)*x^3
+ (3*b^7*c^5*d^3 - (12*a - 47)*b^6*c^4*d^4 + 2*(9*a^2 - 70*a + 100)*b^5*c^3
*d^5 - 6*(2*a^3 - 23*a^2 + 64*a - 36)*b^4*c^2*d^6 + (3*a^4 - 44*a^3 + 168*a
^2 - 144*a)*b^3*c*d^7 - (a^4 - 16*a^3 + 72*a^2)*b^2*d^8)*x^2 + (3*b^7*c^6*d
^2 - 2*(6*a - 23)*b^6*c^5*d^3 + 2*(9*a^2 - 68*a + 93)*b^5*c^4*d^4 - 4*(3*a^
3 - 33*a^2 + 86*a - 44)*b^4*c^3*d^5 + (3*a^4 - 40*a^3 + 132*a^2 - 96*a)*b^3
*c^2*d^6 - 2*(a^4 - 12*a^3 + 24*a^2)*b^2*c*d^7 + 2*(a^4 - 16*a^3)*b*d^8)*x)
*e^(-b*x - a))/(d^13*x^4 + 4*c*d^12*x^3 + 6*c^2*d^11*x^2 + 4*c^3*d^10*x + c
^4*d^9)
```

Sympy [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \left(\int \frac{a^4}{c^5e^{bx}+5c^4dxe^{bx}+10c^3d^2x^2e^{bx}+10c^2d^3x^3e^{bx}+5cd^4x^4e^{bx}+d^5x^5e^{bx}}\,dx + \int \frac{b^4x^4}{c^5e^{bx}+5c^4dxe^{bx}+10c^3d^2x^2e^{bx}+10c^2d^3x^3e^{bx}+5cd^4x^4e^{bx}+d^5x^5e^{bx}}\,dx + \int \frac{4ab^3x^3}{c^5e^{bx}+5c^4dxe^{bx}+10c^3d^2x^2e^{bx}+10c^2d^3x^3e^{bx}+5cd^4x^4e^{bx}+d^5x^5e^{bx}}\,dx + \int \frac{6a^2b^2x^2}{c^5e^{bx}+5c^4dxe^{bx}+10c^3d^2x^2e^{bx}+10c^2d^3x^3e^{bx}+5cd^4x^4e^{bx}+d^5x^5e^{bx}}\,dx + \int \frac{4a^3bx}{c^5e^{bx}+5c^4dxe^{bx}+10c^3d^2x^2e^{bx}+10c^2d^3x^3e^{bx}+5cd^4x^4e^{bx}+d^5x^5e^{bx}}\,dx\right)e^{-a}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)**4/(d*x+c)**5,x)
```

```
[Out] (Integral(a**4/(c**5*exp(b*x) + 5*c**4*d*x*exp(b*x) + 10*c**3*d**2*x**2*exp
(b*x) + 10*c**2*d**3*x**3*exp(b*x) + 5*c*d**4*x**4*exp(b*x) + d**5*x**5*exp
(b*x)), x) + Integral(b**4*x**4/(c**5*exp(b*x) + 5*c**4*d*x*exp(b*x) + 10*c
**3*d**2*x**2*exp(b*x) + 10*c**2*d**3*x**3*exp(b*x) + 5*c*d**4*x**4*exp(b*x
) + d**5*x**5*exp(b*x)), x) + Integral(4*a*b**3*x**3/(c**5*exp(b*x) + 5*c**
4*d*x*exp(b*x) + 10*c**3*d**2*x**2*exp(b*x) + 10*c**2*d**3*x**3*exp(b*x) +
5*c*d**4*x**4*exp(b*x) + d**5*x**5*exp(b*x)), x) + Integral(6*a**2*b**2*x**
2/(c**5*exp(b*x) + 5*c**4*d*x*exp(b*x) + 10*c**3*d**2*x**2*exp(b*x) + 10*c*
```

```
*2*d**3*x**3*exp(b*x) + 5*c*d**4*x**4*exp(b*x) + d**5*x**5*exp(b*x)), x) +
Integral(4*a**3*b*x/(c**5*exp(b*x) + 5*c**4*d*x*exp(b*x) + 10*c**3*d**2*x**
2*exp(b*x) + 10*c**2*d**3*x**3*exp(b*x) + 5*c*d**4*x**4*exp(b*x) + d**5*x**
5*exp(b*x)), x))*exp(-a)
```

Maxima [F]

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \int \frac{(bx+a)^4e^{(-bx-a)}}{(dx+c)^5}\,dx$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="maxima")
```

```
[Out] -(b^3*d^2*x^4 + (4*a*b^2*d^2 - b^2*d^2)*x^3 + (6*a^2*b*d^2 + 5*b^2*c*d - 8*
a*b*d^2 + 2*b*d^2)*x^2 + (4*a^3*d^2 - 5*b^2*c^2 - 18*a^2*d^2 - 20*b*c*d + 4
*(5*b*c*d + 6*d^2)*a - 6*d^2)*x)*e^(-b*x)/(d^7*x^5*e^a + 5*c*d^6*x^4*e^a +
10*c^2*d^5*x^3*e^a + 10*c^3*d^4*x^2*e^a + 5*c^4*d^3*x*e^a + c^5*d^2*e^a) -
a^4*e^(-a + b*c/d)*exp_integral_e(5, (d*x + c)*b/d)/((d*x + c)^4*d) - integ
rate(-(4*a^3*c*d^2 - 5*b^2*c^3 - 18*a^2*c*d^2 - 20*b*c^2*d - 6*c*d^2 + 4*(5
*b*c^2*d + 6*c*d^2)*a + (5*b^3*c^3 - 16*a^3*d^3 + 50*b^2*c^2*d + 90*b*c*d^2
 + 6*(5*b*c*d^2 + 12*d^3)*a^2 + 24*d^3 - 4*(5*b^2*c^2*d + 30*b*c*d^2 + 24*d
^3)*a)*x)*e^(-b*x)/(d^8*x^6*e^a + 6*c*d^7*x^5*e^a + 15*c^2*d^6*x^4*e^a + 20
*c^3*d^5*x^3*e^a + 15*c^4*d^4*x^2*e^a + 6*c^5*d^3*x*e^a + c^6*d^2*e^a), x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16988 vs. $2(524) = 1048$.

Time = 0.48 (sec) , antiderivative size = 16988, normalized size of antiderivative = 30.50

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \text{Too large to display}$$

```
[In] integrate(exp(-b*x-a)*(b*x+a)^4/(d*x+c)^5,x, algorithm="giac")
```

```
[Out] 1/24*((d*x + c)^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^9*c^4*Ei(-((d*x +
 c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
 4*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^10*c^5*Ei(-((d*x + c
)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 6
*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^11*c^6*Ei(-((d*x + c)*
(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 4*(
d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^12*c^7*Ei(-((d*x + c)*(b - b
*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + b^13*c^8*
Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c
- a*d)/d) - 4*(d*x + c)^4*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^8*c^3*d
```

*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c
 - a*d)/d) - 20*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^9*c^4
*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b
*c - a*d)/d) - 36*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^10*
c^5*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^
((b*c - a*d)/d) - 28*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^11*c
^6*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^(
(b*c - a*d)/d) - 8*a*b^12*c^7*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*
x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 6*(d*x + c)^4*a^2*(b - b*c/(d*x
 + c) + a*d/(d*x + c))^4*b^7*c^2*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 40*(d*x + c)^3*a^2*(b - b*
c/(d*x + c) + a*d/(d*x + c))^3*b^8*c^3*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c
) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 90*(d*x + c)^2*a^2*(
b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^9*c^4*d^2*Ei(-((d*x + c)*(b - b*c/(d
*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 84*(d*x + c)*a
^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^10*c^5*d^2*Ei(-((d*x + c)*(b - b*c
/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 28*a^2*b^11
*c^6*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)
*e^((b*c - a*d)/d) - 4*(d*x + c)^4*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^
4*b^6*c*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)
/d)*e^((b*c - a*d)/d) - 40*(d*x + c)^3*a^3*(b - b*c/(d*x + c) + a*d/(d*x +
c))^3*b^7*c^2*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c
- a*d)/d)*e^((b*c - a*d)/d) - 120*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/
(d*x + c))^2*b^8*c^3*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))
 + b*c - a*d)/d)*e^((b*c - a*d)/d) - 140*(d*x + c)*a^3*(b - b*c/(d*x + c) +
 a*d/(d*x + c))*b^9*c^4*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x +
c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 56*a^3*b^10*c^5*d^3*Ei(-((d*x + c)*
(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + (d*
x + c)^4*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^5*d^4*Ei(-((d*x + c)*(
b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 20*(
d*x + c)^3*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*Ei(-((d*x +
c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
90*(d*x + c)^2*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*Ei(-((
d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)
/d) + 140*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*Ei(
-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a
*d)/d) + 70*a^4*b^9*c^4*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x +
c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 4*(d*x + c)^3*a^5*(b - b*c/(d*x + c
) + a*d/(d*x + c))^3*b^5*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x +
 c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 36*(d*x + c)^2*a^5*(b - b*c/(d*x +
 c) + a*d/(d*x + c))^2*b^6*c*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d
*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 84*(d*x + c)*a^5*(b - b*c/(d*x
 + c) + a*d/(d*x + c))*b^7*c^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/
(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 56*a^5*b^8*c^3*d^5*Ei(-((d*x
 + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d)

+ 6*(d*x + c)^2*a^6*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 28*(d*x + c)*a^6*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 28*a^6*b^7*c^2*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 4*(d*x + c)*a^7*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 8*a^7*b^6*c*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + a^8*b^5*d^8*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 16*(d*x + c)^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^8*c^3*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 64*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^9*c^4*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 96*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^10*c^5*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 64*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^11*c^6*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 16*b^12*c^7*d*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 48*(d*x + c)^4*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^7*c^2*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 256*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^8*c^3*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 480*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^9*c^4*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 384*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^10*c^5*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 112*a*b^11*c^6*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 48*(d*x + c)^4*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^6*c*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 384*(d*x + c)^3*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 960*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^8*c^3*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 960*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^4*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 336*a^2*b^10*c^5*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 16*(d*x + c)^4*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^5*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 256*(d*x + c)^3*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 960*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 12

80*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 560*a^3*b^9*c^4*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 64*(d*x + c)^3*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^5*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 480*(d*x + c)^2*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^6*c*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 960*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^7*c^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 560*a^4*b^8*c^3*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 96*(d*x + c)^2*a^5*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 384*(d*x + c)*a^5*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 336*a^5*b^7*c^2*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 64*(d*x + c)*a^6*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 112*a^6*b^6*c*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 16*a^7*b^5*d^8*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + (d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^9*c^4*d*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 3*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^10*c^5*d*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 3*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^11*c^6*d*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + b^12*c^7*d*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 4*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^8*c^3*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 15*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^9*c^4*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 18*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^10*c^5*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 7*a*b^11*c^6*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 6*(d*x + c)^3*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 30*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^8*c^3*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 45*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^4*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 21*a^2*b^10*c^5*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 4*(d*x + c)^3*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 30*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 60*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 35*a^3*b^9*c^4*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + (d*x + c)^3*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^

5*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 15*(d*x + c)^2
a^4(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^6*c*d^5*e^(-(d*x + c)*(b - b*c
/(d*x + c) + a*d/(d*x + c))/d) + 45*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/
(d*x + c))*b^7*c^2*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d)
 + 35*a^4*b^8*c^3*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d)
 - 3*(d*x + c)^2*a^5*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*e^(-(d*x
 + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 18*(d*x + c)*a^5*(b - b*c/(d*
x + c) + a*d/(d*x + c))*b^6*c*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d
*x + c))/d) - 21*a^5*b^7*c^2*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*
x + c))/d) + 3*(d*x + c)*a^6*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d^7*e^
(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 7*a^6*b^6*c*d^7*e^(-(d
x + c)(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - a^7*b^5*d^8*e^(-(d*x + c)*
(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 72*(d*x + c)^4*(b - b*c/(d*x + c)
 + a*d/(d*x + c))^4*b^7*c^2*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 288*(d*x + c)^3*(b - b*c/(d*x +
c) + a*d/(d*x + c))^3*b^8*c^3*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(
d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 432*(d*x + c)^2*(b - b*c/(d*x
 + c) + a*d/(d*x + c))^2*b^9*c^4*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 288*(d*x + c)*(b - b*c/(d*
x + c) + a*d/(d*x + c))*b^10*c^5*d^2*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 72*b^11*c^6*d^2*Ei(-((d*x
 + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d)
 - 144*(d*x + c)^4*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^6*c*d^3*Ei(-((d
x + c)(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/
d) - 864*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3*Ei
(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c -
a*d)/d) - 1728*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^8*c^3*
d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((
b*c - a*d)/d) - 1440*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^
4*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^
((b*c - a*d)/d) - 432*a*b^10*c^5*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 72*(d*x + c)^4*a^2*(b - b*
c/(d*x + c) + a*d/(d*x + c))^4*b^5*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) +
a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 864*(d*x + c)^3*a^2*(b -
 b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*Ei(-((d*x + c)*(b - b*c/(d*x +
c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 2592*(d*x + c)^2*a^
2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*Ei(-((d*x + c)*(b - b*c
/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 2880*(d*x +
 c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*Ei(-((d*x + c)*(b -
 b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 1080*a^
2*b^9*c^4*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*
d)/d)*e^((b*c - a*d)/d) - 288*(d*x + c)^3*a^3*(b - b*c/(d*x + c) + a*d/(d*x
 + c))^3*b^5*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c -
 a*d)/d)*e^((b*c - a*d)/d) - 1728*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/
(d*x + c))^2*b^6*c*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) +

b*c - a*d)/d)*e^((b*c - a*d)/d) - 2880*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^7*c^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 1440*a^3*b^8*c^3*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 432*(d*x + c)^2*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 1440*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 1080*a^4*b^7*c^2*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 288*(d*x + c)*a^5*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 432*a^5*b^6*c*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 72*a^6*b^5*d^8*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 16*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^8*c^3*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 47*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^9*c^4*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 46*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^10*c^5*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 15*b^11*c^6*d^2*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 48*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 188*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^8*c^3*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 230*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^4*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 90*a*b^10*c^5*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 48*(d*x + c)^3*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 282*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 460*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 225*a^2*b^9*c^4*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 16*(d*x + c)^3*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^5*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 188*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^6*c*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 460*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^7*c^2*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 300*a^3*b^8*c^3*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 47*(d*x + c)^2*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 230*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 225*a^4*b^7*c^2*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 46*(d*x + c)*a^5*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 90*a^5*b^6*c*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 15*a^6*b^5*d^8*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x +

c))/d) + 96*(d*x + c)^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^6*c*d^3*Ei
(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c -
a*d)/d) + 384*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3
*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c
 - a*d)/d) + 576*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^8*c^3*
d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((
b*c - a*d)/d) + 384*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^4*d
^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b
*c - a*d)/d) + 96*b^10*c^5*d^3*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 96*(d*x + c)^4*a*(b - b*c/(d*x +
 c) + a*d/(d*x + c))^4*b^5*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x
 + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 768*(d*x + c)^3*a*(b - b*c/(d*x
+ c) + a*d/(d*x + c))^3*b^6*c*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(
d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 1728*(d*x + c)^2*a*(b - b*c/(
d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) +
 a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 1536*(d*x + c)*a*(b - b
*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c)
 + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 480*a*b^9*c^4*d^4*Ei(
-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a
d)/d) + 384(d*x + c)^3*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^5*d^5*
Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c
- a*d)/d) + 1728*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^6*
c*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^
((b*c - a*d)/d) + 2304*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^
7*c^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d
)*e^((b*c - a*d)/d) + 960*a^2*b^8*c^3*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c)
 + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 576*(d*x + c)^2*a^3*(
b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*Ei(-((d*x + c)*(b - b*c/(d*x +
 c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 1536*(d*x + c)*a^3
*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*Ei(-((d*x + c)*(b - b*c/(d*x
 + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 960*a^3*b^7*c^2*
d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((
b*c - a*d)/d) + 384*(d*x + c)*a^4*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^5*d
^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b
*c - a*d)/d) + 480*a^4*b^6*c*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d
*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) - 96*a^5*b^5*d^8*Ei(-((d*x + c)*
(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 72*
(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^7*c^2*d^3*e^(-(d*x + c)
*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 200*(d*x + c)^2*(b - b*c/(d*x + c
) + a*d/(d*x + c))^2*b^8*c^3*d^3*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*
x + c))/d) + 186*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^9*c^4*d^3*
e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 58*b^10*c^5*d^3*e^(-
(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 144*(d*x + c)^3*a*(b - b
*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c)
+ a*d/(d*x + c))/d) - 600*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))

^2*b^7*c^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 744*(
d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*e^(-(d*x + c)*(b
 - b*c/(d*x + c) + a*d/(d*x + c))/d) - 290*a*b^9*c^4*d^4*e^(-(d*x + c)*(b -
 b*c/(d*x + c) + a*d/(d*x + c))/d) + 72*(d*x + c)^3*a^2*(b - b*c/(d*x + c)
+ a*d/(d*x + c))^3*b^5*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)
)/d) + 600*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^6*c*d^5*
e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 1116*(d*x + c)*a^2*(
b - b*c/(d*x + c) + a*d/(d*x + c))*b^7*c^2*d^5*e^(-(d*x + c)*(b - b*c/(d*x
+ c) + a*d/(d*x + c))/d) + 580*a^2*b^8*c^3*d^5*e^(-(d*x + c)*(b - b*c/(d*x
+ c) + a*d/(d*x + c))/d) - 200*(d*x + c)^2*a^3*(b - b*c/(d*x + c) + a*d/(d*
x + c))^2*b^5*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 74
4*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*e^(-(d*x + c)
*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 580*a^3*b^7*c^2*d^6*e^(-(d*x + c)
*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 186*(d*x + c)*a^4*(b - b*c/(d*x +
 c) + a*d/(d*x + c))*b^5*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x +
c))/d) + 290*a^4*b^6*c*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)
)/d) - 58*a^5*b^5*d^8*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d)
+ 24*(d*x + c)^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*b^5*d^4*Ei(-((d*x +
c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
96*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*Ei(-((d*x +
c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
144*(d*x + c)^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^7*c^2*d^4*Ei(-((d*x
 + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d)
 + 96*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^4*Ei(-((d*x +
 c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
 24*b^9*c^4*d^4*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c -
a*d)/d)*e^((b*c - a*d)/d) - 96*(d*x + c)^3*a*(b - b*c/(d*x + c) + a*d/(d*x
+ c))^3*b^5*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c -
a*d)/d)*e^((b*c - a*d)/d) - 288*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x
 + c))^2*b^6*c*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c
 - a*d)/d)*e^((b*c - a*d)/d) - 288*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*
x + c))*b^7*c^2*d^5*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*
c - a*d)/d)*e^((b*c - a*d)/d) - 96*a*b^8*c^3*d^5*Ei(-((d*x + c)*(b - b*c/(d
*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 144*(d*x + c)^
2*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))^2*b^5*d^6*Ei(-((d*x + c)*(b - b*c
/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 288*(d*x +
c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*Ei(-((d*x + c)*(b - b*
c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 144*a^2*b^
7*c^2*d^6*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d
)*e^((b*c - a*d)/d) - 96*(d*x + c)*a^3*(b - b*c/(d*x + c) + a*d/(d*x + c))*
b^5*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*
e^((b*c - a*d)/d) - 96*a^3*b^6*c*d^7*Ei(-((d*x + c)*(b - b*c/(d*x + c) + a*
d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) + 24*a^4*b^5*d^8*Ei(-((d*x +
 c)*(b - b*c/(d*x + c) + a*d/(d*x + c)) + b*c - a*d)/d)*e^((b*c - a*d)/d) +
 96*(d*x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b^6*c*d^4*e^(-(d*x +

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c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 216*(d*x + c)^2*(b - b*c/(d*x +
 c) + a*d/(d*x + c))^2*b^7*c^2*d^4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(
d*x + c))/d) + 176*(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^8*c^3*d^
4*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 50*b^9*c^4*d^4*e^(
-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 96*(d*x + c)^3*a*(b - b
*c/(d*x + c) + a*d/(d*x + c))^3*b^5*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) +
a*d/(d*x + c))/d) - 432*(d*x + c)^2*a*(b - b*c/(d*x + c) + a*d/(d*x + c))^2
*b^6*c*d^5*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 528*(d*x
+ c)*a*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^7*c^2*d^5*e^(-(d*x + c)*(b - b
*c/(d*x + c) + a*d/(d*x + c))/d) - 200*a*b^8*c^3*d^5*e^(-(d*x + c)*(b - b*c
/(d*x + c) + a*d/(d*x + c))/d) + 216*(d*x + c)^2*a^2*(b - b*c/(d*x + c) + a
*d/(d*x + c))^2*b^5*d^6*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d
) + 528*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x + c))*b^6*c*d^6*e^(-(d*
x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) + 300*a^2*b^7*c^2*d^6*e^(-(d*
x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c))/d) - 176*(d*x + c)*a^3*(b - b*c/
(d*x + c) + a*d/(d*x + c))*b^5*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(
d*x + c))/d) - 200*a^3*b^6*c*d^7*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*
x + c))/d) + 50*a^4*b^5*d^8*e^(-(d*x + c)*(b - b*c/(d*x + c) + a*d/(d*x + c
))/d))*d^2/(((d*x + c)^4*(b - b*c/(d*x + c) + a*d/(d*x + c))^4*d^11 + 4*(d*
x + c)^3*(b - b*c/(d*x + c) + a*d/(d*x + c))^3*b*c*d^11 + 6*(d*x + c)^2*(b
- b*c/(d*x + c) + a*d/(d*x + c))^2*b^2*c^2*d^11 + 4*(d*x + c)*(b - b*c/(d*x
 + c) + a*d/(d*x + c))*b^3*c^3*d^11 + b^4*c^4*d^11 - 4*(d*x + c)^3*a*(b - b
*c/(d*x + c) + a*d/(d*x + c))^3*d^12 - 12*(d*x + c)^2*a*(b - b*c/(d*x + c)
+ a*d/(d*x + c))^2*b*c*d^12 - 12*(d*x + c)*a*(b - b*c/(d*x + c) + a*d/(d*x
+ c))*b^2*c^2*d^12 - 4*a*b^3*c^3*d^12 + 6*(d*x + c)^2*a^2*(b - b*c/(d*x + c
) + a*d/(d*x + c))^2*d^13 + 12*(d*x + c)*a^2*(b - b*c/(d*x + c) + a*d/(d*x
+ c))*b*c*d^13 + 6*a^2*b^2*c^2*d^13 - 4*(d*x + c)*a^3*(b - b*c/(d*x + c) +
a*d/(d*x + c))*d^14 - 4*a^3*b*c*d^14 + a^4*d^15)*b)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{e^{-a-bx}(a+bx)^4}{(c+dx)^5}\,dx = \int \frac{\mathrm{e}^{-a-b\,x}\,{(a+b\,x)}^4}{{(c+d\,x)}^5}\,dx$$

```
[In] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^5,x)
[Out] int((exp(- a - b*x)*(a + b*x)^4)/(c + d*x)^5, x)
```

3.83 $\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log$

Optimal result

Integrand size = 39, antiderivative size = 24

$$\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x^{1+m}\log^{1+n}(dx)$$

```
[Out] e*F^(c*(b*x+a))*x^(1+m)*ln(d*x)^(1+n)
```

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.026$, Rules used = {2233}

$$\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx = ex^{m+1}\log^{n+1}(dx)F^{c(a+bx)}$$

```
[In] Int[F^(c*(a + b*x))*x^m*Log[d*x]^n*(e + e*n + e*(1 + m + b*c*x*Log[F])*Log[
d*x]),x]
```

```
[Out] e*F^(c*(a + b*x))*x^(1 + m)*Log[d*x]^(1 + n)
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral} = eF^{c(a+bx)}x^{1+m}\log^{1+n}(dx)$$

Mathematica [A] (verified)

Time = 0.19 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.04

$$\int F^{c(a+bx)}x^m\log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx=eF^{ac+bcx}x^{1+m}\log^{1+n}(dx)$$

```
[In] Integrate[F^(c*(a + b*x))*x^m*Log[d*x]^n*(e + e*n + e*(1 + m + b*c*x*Log[F]
)*Log[d*x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x^(1 + m)*Log[d*x]^(1 + n)
```

Maple [A] (verified)

Time = 307.21 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.08

method	result
parallelrisch	$x\,x^m\ln(dx)\ln(dx)^n F^{c(bx+a)}e$
risch	$\frac{\left(2ex\,F^{c(bx+a)}\ln(x)-ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)+ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2+ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(ix)\,\mathrm{c}\right.}{}$

```
[In] int(F^(c*(b*x+a))*x^m*ln(d*x)^n*(e+e*n+e*(1+m+b*c*x*ln(F))*ln(d*x)),x,metho
d=_RETURNVERBOSE)
```

```
[Out] x*x^m*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.33

$$\begin{aligned}&\int F^{c(a+bx)}x^m\log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx\\&=(ex\log(d)+ex\log(x))F^{bcx+ac}x^m(\log(d)+\log(x))^n\end{aligned}$$

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="fricas")
```

```
[Out] (e*x*log(d) + e*x*log(x))*F^(b*c*x + a*c)*x^m*(log(d) + log(x))^n
```

Sympy [F(-1)]

Timed out.

$$\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx = \text{Timed out}$$

```
[In] integrate(F**(c*(b*x+a))*x**m*ln(d*x)**n*(e+e*n+e*(1+m+b*c*x*ln(F))*ln(d*x)
),x)
```

```
[Out] Timed out
```

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.75

$$\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx$$
$$= (F^{ac}ex\log(d) + F^{ac}ex\log(x))e^{(bcx\log(F)+m\log(x)+n\log(\log(d)+\log(x)))}$$

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*x*log(d) + F^(a*c)*e*x*log(x))*e^(b*c*x*log(F) + m*log(x) + n*lo
g(log(d) + log(x)))
```

Giac [F]

$$\int F^{c(a+bx)}x^m \log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx$$
$$= \int ((bcx\log(F)+m+1)e\log(dx)+en+e)F^{(bx+a)c}x^m\log(dx)^n\,dx$$

```
[In] integrate(F^(c*(b*x+a))*x^m*log(d*x)^n*(e+e*n+e*(1+m+b*c*x*log(F))*log(d*x)
),x, algorithm="giac")
```

```
[Out] integrate(((b*c*x*log(F) + m + 1)*e*log(d*x) + e*n + e)*F^((b*x + a)*c)*x^m
*log(d*x)^n, x)
```

Mupad [B] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.04

$$\int F^{c(a+bx)}x^m\log^n(dx)(e+en+e(1+m+bcx\log(F))\log(dx))\,dx=F^{a\,c+b\,c\,x}\,e\,x^{m+1}\ln\left(d\,x\right)^{n+1}$$

```
[In] int(F^(c*(a + b*x))*x^m*log(d*x)^n*(e + e*n + e*log(d*x)*(m + b*c*x*log(F)
+ 1)),x)
```

```
[Out] F^(a*c + b*c*x)*e*x^(m + 1)*log(d*x)^(n + 1)
```

3.84 $\int F^{c(a+bx)}x^2 \log^n(dx)(e+en+e(3+bcx\log(F))\log(dx)$

Optimal result

Integrand size = 38, antiderivative size = 22

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x^3\log^{1+n}(dx)$$

```
[Out] e*F^(c*(b*x+a))*x^3*ln(d*x)^(1+n)
```

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2233}

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx = ex^3\log^{n+1}(dx)F^{c(a+bx)}$$

```
[In] Int[F^(c*(a + b*x))*x^2*Log[d*x]^n*(e + e*n + e*(3 + b*c*x*Log[F])*Log[d*x]
),x]
```

```
[Out] e*F^(c*(a + b*x))*x^3*Log[d*x]^(1 + n)
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral} = eF^{c(a+bx)}x^3\log^{1+n}(dx)$$

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx=eF^{ac+bcx}x^3\log^{1+n}(dx)$$

```
[In] Integrate[F^(c*(a + b*x))*x^2*Log[d*x]^n*(e + e*n + e*(3 + b*c*x*Log[F])*Lo
g[d*x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x^3*Log[d*x]^(1 + n)
```

Maple [A] (verified)

Time = 41.59 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

method	result
parallelrisch	$x^3\ln(dx)\ln(dx)^nF^{c(bx+a)}e$
risch	$\left(-\frac{i\pi e\,x^3\,\mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)F^{c(bx+a)}}{2}+\frac{i\pi e\,x^3\,\mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2F^{c(bx+a)}}{2}+\frac{i\pi e\,x^3\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2F^{c(bx+a)}}{2}\right.$

```
[In] int(F^(c*(b*x+a))*x^2*ln(d*x)^n*(e+e*n+e*(3+b*c*x*ln(F))*ln(d*x)),x,method=
_RETURNVERBOSE)
```

```
[Out] x^3*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx=F^{bcx+ac}ex^3\log(dx)^n\log(dx)$$

```
[In] integrate(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*x)),
x, algorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*x^3*log(d*x)^n*log(d*x)
```

Sympy [F]

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx$$
$$= e\left(\int F^{ac+bcx}x^2\log{(dx)}^n\,dx+\int F^{ac+bcx}nx^2\log{(dx)}^n\,dx + \int 3F^{ac+bcx}x^2\log{(dx)}\log{(dx)}^n\,dx+\int F^{ac+bcx}bcx^3\log{(F)}\log{(dx)}\log{(dx)}^n\,dx\right)$$

```
[In] integrate(F**(c*(b*x+a))*x**2*ln(d*x)**n*(e+e*n+e*(3+b*c*x*ln(F))*ln(d*x)),
x)
[Out] e*(Integral(F**(a*c + b*c*x)*x**2*log(d*x)**n, x) + Integral(F**(a*c + b*c*
x)*n*x**2*log(d*x)**n, x) + Integral(3*F**(a*c + b*c*x)*x**2*log(d*x)*log(d
*x)**n, x) + Integral(F**(a*c + b*c*x)*b*c*x**3*log(F)*log(d*x)*log(d*x)**n
, x))
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.91

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx$$
$$= \left(F^{ac}ex^3\log{(d)}+F^{ac}ex^3\log{(x)}\right)e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

```
[In] integrate(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*x)),
x, algorithm="maxima")
[Out] (F^(a*c)*e*x^3*log(d) + F^(a*c)*e*x^3*log(x))*e^(b*c*x*log(F) + n*log(log(d
) + log(x)))
```

Giac [F(-2)]

Exception generated.

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx$$
$$= \text{Exception raised: RuntimeError}$$

```
[In] integrate(F^(c*(b*x+a))*x^2*log(d*x)^n*(e+e*n+e*(3+b*c*x*log(F))*log(d*x)),
x, algorithm="giac")
[Out] Exception raised: RuntimeError >> an error occurred running a Giac command:
INPUT:sage2OUTPUT:Unable to divide, perhaps due to rounding error%%%{1,[0,2
,0,0,0,2,1]%%%}+%%%{2,[0,2,0,0,0,1,1]%%%}+%%%{1,[0,2,0,0,0,0,1]%%%} / %%%{1
,[0,3,0,0
```

Mupad [B] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}x^2\log^n(dx)(e+en+e(3+bcx\log(F))\log(dx))\,dx = F^{a\,c+b\,c\,x}\,e\,x^3\ln(d\,x)^{n+1}$$

```
[In] int(F^(c*(a + b*x))*x^2*log(d*x)^n*(e + e*n + e*log(d*x)*(b*c*x*log(F) + 3)
),x)
```

```
[Out] F^(a*c + b*c*x)*e*x^3*log(d*x)^(n + 1)
```

3.85 $\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))$

Optimal result

Integrand size = 36, antiderivative size = 22

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx=eF^{c(a+bx)}x^2\log^{1+n}(dx)$$

```
[Out] e*F^(c*(b*x+a))*x^2*ln(d*x)^(1+n)
```

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.028, Rules used = {2233}

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx=ex^2\log^{n+1}(dx)F^{c(a+bx)}$$

```
[In] Int[F^(c*(a + b*x))*x*Log[d*x]^n*(e + e*n + e*(2 + b*c*x*Log[F])*Log[d*x]),
x]
```

```
[Out] e*F^(c*(a + b*x))*x^2*Log[d*x]^(1 + n)
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral}=eF^{c(a+bx)}x^2\log^{1+n}(dx)$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx=eF^{ac+bcx}x^2\log^{1+n}(dx)$$

```
[In] Integrate[F^(c*(a + b*x))*x*Log[d*x]^n*(e + e*n + e*(2 + b*c*x*Log[F])*Log[
d*x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x^2*Log[d*x]^(1 + n)
```

Maple [A] (verified)

Time = 23.72 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

method	result
parallelrisch	$x^2\ln(dx)\ln(dx)^n F^{c(bx+a)}e$
risch	$\left(-\frac{i\pi e\,x^2\,\mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)F^{c(bx+a)}}{2}+\frac{i\pi e\,x^2\,\mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2F^{c(bx+a)}}{2}+\frac{i\pi e\,x^2\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2F^{c(bx+a)}}{2}\right.$

```
[In] int(F^(c*(b*x+a))*x*ln(d*x)^n*(e+e*n+e*(2+b*c*x*ln(F))*ln(d*x)),x,method=_R
ETURNVERBOSE)
```

```
[Out] x^2*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx=F^{bcx+ac}ex^2\log(dx)^n\log(dx)$$

```
[In] integrate(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*x)),x,
 algorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*x^2*log(d*x)^n*log(d*x)
```

Sympy [F]

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx = e\Bigg(\int F^{ac+bcx}x\log{(dx)}^n\,dx+\int F^{ac+bcx}nx\log{(dx)}^n\,dx + \int 2F^{ac+bcx}x\log{(dx)}\log{(dx)}^n\,dx+\int F^{ac+bcx}bcx^2\log{(F)}\log{(dx)}\log{(dx)}^n\,dx\Bigg)$$

```
[In] integrate(F**(c*(b*x+a))*x*ln(d*x)**n*(e+e*n+e*(2+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] e*(Integral(F**(a*c + b*c*x)*x*log(d*x)**n, x) + Integral(F**(a*c + b*c*x)*
n*x*log(d*x)**n, x) + Integral(2*F**(a*c + b*c*x)*x*log(d*x)*log(d*x)**n, x
) + Integral(F**(a*c + b*c*x)*b*c*x**2*log(F)*log(d*x)*log(d*x)**n, x))
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.91

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx = \left(F^{ac}ex^2\log{(d)}+F^{ac}ex^2\log{(x)}\right)e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

```
[In] integrate(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*x)),x,
 algorithm="maxima")
```

```
[Out] (F^(a*c)*e*x^2*log(d) + F^(a*c)*e*x^2*log(x))*e^(b*c*x*log(F) + n*log(log(d
) + log(x)))
```

Giac [F(-2)]

Exception generated.

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx = \text{Exception raised: RuntimeError}$$

```
[In] integrate(F^(c*(b*x+a))*x*log(d*x)^n*(e+e*n+e*(2+b*c*x*log(F))*log(d*x)),x,
 algorithm="giac")
```

```
[Out] Exception raised: RuntimeError >> an error occurred running a Giac command:
INPUT:sage2OUTPUT:Unable to divide, perhaps due to rounding error%%%{1,[0,2
,0,0,0,2,1]%%%}+%%%{2,[0,2,0,0,0,1,1]%%%}+%%%{1,[0,2,0,0,0,0,1]%%%} / %%%{1
,[0,3,0,0
```

Mupad [B] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}x\log^n(dx)(e+en+e(2+bcx\log(F))\log(dx))\,dx=F^{a\,c+b\,c\,x}\,e\,x^2\ln\left(d\,x\right)^{n+1}$$

```
[In] int(F^(c*(a + b*x))*x*log(d*x)^n*(e + e*n + e*log(d*x)*(b*c*x*log(F) + 2)),
x)
[Out] F^(a*c + b*c*x)*e*x^2*log(d*x)^(n + 1)
```

3.86 $\int F^{c(a+bx)} \log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,d$

Optimal result

Integrand size = 35, antiderivative size = 20

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = eF^{c(a+bx)}x\log^{1+n}(dx)$$

```
[Out] e*F^(c*(b*x+a))*x*ln(d*x)^(1+n)
```

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.029, Rules used = {2232}

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = ex\log^{n+1}(dx)F^{c(a+bx)}$$

```
[In] Int[F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(1 + b*c*x*Log[F])*Log[d*x]),x]
```

```
[Out] e*F^(c*(a + b*x))*x*Log[d*x]^(1 + n)
```

Rule 2232

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*((e_) + Log[(d_
.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x*F^(c*(a + b*x))
*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d, e, f, g, h, n}, x]
 && EqQ[e - f*h*(n + 1), 0] && EqQ[g*h*(n + 1) - b*c*e*Log[F], 0] && NeQ[n,
 -1]
```

Rubi steps

$$\text{integral} = eF^{c(a+bx)}x\log^{1+n}(dx)$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx=eF^{ac+bcx}x\log^{1+n}(dx)$$

```
[In] Integrate[F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(1 + b*c*x*Log[F])*Log[d*
x]),x]
```

```
[Out] e*F^(a*c + b*c*x)*x*Log[d*x]^(1 + n)
```

Maple [A] (verified)

Time = 13.04 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.15

method	result
parallelrisch	$x\ln(dx)\ln(dx)^n F^{c(bx+a)}e$
risch	$\left(-\frac{ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)}{2}+\frac{ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2}{2}+\frac{ix\,F^{c(bx+a)}e\pi\ \mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2}{2}\right.$

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(1+b*c*x*ln(F))*ln(d*x)),x,method=_RET
URNVERBOSE)
```

```
[Out] x*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.15

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx=F^{bcx+ac}ex\log(dx)^n\log(dx)$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*x*log(d*x)^n*log(d*x)
```

Sympy [F]

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = e\left(\int F^{ac+bcx}\log{(dx)}^n\,dx+\int F^{ac+bcx}n\log{(dx)}^n\,dx+\int F^{ac+bcx}\log{(dx)}\log{(dx)}^n\,dx + \int F^{ac+bcx}bcx\log{(F)}\log{(dx)}\log{(dx)}^n\,dx\right)$$

```
[In] integrate(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(1+b*c*x*ln(F))*ln(d*x)),x)
```

```
[Out] e*(Integral(F**(a*c + b*c*x)*log(d*x)**n, x) + Integral(F**(a*c + b*c*x)*n*
log(d*x)**n, x) + Integral(F**(a*c + b*c*x)*log(d*x)*log(d*x)**n, x) + Inte
gral(F**(a*c + b*c*x)*b*c*x*log(F)*log(d*x)*log(d*x)**n, x))
```

Maxima [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 38, normalized size of antiderivative = 1.90

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = (F^{ac}ex\log{(d)}+F^{ac}ex\log{(x)})e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="maxima")
```

```
[Out] (F^(a*c)*e*x*log(d) + F^(a*c)*e*x*log(x))*e^(b*c*x*log(F) + n*log(log(d) +
log(x)))
```

Giac [F(-2)]

Exception generated.

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = \text{Exception raised: RuntimeError}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(1+b*c*x*log(F))*log(d*x)),x, a
lgorithm="giac")
```

```
[Out] Exception raised: RuntimeError >> an error occurred running a Giac command:
INPUT:sage2OUTPUT:Unable to divide, perhaps due to rounding error%%%{1,[0,2
,0,0,0,2,1]%%%}+%%%{2,[0,2,0,0,0,1,1]%%%}+%%%{1,[0,2,0,0,0,0,1]%%%} / %%%{1
,[0,3,0,0
```

Mupad [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

$$\int F^{c(a+bx)}\log^n(dx)(e+en+e(1+bcx\log(F))\log(dx))\,dx = F^{a\,c+b\,c\,x}\,e\,x\ln\left(d\,x\right)^{n+1}$$

```
[In] int(F^(c*(a + b*x))*log(d*x)^n*(e + e*n + e*log(d*x)*(b*c*x*log(F) + 1)),x)
[Out] F^(a*c + b*c*x)*e*x*log(d*x)^(n + 1)
```

3.87 $\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 19

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = eF^{c(a+bx)}\log^{1+n}(dx)$$

```
[Out] e*F^(c*(b*x+a))*ln(d*x)^(1+n)
```

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.029, Rules used = {2233}

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = e\log^{n+1}(dx)F^{c(a+bx)}$$

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + b*c*e*x*Log[F]*Log[d*x]))/x,x]
```

```
[Out] e*F^(c*(a + b*x))*Log[d*x]^(1 + n)
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral} = eF^{c(a+bx)}\log^{1+n}(dx)$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = eF^{c(a+bx)}\log^{1+n}(dx)$$

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + b*c*e*x*Log[F]*Log[d*x]))/
x,x]
```

```
[Out] e*F^(c*(a + b*x))*Log[d*x]^(1 + n)
```

Maple [A] (verified)

Time = 15.12 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.16

method	result
parallelrisch	$\ln(dx)\ln(dx)^n F^{c(bx+a)} e$
risch	$\left(-\frac{i\pi e\ \mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx) F^{c(bx+a)}}{2}+\frac{i\pi e\ \mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2 F^{c(bx+a)}}{2}+\frac{i\pi e\ \mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2 F^{c(bx+a)}}{2}-\frac{i\pi e}{}\right.$

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+b*c*e*x*ln(F)*ln(d*x))/x,x,method=_RETUR
NVERBOSE)
```

```
[Out] ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.16

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = F^{bcx+ac}e\log(dx)^n\log(dx)$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*log(d*x)^n*log(d*x)
```

Sympy [F]

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = e\left(\int \frac{F^{ac+bcx}\log{(dx)}^n}{x}\,dx + \int \frac{F^{ac+bcx}n\log{(dx)}^n}{x}\,dx + \int F^{ac+bcx}bc\log{(F)}\log{(dx)}\log{(dx)}^n\,dx\right)$$

```
[In] integrate(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+b*c*e*x*ln(F)*ln(d*x))/x,x)
[Out] e*(Integral(F**(a*c + b*c*x)*log(d*x)**n/x, x) + Integral(F**(a*c + b*c*x)*
n*log(d*x)**n/x, x) + Integral(F**(a*c + b*c*x)*b*c*log(F)*log(d*x)*log(d*x
)**n, x))
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.89

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = (F^{ac}e\log{(d)} + F^{ac}e\log{(x)})e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="maxima")
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
x)))
```

Giac [F(-2)]

Exception generated.

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = \text{Exception raised: RuntimeError}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+b*c*e*x*log(F)*log(d*x))/x,x, alg
orithm="giac")
[Out] Exception raised: RuntimeError >> an error occurred running a Giac command:
INPUT:sage2OUTPUT:Unable to divide, perhaps due to rounding error%%%{1,[0,2
,0,0,0,2,1]%%%}+%%%{2,[0,2,0,0,0,1,1]%%%}+%%%{1,[0,2,0,0,0,0,1]%%%} / %%%{1
,[0,3,0,0
```

Mupad [B] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.05

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+bcex\log(F)\log(dx))}{x}\,dx = F^{a\,c+b\,c\,x}\,e\ln\left(d\,x\right)^{n+1}$$

```
[In] int((F^(c*(a + b*x))*log(d*x)^n*(e + e*n + b*c*e*x*log(d*x)*log(F)))/x,x)
[Out] F^(a*c + b*c*x)*e*log(d*x)^(n + 1)
```

3.88 $\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx$

Optimal result

Integrand size = 38, antiderivative size = 22

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x}$$

```
[Out] e*F^(c*(b*x+a))*ln(d*x)^(1+n)/x
```

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2233}

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x}$$

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-1 + b*c*x*Log[F])*Log[d*x]))
/x^2,x]
```

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral} = \frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x}$$

Mathematica [A] (verified)

Time = 0.20 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{eF^{ac+bcx}\log^{1+n}(dx)}{x}$$

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-1 + b*c*x*Log[F])*Log[
d*x]))/x^2,x]
```

```
[Out] (e*F^(a*c + b*c*x)*Log[d*x]^(1 + n))/x
```

Maple [A] (verified)

Time = 15.32 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

method	result
parallelrisch	$\frac{\ln(dx)\ln(dx)^n F^{c(bx+a)} e}{x}$
risch	$\frac{F^{c(bx+a)} e\left(-i\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)+i\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2+i\pi\ \mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2-i\pi\,\mathrm{csgn}(idx)^3+2\ln(d)+2\ln(x)\right)\left(\right.}{2x}$

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(-1+b*c*x*ln(F))*ln(d*x))/x^2,x,method
=_RETURNVERBOSE)
```

```
[Out] 1/x*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{F^{bcx+ac}e\log(dx)^n\log(dx)}{x}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^2
,x, algorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*log(d*x)^n*log(d*x)/x
```

Sympy [F]

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx$$
$$= e\left(\int \frac{F^{ac+bcx}\log{(dx)}^n}{x^2}\,dx + \int \frac{F^{ac+bcx}n\log{(dx)}^n}{x^2}\,dx + \int \left(-\frac{F^{ac+bcx}\log{(dx)}\log{(dx)}^n}{x^2}\right)dx + \int \frac{F^{ac+bcx}bc\log{(F)}\log{(dx)}\log{(dx)}^n}{x}\,dx\right)$$

```
[In] integrate(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(-1+b*c*x*ln(F))*ln(d*x))/x**2
,x)
```

```
[Out] e*(Integral(F**(a*c + b*c*x)*log(d*x)**n/x**2, x) + Integral(F**(a*c + b*c*
x)*n*log(d*x)**n/x**2, x) + Integral(-F**(a*c + b*c*x)*log(d*x)*log(d*x)**n
/x**2, x) + Integral(F**(a*c + b*c*x)*b*c*log(F)*log(d*x)*log(d*x)**n/x, x)
)
```

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.77

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{(F^{ac}e\log{(d)} + F^{ac}e\log{(x)})e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}}{x}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^2
,x, algorithm="maxima")
```

```
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
x)))/x
```

Giac [F(-2)]

Exception generated.

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \text{Exception raised: RuntimeError}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-1+b*c*x*log(F))*log(d*x))/x^2
,x, algorithm="giac")
```

```
[Out] Exception raised: RuntimeError >> an error occurred running a Giac command:
INPUT:sage2OUTPUT:Unable to divide, perhaps due to rounding error%%%{1,[0,2
,0,0,0,2,1]%%%}+%%%{2,[0,2,0,0,0,1,1]%%%}+%%%{1,[0,2,0,0,0,0,1]%%%} / %%%{1
,[0,3,0,0
```

Mupad [B] (verification not implemented)

Time = 0.24 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-1+bcx\log(F))\log(dx))}{x^2}\,dx = \frac{F^{a\,c+b\,c\,x}\,e\ln\left(d\,x\right)^{n+1}}{x}$$

```
[In] int((F^(c*(a + b*x))*log(d*x)^n*(e + e*n + e*log(d*x)*(b*c*x*log(F) - 1)))/
x^2,x)
```

```
[Out] (F^(a*c + b*c*x)*e*log(d*x)^(n + 1))/x
```

3.89 $\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3} dx$

Optimal result

Integrand size = 38, antiderivative size = 22

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3} dx = \frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x^2}$$

```
[Out] e*F^(c*(b*x+a))*ln(d*x)^(1+n)/x^2
```

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.026, Rules used = {2233}

$$\int \frac{F^{c(a+bx)} \log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3} dx = \frac{e\log^{n+1}(dx)F^{c(a+bx)}}{x^2}$$

```
[In] Int[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-2 + b*c*x*Log[F])*Log[d*x]))
/x^3,x]
```

```
[Out] (e*F^(c*(a + b*x))*Log[d*x]^(1 + n))/x^2
```

Rule 2233

```
Int[Log[(d_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*(x_)^(m_.)*((e_
) + Log[(d_.)*(x_)]*(h_.)*((f_.) + (g_.)*(x_))), x_Symbol] :> Simp[e*x^(m +
 1)*F^(c*(a + b*x))*(Log[d*x]^(n + 1)/(n + 1)), x] /; FreeQ[{F, a, b, c, d,
 e, f, g, h, m, n}, x] && EqQ[e*(m + 1) - f*h*(n + 1), 0] && EqQ[g*h*(n + 1
) - b*c*e*Log[F], 0] && NeQ[n, -1]
```

Rubi steps

$$\text{integral} = \frac{eF^{c(a+bx)}\log^{1+n}(dx)}{x^2}$$

Mathematica [A] (verified)

Time = 0.21 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx = \frac{eF^{ac+bcx}\log^{1+n}(dx)}{x^2}$$

```
[In] Integrate[(F^(c*(a + b*x))*Log[d*x]^n*(e + e*n + e*(-2 + b*c*x*Log[F])*Log[
d*x]))/x^3,x]
```

```
[Out] (e*F^(a*c + b*c*x)*Log[d*x]^(1 + n))/x^2
```

Maple [A] (verified)

Time = 15.32 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

method	result
parallelrisch	$\frac{\ln(dx)\ln(dx)^n F^{c(bx+a)} e}{x^2}$
risch	$\frac{F^{c(bx+a)} e\left(-i\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(ix)\,\mathrm{csgn}(idx)+i\pi\ \mathrm{csgn}(id)\,\mathrm{csgn}(idx)^2+i\pi\ \mathrm{csgn}(ix)\,\mathrm{csgn}(idx)^2-i\pi\,\mathrm{csgn}(idx)^3+2\ln(d)+2\ln(x)\right)\left(\right.}{2x^2}$

```
[In] int(F^(c*(b*x+a))*ln(d*x)^n*(e+e*n+e*(-2+b*c*x*ln(F))*ln(d*x))/x^3,x,method
=_RETURNVERBOSE)
```

```
[Out] 1/x^2*ln(d*x)*ln(d*x)^n*F^(c*(b*x+a))*e
```

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.14

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx = \frac{F^{bcx+ac}e\log(dx)^n\log(dx)}{x^2}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,x, algorithm="fricas")
```

```
[Out] F^(b*c*x + a*c)*e*log(d*x)^n*log(d*x)/x^2
```

Sympy [F]

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx$$
$$= e\left(\int \frac{F^{ac+bcx}\log(dx)^n}{x^3}\,dx + \int \frac{F^{ac+bcx}n\log(dx)^n}{x^3}\,dx + \int \left(-\frac{2F^{ac+bcx}\log(dx)\log(dx)^n}{x^3}\right)dx + \int \frac{F^{ac+bcx}bc\log(F)\log(dx)\log(dx)^n}{x^2}\,dx\right)$$

```
[In] integrate(F**(c*(b*x+a))*ln(d*x)**n*(e+e*n+e*(-2+b*c*x*ln(F))*ln(d*x))/x**3
,x)
[Out] e*(Integral(F**(a*c + b*c*x)*log(d*x)**n/x**3, x) + Integral(F**(a*c + b*c*
x)*n*log(d*x)**n/x**3, x) + Integral(-2*F**(a*c + b*c*x)*log(d*x)*log(d*x)*
*n/x**3, x) + Integral(F**(a*c + b*c*x)*b*c*log(F)*log(d*x)*log(d*x)**n/x**
2, x))
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.77

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx = \frac{(F^{ac}e\log(d)+F^{ac}e\log(x))e^{(bcx\log(F)+n\log(\log(d)+\log(x)))}}{x^2}$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,x, algorithm="maxima")
[Out] (F^(a*c)*e*log(d) + F^(a*c)*e*log(x))*e^(b*c*x*log(F) + n*log(log(d) + log(
x)))/x^2
```

Giac [F]

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx = \int \frac{((bcx\log(F)-2)e\log(dx)+en+e)F^{(bx+a)c}\log(dx)^n}{x^3}\,dx$$

```
[In] integrate(F^(c*(b*x+a))*log(d*x)^n*(e+e*n+e*(-2+b*c*x*log(F))*log(d*x))/x^3
,x, algorithm="giac")
[Out] integrate(((b*c*x*log(F) - 2)*e*log(d*x) + e*n + e)*F^((b*x + a)*c)*log(d*x
)^n/x^3, x)
```

Mupad [B] (verification not implemented)

Time = 0.24 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

$$\int \frac{F^{c(a+bx)}\log^n(dx)(e+en+e(-2+bcx\log(F))\log(dx))}{x^3}\,dx = \frac{F^{a\,c+b\,c\,x}\,e\ln\left(d\,x\right)^{n+1}}{x^2}$$

```
[In] int((F^(c*(a + b*x))*log(d*x)^n*(e + e*n + e*log(d*x)*(b*c*x*log(F) - 2)))/
x^3,x)
```

```
[Out] (F^(a*c + b*c*x)*e*log(d*x)^(n + 1))/x^2
```

3.90 $\int \sqrt{e^{a+bx}}x^4\,dx$

Optimal result

Integrand size = 15, antiderivative size = 91

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{768\sqrt{e^{a+bx}}}{b^5} - \frac{384\sqrt{e^{a+bx}}x}{b^4} + \frac{96\sqrt{e^{a+bx}}x^2}{b^3} - \frac{16\sqrt{e^{a+bx}}x^3}{b^2} + \frac{2\sqrt{e^{a+bx}}x^4}{b}$$

```
[Out] 768*exp(b*x+a)^(1/2)/b^5-384*x*exp(b*x+a)^(1/2)/b^4+96*x^2*exp(b*x+a)^(1/2)
/b^3-16*x^3*exp(b*x+a)^(1/2)/b^2+2*x^4*exp(b*x+a)^(1/2)/b
```

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 91, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2207, 2225}

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{768\sqrt{e^{a+bx}}}{b^5} - \frac{384x\sqrt{e^{a+bx}}}{b^4} + \frac{96x^2\sqrt{e^{a+bx}}}{b^3} - \frac{16x^3\sqrt{e^{a+bx}}}{b^2} + \frac{2x^4\sqrt{e^{a+bx}}}{b}$$

```
[In] Int[Sqrt[E^(a + b*x)]*x^4,x]
```

```
[Out] (768*Sqrt[E^(a + b*x)])/b^5 - (384*Sqrt[E^(a + b*x)]*x)/b^4 + (96*Sqrt[E^(a
 + b*x)]*x^2)/b^3 - (16*Sqrt[E^(a + b*x)]*x^3)/b^2 + (2*Sqrt[E^(a + b*x)]*x
^4)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{2\sqrt{e^{a+bx}}x^4}{b} - \frac{8\int \sqrt{e^{a+bx}}x^3\,dx}{b} \\
&= -\frac{16\sqrt{e^{a+bx}}x^3}{b^2} + \frac{2\sqrt{e^{a+bx}}x^4}{b} + \frac{48\int \sqrt{e^{a+bx}}x^2\,dx}{b^2} \\
&= \frac{96\sqrt{e^{a+bx}}x^2}{b^3} - \frac{16\sqrt{e^{a+bx}}x^3}{b^2} + \frac{2\sqrt{e^{a+bx}}x^4}{b} - \frac{192\int \sqrt{e^{a+bx}}x\,dx}{b^3} \\
&= -\frac{384\sqrt{e^{a+bx}}x}{b^4} + \frac{96\sqrt{e^{a+bx}}x^2}{b^3} - \frac{16\sqrt{e^{a+bx}}x^3}{b^2} + \frac{2\sqrt{e^{a+bx}}x^4}{b} + \frac{384\int \sqrt{e^{a+bx}}\,dx}{b^4} \\
&= \frac{768\sqrt{e^{a+bx}}}{b^5} - \frac{384\sqrt{e^{a+bx}}x}{b^4} + \frac{96\sqrt{e^{a+bx}}x^2}{b^3} - \frac{16\sqrt{e^{a+bx}}x^3}{b^2} + \frac{2\sqrt{e^{a+bx}}x^4}{b}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 45, normalized size of antiderivative = 0.49

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{2\sqrt{e^{a+bx}}(384 - 192bx + 48b^2x^2 - 8b^3x^3 + b^4x^4)}{b^5}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^4,x]
[Out] (2*Sqrt[E^(a + b*x)]*(384 - 192*b*x + 48*b^2*x^2 - 8*b^3*x^3 + b^4*x^4))/b^
5
```

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 43, normalized size of antiderivative = 0.47

method	result	size
gosper	$\frac{2\left(b^{4} x^{4}-8 b^{3} x^{3}+48 b^{2} x^{2}-192 b x+384\right) \sqrt{{\mathrm e}^{b x+a}}}{b^{5}}$	43
risch	$\frac{2\left(b^{4} x^{4}-8 b^{3} x^{3}+48 b^{2} x^{2}-192 b x+384\right) \sqrt{{\mathrm e}^{b x+a}}}{b^{5}}$	43
parallelrisch	$\frac{2 x^{4} \sqrt{{\mathrm e}^{b x+a}}\, b^{4}-16 \sqrt{{\mathrm e}^{b x+a}}\, x^{3} b^{3}+96 \sqrt{{\mathrm e}^{b x+a}}\, x^{2} b^{2}-384 b \sqrt{{\mathrm e}^{b x+a}}\, x+768 \sqrt{{\mathrm e}^{b x+a}}}{b^{5}}$	76
meijerg	$-\frac{32 \,{\mathrm e}^{-\frac{5 a}{2}-\frac{b x \,{\mathrm e}^{\frac{a}{2}}}{2}} \sqrt{{\mathrm e}^{b x+a}}\, \left(24-\frac{\left(\frac{5 b^{4} x^{4} {\mathrm e}^{2 a}}{16}-\frac{5 b^{3} x^{3} {\mathrm e}^{\frac{3 a}{2}}}{2}+15 b^{2} x^{2} {\mathrm e}^{a}-60 b x \,{\mathrm e}^{\frac{a}{2}}+120\right) {\mathrm e}^{\frac{b x \,{\mathrm e}^{\frac{a}{2}}}{2}}}{5}\right)}{b^{5}}$	84

```
[In] int(x^4*exp(b*x+a)^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] 2*(b^4*x^4-8*b^3*x^3+48*b^2*x^2-192*b*x+384)*exp(b*x+a)^(1/2)/b^5
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 43, normalized size of antiderivative = 0.47

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{2\,(b^4x^4 - 8\,b^3x^3 + 48\,b^2x^2 - 192\,bx + 384)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^5}$$

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b^4*x^4 - 8*b^3*x^3 + 48*b^2*x^2 - 192*b*x + 384)*e^(1/2*b*x + 1/2*a)/b^
5
```

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.56

$$\int \sqrt{e^{a+bx}}x^4\,dx = \begin{cases} \frac{(2b^4x^4 - 16b^3x^3 + 96b^2x^2 - 384bx + 768)\sqrt{e^{a+bx}}}{b^5} & \text{for}\ b^5 \neq 0 \\ \frac{x^5}{5} & \text{otherwise} \end{cases}$$

```
[In] integrate(x**4*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b**4*x**4 - 16*b**3*x**3 + 96*b**2*x**2 - 384*b*x + 768)*sqrt
(exp(a + b*x))/b**5, Ne(b**5, 0)), (x**5/5, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 60, normalized size of antiderivative = 0.66

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{2\left(b^4x^4e^{\left(\frac{1}{2}\,a\right)} - 8\,b^3x^3e^{\left(\frac{1}{2}\,a\right)} + 48\,b^2x^2e^{\left(\frac{1}{2}\,a\right)} - 192\,bxe^{\left(\frac{1}{2}\,a\right)} + 384\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^5}$$

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b^4*x^4*e^(1/2*a) - 8*b^3*x^3*e^(1/2*a) + 48*b^2*x^2*e^(1/2*a) - 192*b*x
*e^(1/2*a) + 384*e^(1/2*a))*e^(1/2*b*x)/b^5
```

Giac [A] (verification not implemented)

none

Time = 0.32 (sec) , antiderivative size = 43, normalized size of antiderivative = 0.47

$$\int \sqrt{e^{a+bx}}x^4\,dx = \frac{2\,(b^4x^4 - 8\,b^3x^3 + 48\,b^2x^2 - 192\,bx + 384)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^5}$$

```
[In] integrate(x^4*exp(b*x+a)^(1/2),x, algorithm="giac")
```

```
[Out] 2*(b^4*x^4 - 8*b^3*x^3 + 48*b^2*x^2 - 192*b*x + 384)*e^(1/2*b*x + 1/2*a)/b^
5
```

Mupad [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 45, normalized size of antiderivative = 0.49

$$\int \sqrt{e^{a+bx}}x^4\,dx = \sqrt{\mathrm{e}^{a+b\,x}}\left(\frac{768}{b^5} - \frac{384\,x}{b^4} + \frac{2\,x^4}{b} - \frac{16\,x^3}{b^2} + \frac{96\,x^2}{b^3}\right)$$

```
[In] int(x^4*exp(a + b*x)^(1/2),x)
```

```
[Out] exp(a + b*x)^(1/2)*(768/b^5 - (384*x)/b^4 + (2*x^4)/b - (16*x^3)/b^2 + (96*
x^2)/b^3)
```

3.91 $\int \sqrt{e^{a+bx}}x^3\,dx$

Optimal result

Integrand size = 15, antiderivative size = 72

$$\int \sqrt{e^{a+bx}}x^3\,dx=-\frac{96\sqrt{e^{a+bx}}}{b^4}+\frac{48\sqrt{e^{a+bx}}x}{b^3}-\frac{12\sqrt{e^{a+bx}}x^2}{b^2}+\frac{2\sqrt{e^{a+bx}}x^3}{b}$$

```
[Out] -96*exp(b*x+a)^(1/2)/b^4+48*x*exp(b*x+a)^(1/2)/b^3-12*x^2*exp(b*x+a)^(1/2)/
b^2+2*x^3*exp(b*x+a)^(1/2)/b
```

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 72, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2207, 2225}

$$\int \sqrt{e^{a+bx}}x^3\,dx=-\frac{96\sqrt{e^{a+bx}}}{b^4}+\frac{48x\sqrt{e^{a+bx}}}{b^3}-\frac{12x^2\sqrt{e^{a+bx}}}{b^2}+\frac{2x^3\sqrt{e^{a+bx}}}{b}$$

```
[In] Int[Sqrt[E^(a + b*x)]*x^3,x]
```

```
[Out] (-96*Sqrt[E^(a + b*x)])/b^4 + (48*Sqrt[E^(a + b*x)]*x)/b^3 - (12*Sqrt[E^(a
+ b*x)]*x^2)/b^2 + (2*Sqrt[E^(a + b*x)]*x^3)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{2\sqrt{e^{a+bx}}x^3}{b} - \frac{6\int \sqrt{e^{a+bx}}x^2\,dx}{b} \\
&= -\frac{12\sqrt{e^{a+bx}}x^2}{b^2} + \frac{2\sqrt{e^{a+bx}}x^3}{b} + \frac{24\int \sqrt{e^{a+bx}}x\,dx}{b^2} \\
&= \frac{48\sqrt{e^{a+bx}}x}{b^3} - \frac{12\sqrt{e^{a+bx}}x^2}{b^2} + \frac{2\sqrt{e^{a+bx}}x^3}{b} - \frac{48\int \sqrt{e^{a+bx}}\,dx}{b^3} \\
&= -\frac{96\sqrt{e^{a+bx}}}{b^4} + \frac{48\sqrt{e^{a+bx}}x}{b^3} - \frac{12\sqrt{e^{a+bx}}x^2}{b^2} + \frac{2\sqrt{e^{a+bx}}x^3}{b}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 37, normalized size of antiderivative = 0.51

$$\int \sqrt{e^{a+bx}}x^3\,dx = \frac{2\sqrt{e^{a+bx}}(-48+24bx-6b^2x^2+b^3x^3)}{b^4}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^3,x]
[Out] (2*Sqrt[E^(a + b*x)]*(-48 + 24*b*x - 6*b^2*x^2 + b^3*x^3))/b^4
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.49

method	result	size
gosper	$\frac{2\left(b^3x^3-6b^2x^2+24bx-48\right)\sqrt{\mathrm{e}^{bx+a}}}{b^4}$	35
risch	$\frac{2\left(b^3x^3-6b^2x^2+24bx-48\right)\sqrt{\mathrm{e}^{bx+a}}}{b^4}$	35
parallelrisch	$\frac{2\sqrt{\mathrm{e}^{bx+a}}\,x^3b^3-12\sqrt{\mathrm{e}^{bx+a}}\,x^2b^2+48b\sqrt{\mathrm{e}^{bx+a}}\,x-96\sqrt{\mathrm{e}^{bx+a}}}{b^4}$	60
meijerg	$\frac{16\,\mathrm{e}^{-2a-\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\sqrt{\mathrm{e}^{bx+a}}\left(6-\frac{\left(-\frac{b^3x^3\mathrm{e}^{\frac{3a}{2}}}{2}+3b^2x^2\mathrm{e}^{a}-12bx\,\mathrm{e}^{\frac{a}{2}}+24\right)\mathrm{e}^{\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}}{4}\right)}{b^4}$	72

```
[In] int(x^3*exp(b*x+a)^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] 2*(b^3*x^3-6*b^2*x^2+24*b*x-48)*exp(b*x+a)^(1/2)/b^4
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.49

$$\int \sqrt{e^{a+bx}}x^3\,dx = \frac{2\,(b^3x^3 - 6\,b^2x^2 + 24\,bx - 48)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^4}$$

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="fricas")
```

```
[Out] 2*(b^3*x^3 - 6*b^2*x^2 + 24*b*x - 48)*e^(1/2*b*x + 1/2*a)/b^4
```

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.58

$$\int \sqrt{e^{a+bx}}x^3\,dx = \begin{cases} \frac{(2b^3x^3-12b^2x^2+48bx-96)\sqrt{e^{a+bx}}}{b^4} & \text{for } b^4 \neq 0 \\ \frac{x^4}{4} & \text{otherwise} \end{cases}$$

```
[In] integrate(x**3*exp(b*x+a)**(1/2),x)
```

```
[Out] Piecewise(((2*b**3*x**3 - 12*b**2*x**2 + 48*b*x - 96)*sqrt(exp(a + b*x))/b*
*4, Ne(b**4, 0)), (x**4/4, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 48, normalized size of antiderivative = 0.67

$$\int \sqrt{e^{a+bx}}x^3\,dx = \frac{2\left(b^3x^3e^{\left(\frac{1}{2}\,a\right)} - 6\,b^2x^2e^{\left(\frac{1}{2}\,a\right)} + 24\,bxe^{\left(\frac{1}{2}\,a\right)} - 48\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^4}$$

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="maxima")
```

```
[Out] 2*(b^3*x^3*e^(1/2*a) - 6*b^2*x^2*e^(1/2*a) + 24*b*x*e^(1/2*a) - 48*e^(1/2*a
))*e^(1/2*b*x)/b^4
```

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.49

$$\int \sqrt{e^{a+bx}}x^3\,dx = \frac{2\,(b^3x^3 - 6\,b^2x^2 + 24\,bx - 48)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^4}$$

```
[In] integrate(x^3*exp(b*x+a)^(1/2),x, algorithm="giac")
[Out] 2*(b^3*x^3 - 6*b^2*x^2 + 24*b*x - 48)*e^(1/2*b*x + 1/2*a)/b^4
```

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 37, normalized size of antiderivative = 0.51

$$\int \sqrt{e^{a+bx}}x^3\,dx = \sqrt{\mathrm{e}^{a+b\,x}}\,\left(\frac{48\,x}{b^3} - \frac{96}{b^4} + \frac{2\,x^3}{b} - \frac{12\,x^2}{b^2}\right)$$

```
[In] int(x^3*exp(a + b*x)^(1/2),x)
[Out] exp(a + b*x)^(1/2)*((48*x)/b^3 - 96/b^4 + (2*x^3)/b - (12*x^2)/b^2)
```

3.92 $\int \sqrt{e^{a+bx}}x^2\,dx$

Optimal result

Integrand size = 15, antiderivative size = 53

$$\int \sqrt{e^{a+bx}}x^2\,dx=\frac{16\sqrt{e^{a+bx}}}{b^3}-\frac{8\sqrt{e^{a+bx}}x}{b^2}+\frac{2\sqrt{e^{a+bx}}x^2}{b}$$

```
[Out] 16*exp(b*x+a)^(1/2)/b^3-8*x*exp(b*x+a)^(1/2)/b^2+2*x^2*exp(b*x+a)^(1/2)/b
```

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2207, 2225}

$$\int \sqrt{e^{a+bx}}x^2\,dx=\frac{16\sqrt{e^{a+bx}}}{b^3}-\frac{8x\sqrt{e^{a+bx}}}{b^2}+\frac{2x^2\sqrt{e^{a+bx}}}{b}$$

```
[In] Int[Sqrt[E^(a + b*x)]*x^2,x]
```

```
[Out] (16*Sqrt[E^(a + b*x)])/b^3 - (8*Sqrt[E^(a + b*x)]*x)/b^2 + (2*Sqrt[E^(a + b
*x)]*x^2)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \frac{2\sqrt{e^{a+bx}}x^2}{b} - \frac{4\int \sqrt{e^{a+bx}}x\,dx}{b}\\ &= -\frac{8\sqrt{e^{a+bx}}x}{b^2} + \frac{2\sqrt{e^{a+bx}}x^2}{b} + \frac{8\int \sqrt{e^{a+bx}}\,dx}{b^2}\\ &= \frac{16\sqrt{e^{a+bx}}}{b^3} - \frac{8\sqrt{e^{a+bx}}x}{b^2} + \frac{2\sqrt{e^{a+bx}}x^2}{b}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.55

$$\int \sqrt{e^{a+bx}}x^2\,dx = \frac{2\sqrt{e^{a+bx}}(8-4bx+b^2x^2)}{b^3}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]*x^2,x]
[Out] (2*Sqrt[E^(a + b*x)]*(8 - 4*b*x + b^2*x^2))/b^3
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.51

method	result	size
gosper	$\frac{2\left(b^2x^2-4bx+8\right)\sqrt{\mathrm{e}^{bx+a}}}{b^3}$	27
risch	$\frac{2\left(b^2x^2-4bx+8\right)\sqrt{\mathrm{e}^{bx+a}}}{b^3}$	27
parallelrisch	$\frac{2\sqrt{\mathrm{e}^{bx+a}}\,x^2b^2-8b\sqrt{\mathrm{e}^{bx+a}}\,x+16\sqrt{\mathrm{e}^{bx+a}}}{b^3}$	44
meijerg	$-\frac{8\,\mathrm{e}^{-\frac{3a}{2}-\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\sqrt{\mathrm{e}^{bx+a}}\left(2-\frac{\left(\frac{3b^2x^2\mathrm{e}^{a}}{4}-3bx\,\mathrm{e}^{\frac{a}{2}}+6\right)\mathrm{e}^{\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}}{3}\right)}{b^3}$	60

```
[In] int(x^2*exp(b*x+a)^(1/2),x,method=_RETURNVERBOSE)
[Out] 2*(b^2*x^2-4*b*x+8)*exp(b*x+a)^(1/2)/b^3
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.51

$$\int \sqrt{e^{a+bx}}x^2\,dx = \frac{2\,(b^2x^2 - 4\,bx + 8)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^3}$$

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="fricas")
[Out] 2*(b^2*x^2 - 4*b*x + 8)*e^(1/2*b*x + 1/2*a)/b^3
```

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.64

$$\int \sqrt{e^{a+bx}}x^2\,dx = \begin{cases} \frac{(2b^2x^2 - 8bx + 16)\sqrt{e^{a+bx}}}{b^3} & \text{for } b^3 \neq 0 \\ \frac{x^3}{3} & \text{otherwise} \end{cases}$$

```
[In] integrate(x**2*exp(b*x+a)**(1/2),x)
[Out] Piecewise(((2*b**2*x**2 - 8*b*x + 16)*sqrt(exp(a + b*x))/b**3, Ne(b**3, 0))
, (x**3/3, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.68

$$\int \sqrt{e^{a+bx}}x^2\,dx = \frac{2\left(b^2x^2e^{\left(\frac{1}{2}\,a\right)} - 4\,bxe^{\left(\frac{1}{2}\,a\right)} + 8\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^3}$$

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="maxima")
[Out] 2*(b^2*x^2*e^(1/2*a) - 4*b*x*e^(1/2*a) + 8*e^(1/2*a))*e^(1/2*b*x)/b^3
```

Giac [A] (verification not implemented)

none

Time = 0.32 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.51

$$\int \sqrt{e^{a+bx}}x^2\,dx = \frac{2\,(b^2x^2 - 4\,bx + 8)e^{\left(\frac{1}{2}\,bx + \frac{1}{2}\,a\right)}}{b^3}$$

```
[In] integrate(x^2*exp(b*x+a)^(1/2),x, algorithm="giac")
[Out] 2*(b^2*x^2 - 4*b*x + 8)*e^(1/2*b*x + 1/2*a)/b^3
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.55

$$\int \sqrt{e^{a+bx}}x^2\,dx = \sqrt{\mathrm{e}^{a+b\,x}}\left(\frac{16}{b^3} - \frac{8\,x}{b^2} + \frac{2\,x^2}{b}\right)$$

```
[In] int(x^2*exp(a + b*x)^(1/2),x)
[Out] exp(a + b*x)^(1/2)*(16/b^3 - (8*x)/b^2 + (2*x^2)/b)
```

3.93 $\int \sqrt{e^{a+bx}}x\,dx$

Optimal result

Integrand size = 13, antiderivative size = 34

$$\int \sqrt{e^{a+bx}}x\,dx = -\frac{4\sqrt{e^{a+bx}}}{b^2}+\frac{2\sqrt{e^{a+bx}}x}{b}$$

```
[Out] -4*exp(b*x+a)^(1/2)/b^2+2*x*exp(b*x+a)^(1/2)/b
```

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.154, Rules used = {2207, 2225}

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2x\sqrt{e^{a+bx}}}{b}-\frac{4\sqrt{e^{a+bx}}}{b^2}$$

```
[In] Int[Sqrt[E^(a + b*x)]*x,x]
```

```
[Out] (-4*Sqrt[E^(a + b*x)])/b^2 + (2*Sqrt[E^(a + b*x)]*x)/b
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] &&  !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \frac{2\sqrt{e^{a+bx}}x}{b} - \frac{2\int \sqrt{e^{a+bx}}\,dx}{b}\\ &= -\frac{4\sqrt{e^{a+bx}}}{b^2} + \frac{2\sqrt{e^{a+bx}}x}{b}\end{aligned}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.62

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2\sqrt{e^{a+bx}}(-2+bx)}{b^2}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]*x,x]
[Out] (2*Sqrt[E^(a + b*x)]*(-2 + b*x))/b^2
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.56

method	result	size
gosper	$\frac{2(bx-2)\sqrt{e^{bx+a}}}{b^2}$	19
risch	$\frac{2(bx-2)\sqrt{e^{bx+a}}}{b^2}$	19
parallelrisch	$\frac{2b\sqrt{e^{bx+a}}\,x-4\sqrt{e^{bx+a}}}{b^2}$	28
meijerg	$\frac{4\sqrt{e^{bx+a}}\,e^{-a-\frac{bx\,e^{\frac{a}{2}}}{2}}\left(1-\frac{\left(-bx\,e^{\frac{a}{2}}+2\right)e^{\frac{bx\,e^{\frac{a}{2}}}{2}}}{2}\right)}{b^2}$	50

```
[In] int(x*exp(b*x+a)^(1/2),x,method=_RETURNVERBOSE)
[Out] 2*(b*x-2)*exp(b*x+a)^(1/2)/b^2
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.56

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2\,(bx-2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^2}$$

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="fricas")
[Out] 2*(b*x - 2)*e^(1/2*b*x + 1/2*a)/b^2
```

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.76

$$\int \sqrt{e^{a+bx}}x\,dx = \begin{cases} \frac{(2bx-4)\sqrt{e^{a+bx}}}{b^2} & \text{for } b^2 \neq 0 \\ \frac{x^2}{2} & \text{otherwise} \end{cases}$$

```
[In] integrate(x*exp(b*x+a)**(1/2),x)
[Out] Piecewise(((2*b*x - 4)*sqrt(exp(a + b*x))/b**2, Ne(b**2, 0)), (x**2/2, True
))
```

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.71

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2\left(bxe^{\left(\frac{1}{2}\,a\right)} - 2\,e^{\left(\frac{1}{2}\,a\right)}\right)e^{\left(\frac{1}{2}\,bx\right)}}{b^2}$$

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="maxima")
[Out] 2*(b*x*e^(1/2*a) - 2*e^(1/2*a))*e^(1/2*b*x)/b^2
```

Giac [A] (verification not implemented)

none

Time = 0.35 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.56

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2\,(bx-2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b^2}$$

```
[In] integrate(x*exp(b*x+a)^(1/2),x, algorithm="giac")
[Out] 2*(b*x - 2)*e^(1/2*b*x + 1/2*a)/b^2
```

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.53

$$\int \sqrt{e^{a+bx}}x\,dx = \frac{2\,\sqrt{\mathrm{e}^{a+b\,x}}\,(b\,x-2)}{b^2}$$

```
[In] int(x*exp(a + b*x)^(1/2),x)
[Out] (2*exp(a + b*x)^(1/2)*(b*x - 2))/b^2
```

3.94 $\int \sqrt{e^{a+bx}}\,dx$

Optimal result

Integrand size = 11, antiderivative size = 16

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\sqrt{e^{a+bx}}}{b}$$

```
[Out] 2*exp(b*x+a)^(1/2)/b
```

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.091, Rules used = {2225}

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\sqrt{e^{a+bx}}}{b}$$

```
[In] Int[Sqrt[E^(a + b*x)],x]
```

```
[Out] (2*Sqrt[E^(a + b*x)])/b
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
 b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rubi steps

$$\text{integral} = \frac{2\sqrt{e^{a+bx}}}{b}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \sqrt{e^{a+bx}}\, dx = \frac{2\sqrt{e^{a+bx}}}{b}$$

```
[In] Integrate[Sqrt[E^(a + b*x)],x]
[Out] (2*Sqrt[E^(a + b*x)])/b
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

method	result	size
gosper	$\frac{2\sqrt{\mathrm{e}^{bx+a}}}{b}$	14
derivativedivides	$\frac{2\sqrt{\mathrm{e}^{bx+a}}}{b}$	14
default	$\frac{2\sqrt{\mathrm{e}^{bx+a}}}{b}$	14
risch	$\frac{2\sqrt{\mathrm{e}^{bx+a}}}{b}$	14
parallelrisch	$\frac{2\sqrt{\mathrm{e}^{bx+a}}}{b}$	14
meijerg	$-\frac{2\sqrt{\mathrm{e}^{bx+a}}\,\mathrm{e}^{-\frac{a}{2}-\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\left(1-\mathrm{e}^{\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\right)}{b}$	40

```
[In] int(exp(b*x+a)^(1/2),x,method=_RETURNVERBOSE)
[Out] 2*exp(b*x+a)^(1/2)/b
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \sqrt{e^{a+bx}}\, dx = \frac{2\, e^{\left(\frac{1}{2}\, bx+\frac{1}{2}\, a\right)}}{b}$$

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="fricas")
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \sqrt{e^{a+bx}}\,dx = \begin{cases} \frac{2\sqrt{e^{a+bx}}}{b} & \text{for } b \neq 0 \\ x & \text{otherwise} \end{cases}$$

```
[In] integrate(exp(b*x+a)**(1/2),x)
[Out] Piecewise((2*sqrt(exp(a + b*x))/b, Ne(b, 0)), (x, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b}$$

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="maxima")
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

Giac [A] (verification not implemented)

none

Time = 0.35 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{b}$$

```
[In] integrate(exp(b*x+a)^(1/2),x, algorithm="giac")
[Out] 2*e^(1/2*b*x + 1/2*a)/b
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

$$\int \sqrt{e^{a+bx}}\,dx = \frac{2\sqrt{\mathrm{e}^{a+b\,x}}}{b}$$

```
[In] int(exp(a + b*x)^(1/2),x)
[Out] (2*exp(a + b*x)^(1/2))/b
```

3.95 $\int \frac{\sqrt{e^{a+bx}}}{x} \, dx$

Optimal result

Integrand size = 15, antiderivative size = 27

$$\int \frac{\sqrt{e^{a+bx}}}{x} \, dx = e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \, \text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[Out] Ei(1/2*b*x)*exp(b*x+a)^(1/2)/exp(1/2*b*x)
```

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.133, Rules used = {2213, 2209}

$$\int \frac{\sqrt{e^{a+bx}}}{x} \, dx = e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \, \text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[In] Int[Sqrt[E^(a + b*x)]/x,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/E^((b*x)/2)
```

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 2213

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
```

```
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rubi steps

$$\begin{aligned}\text{integral} &= \left(e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int \frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx\\ &= e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)\end{aligned}$$

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[In] Integrate[Sqrt[E^(a + b*x)]/x,x]
[Out] (Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/E^((b*x)/2)
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 56 vs. $2(21) = 42$.

Time = 0.01 (sec) , antiderivative size = 57, normalized size of antiderivative = 2.11

method	result	size
meijerg	$\sqrt{e^{bx+a}}\,e^{-\frac{bx\,e^{\frac{a}{2}}}{2}}\left(\ln\left(x\right)-\ln\left(2\right)+\ln\left(-b\,e^{\frac{a}{2}}\right)-\ln\left(-\frac{bx\,e^{\frac{a}{2}}}{2}\right)-\text{Ei}_1\left(-\frac{bx\,e^{\frac{a}{2}}}{2}\right)\right)$	57

```
[In] int(exp(b*x+a)^(1/2)/x,x,method=_RETURNVERBOSE)
[Out] exp(b*x+a)^(1/2)*exp(-1/2*b*x*exp(1/2*a))*(ln(x)-ln(2)+ln(-b*exp(1/2*a))-ln
(-1/2*b*x*exp(1/2*a))-Ei(1,-1/2*b*x*exp(1/2*a)))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.37

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = \operatorname{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="fricas")
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

Sympy [F]

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = \int \frac{\sqrt{e^a e^{bx}}}{x}\,dx$$

```
[In] integrate(exp(b*x+a)**(1/2)/x,x)
[Out] Integral(sqrt(exp(a)*exp(b*x))/x, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.37

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = \operatorname{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="maxima")
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

Giac [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.37

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = \operatorname{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x,x, algorithm="giac")
[Out] Ei(1/2*b*x)*e^(1/2*a)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{e^{a+bx}}}{x}\,dx = \int \frac{\sqrt{\mathrm{e}^{a+b\,x}}}{x}\,dx$$

```
[In] int(exp(a + b*x)^(1/2)/x,x)
[Out] int(exp(a + b*x)^(1/2)/x, x)
```

3.96 $\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx$

Optimal result

Integrand size = 15, antiderivative size = 48

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = -\frac{\sqrt{e^{a+bx}}}{x} + \frac{1}{2}be^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[Out] -exp(b*x+a)^(1/2)/x+1/2*b*Ei(1/2*b*x)*exp(b*x+a)^(1/2)/exp(1/2*b*x)
```

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.200, Rules used = {2208, 2213, 2209}

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \frac{1}{2}be^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right) - \frac{\sqrt{e^{a+bx}}}{x}$$

```
[In] Int[Sqrt[E^(a + b*x)]/x^2,x]
```

```
[Out] -(Sqrt[E^(a + b*x)]/x) + (b*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(2*E^
((b*x)/2))
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2213

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rubi steps

$$\begin{aligned}\text{integral} &= -\frac{\sqrt{e^{a+bx}}}{x}+\frac{1}{2}b\int\frac{\sqrt{e^{a+bx}}}{x}\,dx\\ &= -\frac{\sqrt{e^{a+bx}}}{x}+\frac{1}{2}\left(be^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int\frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx\\ &= -\frac{\sqrt{e^{a+bx}}}{x}+\frac{1}{2}be^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)\end{aligned}$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 47, normalized size of antiderivative = 0.98

$$\int\frac{\sqrt{e^{a+bx}}}{x^2}\,dx=\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(-2e^{\frac{bx}{2}}+bx\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)\right)}{2x}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^2,x]
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2) + b*x*ExpIntegralEi[(b*x)/2]))/(2*E^((b*
x)/2)*x)
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 115 vs. 2(37) = 74.

Time = 0.02 (sec) , antiderivative size = 116, normalized size of antiderivative = 2.42

method	result	siz
meijerg	$-\frac{\sqrt{e^{bx+a}}\,e^{\frac{a}{2}-\frac{bx\,e^{\frac{a}{2}}}{2}}\,b\left(\frac{2\,e^{-\frac{a}{2}}}{xb}+1-\ln(x)+\ln(2)-\ln\left(-b\,e^{\frac{a}{2}}\right)-\frac{e^{-\frac{a}{2}}\left(2+bx\,e^{\frac{a}{2}}\right)}{bx}+\frac{2\,e^{-\frac{a}{2}+\frac{bx\,e^{\frac{a}{2}}}{2}}}{bx}+\ln\left(-\frac{bx\,e^{\frac{a}{2}}}{2}\right)+\text{Ei}_1\left(-\frac{bx\,e^{\frac{a}{2}}}{2}\right)\right)}{2}$	11

```
[In] int(exp(b*x+a)^(1/2)/x^2,x,method=_RETURNVERBOSE)
```

```
[Out] -1/2*exp(b*x+a)^(1/2)*exp(1/2*a-1/2*b*x*exp(1/2*a))*b*(2/x/b*exp(-1/2*a)+1-
ln(x)+ln(2)-ln(-b*exp(1/2*a))-1/b/x*exp(-1/2*a)*(2+b*x*exp(1/2*a))+2/b/x*ex
p(-1/2*a+1/2*b*x*exp(1/2*a))+ln(-1/2*b*x*exp(1/2*a))+Ei(1,-1/2*b*x*exp(1/2*
a)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.60

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \frac{bx\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{2\,x}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="fricas")
[Out] 1/2*(b*x*Ei(1/2*b*x)*e^(1/2*a) - 2*e^(1/2*b*x + 1/2*a))/x
```

Sympy [F]

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \int \frac{\sqrt{e^a e^{bx}}}{x^2}\,dx$$

```
[In] integrate(exp(b*x+a)**(1/2)/x**2,x)
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**2, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.27

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \frac{1}{2}\,be^{\left(\frac{1}{2}\,a\right)}\Gamma\left(-1,-\frac{1}{2}\,bx\right)$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="maxima")
[Out] 1/2*b*e^(1/2*a)*gamma(-1, -1/2*b*x)
```

Giac [A] (verification not implemented)

none

Time = 0.35 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.60

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \frac{bx\text{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{2\,x}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^2,x, algorithm="giac")
[Out] 1/2*(b*x*Ei(1/2*b*x)*e^(1/2*a) - 2*e^(1/2*b*x + 1/2*a))/x
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{e^{a+bx}}}{x^2}\,dx = \int \frac{\sqrt{\mathrm{e}^{a+b\,x}}}{x^2}\,dx$$

```
[In] int(exp(a + b*x)^(1/2)/x^2,x)
[Out] int(exp(a + b*x)^(1/2)/x^2, x)
```

3.97 $\int \frac{\sqrt{e^{a+bx}}}{x^3} \, dx$

Optimal result

Integrand size = 15, antiderivative size = 71

$$\int \frac{\sqrt{e^{a+bx}}}{x^3} \, dx = -\frac{\sqrt{e^{a+bx}}}{2x^2} - \frac{b\sqrt{e^{a+bx}}}{4x} + \frac{1}{8} b^2 e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[Out] -1/2*exp(b*x+a)^(1/2)/x^2-1/4*b*exp(b*x+a)^(1/2)/x+1/8*b^2*Ei(1/2*b*x)*exp(
b*x+a)^(1/2)/exp(1/2*b*x)
```

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.200, Rules used = {2208, 2213, 2209}

$$\int \frac{\sqrt{e^{a+bx}}}{x^3} \, dx = \frac{1}{8} b^2 e^{-\frac{bx}{2}} \sqrt{e^{a+bx}} \text{ExpIntegralEi}\left(\frac{bx}{2}\right) - \frac{\sqrt{e^{a+bx}}}{2x^2} - \frac{b\sqrt{e^{a+bx}}}{4x}$$

```
[In] Int[Sqrt[E^(a + b*x)]/x^3,x]
```

```
[Out] -1/2*Sqrt[E^(a + b*x)]/x^2 - (b*Sqrt[E^(a + b*x)])/(4*x) + (b^2*Sqrt[E^(a +
 b*x)]*ExpIntegralEi[(b*x)/2])/(8*E^((b*x)/2))
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
egerQ[2*m] && !TrueQ[$UseGamma]
```

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 2213

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{\sqrt{e^{a+bx}}}{2x^2}+\frac{1}{4}b\int\frac{\sqrt{e^{a+bx}}}{x^2}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{2x^2}-\frac{b\sqrt{e^{a+bx}}}{4x}+\frac{1}{8}b^2\int\frac{\sqrt{e^{a+bx}}}{x}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{2x^2}-\frac{b\sqrt{e^{a+bx}}}{4x}+\frac{1}{8}\left(b^2e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int\frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{2x^2}-\frac{b\sqrt{e^{a+bx}}}{4x}+\frac{1}{8}b^2e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.79

$$\int\frac{\sqrt{e^{a+bx}}}{x^3}\,dx=\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(-2e^{\frac{bx}{2}}(2+bx)+b^2x^2\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)\right)}{8x^2}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^3,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2)*(2 + b*x) + b^2*x^2*ExpIntegralEi[(b*x)/
2]))/(8*E^((b*x)/2)*x^2)
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 154 vs. $2(53) = 106$.

Time = 0.02 (sec) , antiderivative size = 155, normalized size of antiderivative = 2.18

method	result
meijerg	$\frac{\sqrt{\mathrm{e}^{bx+a}}\,\mathrm{e}^{a-\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\,b^{2}\left(-\frac{2\,\mathrm{e}^{-a}}{x^{2}b^{2}}-\frac{2\,\mathrm{e}^{-\frac{a}{2}}}{xb}-\frac{3}{4}+\frac{\ln(x)}{2}-\frac{\ln(2)}{2}+\frac{\ln\left(-b\,\mathrm{e}^{\frac{a}{2}}\right)}{2}+\frac{\mathrm{e}^{-a}\left(\frac{9b^{2}x^{2}\mathrm{e}^{a}}{4}+6bx\,\mathrm{e}^{\frac{a}{2}}+6\right)}{3b^{2}x^{2}}-\frac{2\,\mathrm{e}^{-a+\frac{bx\,\mathrm{e}^{\frac{a}{2}}}{2}}\left(3+\frac{3bx\,\mathrm{e}^{\frac{a}{2}}}{2}\right)}{3b^{2}x^{2}}-\frac{\ln\left(-b \right.}{2}}{4}$

```
[In] int(exp(b*x+a)^(1/2)/x^3,x,method=_RETURNVERBOSE)
```

```
[Out] 1/4*exp(b*x+a)^(1/2)*exp(a-1/2*b*x*exp(1/2*a))*b^2*(-2/x^2/b^2*exp(-a)-2/x/
b*exp(-1/2*a)-3/4+1/2*ln(x)-1/2*ln(2)+1/2*ln(-b*exp(1/2*a))+1/3/b^2/x^2*exp
(-a)*(9/4*b^2*x^2*exp(a)+6*b*x*exp(1/2*a)+6)-2/3/b^2/x^2*exp(-a+1/2*b*x*exp
(1/2*a))*(3+3/2*b*x*exp(1/2*a))-1/2*ln(-1/2*b*x*exp(1/2*a))-1/2*Ei(1,-1/2*b
*x*exp(1/2*a)))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.54

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = \frac{b^2x^2\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,(bx+2)e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{8\,x^2}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="fricas")
```

```
[Out] 1/8*(b^2*x^2*Ei(1/2*b*x)*e^(1/2*a) - 2*(b*x + 2)*e^(1/2*b*x + 1/2*a))/x^2
```

Sympy [F]

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = \int \frac{\sqrt{e^a e^{bx}}}{x^3}\,dx$$

```
[In] integrate(exp(b*x+a)**(1/2)/x**3,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**3, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.21

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = -\frac{1}{4}\,b^2 e^{\left(\frac{1}{2}\,a\right)}\Gamma\left(-2,-\frac{1}{2}\,bx\right)$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="maxima")
[Out] -1/4*b^2*e^(1/2*a)*gamma(-2, -1/2*b*x)
```

Giac [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 46, normalized size of antiderivative = 0.65

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = \frac{b^2x^2\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,bxe^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)} - 4\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{8\,x^2}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^3,x, algorithm="giac")
[Out] 1/8*(b^2*x^2*Ei(1/2*b*x)*e^(1/2*a) - 2*b*x*e^(1/2*b*x + 1/2*a) - 4*e^(1/2*b
*x + 1/2*a))/x^2
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{e^{a+bx}}}{x^3}\,dx = \int \frac{\sqrt{\mathrm{e}^{a+b\,x}}}{x^3}\,dx$$

```
[In] int(exp(a + b*x)^(1/2)/x^3,x)
[Out] int(exp(a + b*x)^(1/2)/x^3, x)
```

3.98 $\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx$

Optimal result

Integrand size = 15, antiderivative size = 92

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx=-\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)$$

```
[Out] -1/3*exp(b*x+a)^(1/2)/x^3-1/12*b*exp(b*x+a)^(1/2)/x^2-1/24*b^2*exp(b*x+a)^(
1/2)/x+1/48*b^3*Ei(1/2*b*x)*exp(b*x+a)^(1/2)/exp(1/2*b*x)
```

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 92, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.200, Rules used = {2208, 2213, 2209}

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx=\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)-\frac{b^2\sqrt{e^{a+bx}}}{24x}-\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}$$

```
[In] Int[Sqrt[E^(a + b*x)]/x^4,x]
```

```
[Out] -1/3*Sqrt[E^(a + b*x)]/x^3 - (b*Sqrt[E^(a + b*x)])/(12*x^2) - (b^2*Sqrt[E^(
a + b*x)])/(24*x) + (b^3*Sqrt[E^(a + b*x)]*ExpIntegralEi[(b*x)/2])/(48*E^((
b*x)/2))
```

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_), x_Symbol] :> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1)))
, x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e +
f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && Int
```

```
egerQ[2*m] &&  !TrueQ[$UseGamma]
```

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 2213

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_)*((c_.) + (d_.)*(x_))^(m_
.), x_Symbol] :> Dist[(b*F^(g*(e + f*x)))^n/F^(g*n*(e + f*x)), Int[(c + d*x
)^m*F^(g*n*(e + f*x)), x], x] /; FreeQ[{F, b, c, d, e, f, g, m, n}, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{\sqrt{e^{a+bx}}}{3x^3}+\frac{1}{6}b\int\frac{\sqrt{e^{a+bx}}}{x^3}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}+\frac{1}{24}b^2\int\frac{\sqrt{e^{a+bx}}}{x^2}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}b^3\int\frac{\sqrt{e^{a+bx}}}{x}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}\left(b^3e^{\frac{1}{2}(-a-bx)}\sqrt{e^{a+bx}}\right)\int\frac{e^{\frac{1}{2}(a+bx)}}{x}\,dx\\
&= -\frac{\sqrt{e^{a+bx}}}{3x^3}-\frac{b\sqrt{e^{a+bx}}}{12x^2}-\frac{b^2\sqrt{e^{a+bx}}}{24x}+\frac{1}{48}b^3e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\,\text{Ei}\left(\frac{bx}{2}\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 64, normalized size of antiderivative = 0.70

$$\int\frac{\sqrt{e^{a+bx}}}{x^4}\,dx=\frac{e^{-\frac{bx}{2}}\sqrt{e^{a+bx}}\left(-2e^{\frac{bx}{2}}(8+2bx+b^2x^2)+b^3x^3\,\text{ExpIntegralEi}\left(\frac{bx}{2}\right)\right)}{48x^3}$$

```
[In] Integrate[Sqrt[E^(a + b*x)]/x^4,x]
```

```
[Out] (Sqrt[E^(a + b*x)]*(-2*E^((b*x)/2)*(8 + 2*b*x + b^2*x^2) + b^3*x^3*ExpInteg
ralEi[(b*x)/2]))/(48*E^((b*x)/2)*x^3)
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 188 vs. $2(69) = 138$.

Time = 0.03 (sec) , antiderivative size = 189, normalized size of antiderivative = 2.05

method	result
meijerg	$-\frac{\sqrt{e^{bx+a}}\, e^{\frac{3a}{2}-\frac{bx\, e^{\frac{a}{2}}}{2}} b^{3} \left(\frac{8\, e^{-\frac{3a}{2}}}{3x^{3}b^{3}}+\frac{2\, e^{-a}}{x^{2}b^{2}}+\frac{e^{-\frac{a}{2}}}{xb}+\frac{11}{36}-\frac{\ln(x)}{6}+\frac{\ln(2)}{6}-\frac{\ln\left(-b\, e^{\frac{a}{2}}\right)}{6}-\frac{e^{-\frac{3a}{2}}\left(\frac{11b^{3}x^{3}e^{\frac{3a}{2}}}{4}+9b^{2}x^{2}e^{a}+18bx\, e^{\frac{a}{2}}+24\right)}{9b^{3}x^{3}}+\frac{e^{-\frac{3a}{2}+}}{}\right.}{8}$

```
[In] int(exp(b*x+a)^(1/2)/x^4,x,method=_RETURNVERBOSE)
```

```
[Out] -1/8*exp(b*x+a)^(1/2)*exp(3/2*a-1/2*b*x*exp(1/2*a))*b^3*(8/3/x^3/b^3*exp(-3
/2*a)+2/x^2/b^2*exp(-a)+1/x/b*exp(-1/2*a)+11/36-1/6*ln(x)+1/6*ln(2)-1/6*ln(
-b*exp(1/2*a))-1/9/b^3/x^3*exp(-3/2*a)*(11/4*b^3*x^3*exp(3/2*a)+9*b^2*x^2*e
xp(a)+18*b*x*exp(1/2*a)+24)+1/3/b^3/x^3*exp(-3/2*a+1/2*b*x*exp(1/2*a))*(b^2
*x^2*exp(a)+2*b*x*exp(1/2*a)+8)+1/6*ln(-1/2*b*x*exp(1/2*a))+1/6*Ei(1,-1/2*b
*x*exp(1/2*a)))
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 46, normalized size of antiderivative = 0.50

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\, dx = \frac{b^3x^3\mathrm{Ei}\left(\frac{1}{2}\, bx\right) e^{\left(\frac{1}{2}\, a\right)} - 2\,(b^2x^2 + 2\, bx + 8)e^{\left(\frac{1}{2}\, bx+\frac{1}{2}\, a\right)}}{48\, x^3}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="fricas")
```

```
[Out] 1/48*(b^3*x^3*Ei(1/2*b*x)*e^(1/2*a) - 2*(b^2*x^2 + 2*b*x + 8)*e^(1/2*b*x +
1/2*a))/x^3
```

Sympy [F]

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\, dx = \int \frac{\sqrt{e^a e^{bx}}}{x^4}\, dx$$

```
[In] integrate(exp(b*x+a)**(1/2)/x**4,x)
```

```
[Out] Integral(sqrt(exp(a)*exp(b*x))/x**4, x)
```

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.16

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx = \frac{1}{8}\,b^3e^{\left(\frac{1}{2}\,a\right)}\Gamma\left(-3,-\frac{1}{2}\,bx\right)$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="maxima")
[Out] 1/8*b^3*e^(1/2*a)*gamma(-3, -1/2*b*x)
```

Giac [A] (verification not implemented)

none

Time = 0.40 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.68

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx = \frac{b^3x^3\mathrm{Ei}\left(\frac{1}{2}\,bx\right)e^{\left(\frac{1}{2}\,a\right)} - 2\,b^2x^2e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)} - 4\,bxe^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)} - 16\,e^{\left(\frac{1}{2}\,bx+\frac{1}{2}\,a\right)}}{48\,x^3}$$

```
[In] integrate(exp(b*x+a)^(1/2)/x^4,x, algorithm="giac")
[Out] 1/48*(b^3*x^3*Ei(1/2*b*x)*e^(1/2*a) - 2*b^2*x^2*e^(1/2*b*x + 1/2*a) - 4*b*x
*e^(1/2*b*x + 1/2*a) - 16*e^(1/2*b*x + 1/2*a))/x^3
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{e^{a+bx}}}{x^4}\,dx = \int \frac{\sqrt{\mathrm{e}^{a+b\,x}}}{x^4} \,d x$$

```
[In] int(exp(a + b*x)^(1/2)/x^4,x)
[Out] int(exp(a + b*x)^(1/2)/x^4, x)
```

CHAPTER 4

APPENDIX

4.1 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.

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,leafCou
    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",""}
                    ,(*ELSE*)
                    finalresult={"B","Both result and optimal contain complex but leaf count is
                  ]
            ,(*ELSE*)
                finalresult={"C","Result contains complex when optimal does not."}
            ]
        ,(*ELSE*)(*result does not contains complex*)
            If[leafCountResult<=2*leafCountOptimal,
               finalresult={"A",""}
            ,(*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 "<>T
            ,
            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]
```

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
                                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 opt
                                   convert(leaf_count_result,string),"$ vs. $2(",
                                   convert(leaf_count_optimal,string),")=",convert(2*leaf_count
            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:
```

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)),ExpnTy
    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 large
                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(le
        else:
            grade = "C"
            grade_annotation ="Result contains higher order function than in optimal. Order "+str(ExpnType_
```

```
    #print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

    return grade, grade_annotation
```

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-ty
   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.
   elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #isinstance(expn,Add) or isinsta
      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 th
        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_c
else:
    grade = "C"
    grade_annotation ="Result contains higher order function than in optimal. Order "+str(expnType_resul


print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation
```