

CAS integration tests regression report

Mathematica 13.1 vs. Mathematica 12.3

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1 Summary of regression test table

Table 1: Summary table of regression tests

#	test file #	integral #	Mathematica 13.1	Mathematica 12.3
1	16	30	0 (not solved)	1 (pass)
2	33	1427	0 (not solved)	1 (pass)
3	33	1428	0 (not solved)	1 (pass)
4	35	810	0 (not solved)	1 (pass)
5	35	811	0 (not solved)	1 (pass)
6	35	812	0 (not solved)	1 (pass)
7	35	923	0 (not solved)	1 (pass)
8	35	928	0 (not solved)	1 (pass)
9	38	371	0 (not solved)	1 (pass)
10	74	1436	-1 (time out)	1 (pass)
11	103	312	0 (not solved)	1 (pass)
12	103	789	0 (not solved)	1 (pass)
13	103	1319	0 (not solved)	1 (pass)
14	104	207	0 (not solved)	1 (pass)
15	125	82	-1 (time out)	1 (pass)
16	144	173	0 (not solved)	1 (pass)
17	149	12	0 (not solved)	1 (pass)
18	149	19	0 (not solved)	1 (pass)
19	150	141	0 (not solved)	1 (pass)
20	150	142	0 (not solved)	1 (pass)
21	150	143	0 (not solved)	1 (pass)
22	150	144	0 (not solved)	1 (pass)
23	150	145	0 (not solved)	1 (pass)
24	150	146	0 (not solved)	1 (pass)
25	150	147	0 (not solved)	1 (pass)
26	150	1228	0 (not solved)	1 (pass)
27	151	62	-1 (time out)	1 (pass)

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Table 1 – continued from previous page

#	test file #	inte-gral #	Mathematica 13.1	Mathematica 12.3
28	154	113	-1 (time out)	1 (pass)
29	154	145	0 (not solved)	1 (pass)
30	187	621	0 (not solved)	1 (pass)
31	188	22	0 (not solved)	1 (pass)
32	188	94	0 (not solved)	1 (pass)
33	188	208	0 (not solved)	1 (pass)
34	188	214	0 (not solved)	1 (pass)
35	188	220	0 (not solved)	1 (pass)
36	190	519	0 (not solved)	1 (pass)
37	190	520	0 (not solved)	1 (pass)
38	190	521	0 (not solved)	1 (pass)
39	191	178	0 (not solved)	1 (pass)
40	197	4	0 (not solved)	1 (pass)
41	201	18	-1 (time out)	1 (pass)
42	201	58	0 (not solved)	1 (pass)
43	209	3046	0 (not solved)	1 (pass)
44	210	8	-1 (time out)	1 (pass)
45	210	19	0 (not solved)	1 (pass)
46	210	38	0 (not solved)	1 (pass)
47	210	91	0 (not solved)	1 (pass)
48	210	294	0 (not solved)	1 (pass)
49	210	300	-1 (time out)	1 (pass)
50	210	358	0 (not solved)	1 (pass)
51	210	379	0 (not solved)	1 (pass)
52	210	414	0 (not solved)	1 (pass)
53	210	578	0 (not solved)	1 (pass)
54	210	760	-1 (time out)	1 (pass)
55	210	1020	0 (not solved)	1 (pass)
56	210	2052	-1 (time out)	1 (pass)

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Table 1 – continued from previous page

#	test file #	inte-gral #	Mathematica 13.1	Mathematica 12.3
57	210	2234	0 (not solved)	1 (pass)
58	210	2451	0 (not solved)	1 (pass)
59	210	2680	0 (not solved)	1 (pass)
60	210	2812	0 (not solved)	1 (pass)
61	210	2856	0 (not solved)	1 (pass)
62	210	2913	0 (not solved)	1 (pass)
63	210	3121	0 (not solved)	1 (pass)
64	210	3124	0 (not solved)	1 (pass)
65	210	3351	0 (not solved)	1 (pass)
66	210	3670	0 (not solved)	1 (pass)
67	210	3955	0 (not solved)	1 (pass)
68	210	4166	0 (not solved)	1 (pass)
69	210	4890	0 (not solved)	1 (pass)
70	210	4908	0 (not solved)	1 (pass)
71	210	5022	0 (not solved)	1 (pass)
72	210	5264	-1 (time out)	1 (pass)
73	210	5265	0 (not solved)	1 (pass)
74	210	5410	-1 (time out)	1 (pass)
75	210	5820	0 (not solved)	1 (pass)
76	210	5856	0 (not solved)	1 (pass)
77	210	6066	0 (not solved)	1 (pass)
78	210	6250	0 (not solved)	1 (pass)
79	210	6633	0 (not solved)	1 (pass)
80	210	6675	0 (not solved)	1 (pass)
81	210	6680	0 (not solved)	1 (pass)
82	210	6838	0 (not solved)	1 (pass)
83	210	7310	-1 (time out)	1 (pass)
84	210	7387	0 (not solved)	1 (pass)
85	210	7414	0 (not solved)	1 (pass)

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Table 1 – continued from previous page

#	test file #	inte-gral #	Mathematica 13.1	Mathematica 12.3
86	210	7882	-1 (time out)	1 (pass)
87	210	8195	0 (not solved)	1 (pass)
88	210	8361	0 (not solved)	1 (pass)
89	210	8653	0 (not solved)	1 (pass)
90	210	8762	0 (not solved)	1 (pass)
91	210	8818	0 (not solved)	1 (pass)
92	210	9331	0 (not solved)	1 (pass)
93	210	9462	0 (not solved)	1 (pass)
94	210	9582	0 (not solved)	1 (pass)
95	210	9617	0 (not solved)	1 (pass)
96	210	9713	0 (not solved)	1 (pass)
97	210	10072	0 (not solved)	1 (pass)
98	210	10272	0 (not solved)	1 (pass)

2 Test file number 16

Test folder name:

```
test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.1_Linear/16_1.1.1.5_P-x-
a+b_x^-m-c+d_x^-n
```

2.1 Problem number 30

$$\int \frac{(c+dx)^n (A+Bx+Cx^2+Dx^3)}{(a+bx)^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{(bCd - 2Dad - Dbc)(dx + c)^{1+n}}{b^3 d^2 (1+n)} - \frac{\left(A - \frac{a(Bb^2 - Cab + Da^2)}{b^3}\right)(dx + c)^{1+n}}{(-ad + bc)(bx + a)} + \frac{D(dx + c)^{2+n}}{b^2 d^2 (2+n)} \\ & + \frac{(a^3 d D (3+n) - b^3 (Ad n + Bc) + a b^2 (2cC + Bd(1+n)) - a^2 b (3cD + Cd(2+n))) (dx + c)^{1+n} \text{hypergeom}([1, 1]}{b^3 (-ad + bc)^2 (1+n)} \end{aligned}$$

command

```
Integrate[((c + d*x)^n*(A + B*x + C*x^2 + D*x^3))/(a + b*x)^2, x]
```

Mathematica 13.1 output

$$\int \frac{(c+dx)^n (A+Bx+Cx^2+Dx^3)}{(a+bx)^2} dx$$

Mathematica 12.3 output

$$\frac{(c+dx)^{n+1} \left(\frac{d(Ab^3 - a(a^2 D - abC + b^2 B)) {}_2F_1\left(2, n+1; n+2; \frac{b(c+dx)}{bc-ad}\right)}{(n+1)(bc-ad)^2} - \frac{(3a^2 D - 2abC + b^2 B) {}_2F_1\left(1, n+1; n+2; \frac{b(c+dx)}{bc-ad}\right)}{(n+1)(bc-ad)} + \frac{-2adD - bcD + bC}{d^2(n+1)} \right)}{b^3}$$

3 Test file number 33

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trimomial_products/1.2.1_Quadratic/33_1.2.1.2-
d+e_x^-m-a+b_x+c_x^2-p
```

3.1 Problem number 1427

$$\int \frac{(bd + 2cdx)^m}{(a + bx + cx^2)^2} dx$$

Optimal antiderivative

$$\frac{8c(d(2cx + b))^{1+m} \text{hypergeom}\left(\left[2, \frac{1}{2} + \frac{m}{2}\right], \left[\frac{3}{2} + \frac{m}{2}\right], \frac{(2cx+b)^2}{-4ac+b^2}\right)}{(-4ac + b^2)^2 d(1 + m)}$$

command

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

Mathematica 13.1 output

$$\int \frac{(bd + 2cdx)^m}{(a + bx + cx^2)^2} dx$$

Mathematica 12.3 output

$$\frac{8c(b + 2cx)(d(b + 2cx))^m {}_2F_1\left(2, \frac{m+1}{2}; \frac{m+3}{2}; \frac{(b+2cx)^2}{b^2-4ac}\right)}{(m + 1) (b^2 - 4ac)^2}$$

3.2 Problem number 1428

$$\int \frac{(bd + 2cdx)^m}{(a + bx + cx^2)^3} dx$$

Optimal antiderivative

$$\frac{32c^2(d(2cx + b))^{1+m} \text{hypergeom}\left(\left[3, \frac{1}{2} + \frac{m}{2}\right], \left[\frac{3}{2} + \frac{m}{2}\right], \frac{(2cx+b)^2}{-4ac+b^2}\right)}{(-4ac + b^2)^3 d(1 + m)}$$

command

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

Mathematica 13.1 output

$$\int \frac{(bd + 2cdx)^m}{(a + bx + cx^2)^3} dx$$

Mathematica 12.3 output

$$\frac{32c^2(b + 2cx)(d(b + 2cx))^m {}_2F_1\left(3, \frac{m+1}{2}; \frac{m+3}{2}; \frac{(b+2cx)^2}{b^2-4ac}\right)}{(m + 1) (b^2 - 4ac)^3}$$

4 Test file number 35

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/35_1.2.1.4-d+e_x-^m-f+g_x-^n-a+b_x+c_x^2-^p`

4.1 Problem number 810

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^2} dx$$

Optimal antiderivative

$$\frac{c(gx + f)^{1+n}}{eg(1+n)} - \frac{(cd^2 - ae) g(gx + f)^{1+n} \text{hypergeom}\left([2, 1+n], [2+n], \frac{e(gx+f)}{-dg+ef}\right)}{e(-dg + ef)^2 (1+n)}$$

command

`Integrate[((f + g*x)^n*(a + 2*c*d*x + c*e*x^2))/(d + e*x)^2,x]`

Mathematica 13.1 output

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^2} dx$$

Mathematica 12.3 output

$$\frac{(f + gx)^{n+1} \left(g^2 (ae - cd^2) {}_2F_1\left(2, n+1; n+2; \frac{e(f+gx)}{ef-dg}\right) + c(e f - d g)^2\right)}{eg(n+1)(ef - dg)^2}$$

4.2 Problem number 811

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^3} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{\left(a - \frac{cd^2}{e}\right) (gx + f)^{1+n}}{2 (-dg + ef) (ex + d)^2} - \frac{(cd^2 - ae) g(1-n) (gx + f)^{1+n}}{2e (-dg + ef)^2 (ex + d)} \\ & + \frac{\left(ae g^2 (1-n) n - c(2e^2 f^2 - 4defg + d^2 g^2 (-n^2 + n + 2))\right) (gx + f)^{1+n} \text{hypergeom}\left([1, 1+n], [2+n], \frac{e(gx+f)}{-dg+ef}\right)}{2e (-dg + ef)^3 (1+n)} \end{aligned}$$

command

`Integrate[((f + g*x)^n*(a + 2*c*d*x + c*e*x^2))/(d + e*x)^3,x]`

Mathematica 13.1 output

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^3} dx$$

Mathematica 12.3 output

$$-\frac{(f + gx)^{n+1} \left(g^2(ae - cd^2) {}_2F_1\left(3, n+1; n+2; \frac{e(f+gx)}{ef-dg}\right) + c(e f - d g)^2 {}_2F_1\left(1, n+1; n+2; \frac{e(f+gx)}{ef-dg}\right)\right)}{e(n+1)(ef - dg)^3}$$

4.3 Problem number 812

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^4} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{\left(a - \frac{c d^2}{e}\right) (g x + f)^{1+n}}{3 (-d g + e f) (e x + d)^3} - \frac{(c d^2 - a e) g (2 - n) (g x + f)^{1+n}}{6 e (-d g + e f)^2 (e x + d)^2} \\ & + \frac{g (a e g^2 (n^2 - 3 n + 2) + c (6 e^2 f^2 - 12 d e f g + d^2 g^2 (-n^2 + 3 n + 4))) (g x + f)^{1+n} \text{hypergeom}\left([2, 1 + n], [2 + n], \frac{e f}{-d g + e f}\right)}{6 e (-d g + e f)^4 (1 + n)} \end{aligned}$$

command

`Integrate[((f + g*x)^n*(a + 2*c*d*x + c*e*x^2))/(d + e*x)^4,x]`

Mathematica 13.1 output

$$\int \frac{(f + gx)^n (a + 2cdx + cex^2)}{(d + ex)^4} dx$$

Mathematica 12.3 output

$$-\frac{g(f + gx)^{n+1} \left(g^2(ae - cd^2) {}_2F_1\left(4, n+1; n+2; \frac{e(f+gx)}{ef-dg}\right) + c(e f - d g)^2 {}_2F_1\left(2, n+1; n+2; \frac{e(f+gx)}{ef-dg}\right)\right)}{e(n+1)(ef - dg)^4}$$

4.4 Problem number 923

$$\int \frac{(d+ex)^m (a+bx+cx^2)}{(f+gx)^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{c(ex+d)^{1+m}}{e g^2 (1+m)} + \frac{\left(a + \frac{f(-bg+cf)}{g^2}\right) (ex+d)^{1+m}}{(-dg+ef)(gx+f)} \\ & + \frac{(cf(2dg-ef(2+m))-g(aegm+b(dg-ef(1+m)))) (ex+d)^{1+m} \text{hypergeom}\left([1, 1+m], [2+m], -\frac{g(ex+d)}{-dg+ef}\right)}{g^2 (-dg+ef)^2 (1+m)} \end{aligned}$$

command

Integrate[((d + e*x)^m*(a + b*x + c*x^2))/(f + g*x)^2, x]

Mathematica 13.1 output

$$\int \frac{(d+ex)^m (a+bx+cx^2)}{(f+gx)^2} dx$$

Mathematica 12.3 output

$$\frac{(d+ex)^{m+1} \left(e^2 (g(ag-bf)+cf^2) {}_2F_1\left(2,m+1;m+2;\frac{g(d+ex)}{dg-ef}\right) - e(2cf-bg)(ef-dg) {}_2F_1\left(1,m+1;m+2;\frac{g(d+ex)}{dg-ef}\right)\right)}{eg^2(m+1)(ef-dg)^2}$$

4.5 Problem number 928

$$\int \frac{(d+ex)^m (a+bx+cx^2)^2}{(f+gx)^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{(b^2 e^2 g^2 + c^2 (d^2 g^2 + 2 d e f g + 3 e^2 f^2) + 2 c e g (a e g - b (d g + 2 e f))) (ex+d)^{1+m}}{e^3 g^4 (1+m)} \\ & - \frac{2 c (-b e g + c d g + c e f) (ex+d)^{2+m}}{e^3 g^3 (2+m)} + \frac{c^2 (ex+d)^{3+m}}{e^3 g^2 (3+m)} + \frac{(a g^2 - b f g + c f^2)^2 (ex+d)^{1+m}}{g^4 (-dg+ef)(gx+f)} \\ & + \frac{(a g^2 - b f g + c f^2) (c f (4 d g - e f (4+m)) - g (a e g m + b (2 d g - e f (2+m)))) (ex+d)^{1+m} \text{hypergeom}\left([1, 1+m], [2+m], -\frac{g(ex+d)}{-dg+ef}\right)}{g^4 (-dg+ef)^2 (1+m)} \end{aligned}$$

command

`Integrate[((d + e*x)^m*(a + b*x + c*x^2)^2)/(f + g*x)^2,x]`

Mathematica 13.1 output

$$\int \frac{(d+ex)^m (a+bx+cx^2)^2}{(f+gx)^2} dx$$

Mathematica 12.3 output

$$(d+ex)^{m+1} \left(\frac{2ceg(aeg-b(dg+2ef))+b^2e^2g^2+c^2(d^2g^2+2defg+3e^2f^2)}{e^3(m+1)} + \frac{e(g(ag-bf)+cf^2)^2 {}_2F_1(2,m+1;m+2; \frac{g(d+ex)}{dg-ef})}{(m+1)(ef-dg)^2} - \frac{2(2cf-bg)(g(d+ex))}{g^4} \right)$$

5 Test file number 38

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/38_1.2.1.9_P-x-d+e_x^-m-a+b_x+c_x^2^-p`

5.1 Problem number 371

$$\int \frac{(d+ex)^m (2+x+3x^2-5x^3+4x^4)}{(3+2x+5x^2)^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{4(ex+d)^{1+m}}{25e(1+m)} - \frac{(1367d - 293e + (423d - 1367e)x)(ex+d)^{1+m}}{700(5d^2 - 2de + 3e^2)(5x^2 + 2x + 3)} \\ & + \frac{(ex+d)^{1+m} \text{hypergeom}\left([1, 1+m], [2+m], \frac{5ex+5d}{5d-e(1+\text{I}\sqrt{14})}\right) (80360d^2 - 32144de + 48216e^2 - 5922dem + 19138e)}{19600(5d^2 - 2de + 3e^2)(1+m)(5d - e(1 + \text{I}\sqrt{14}))} \\ & + \frac{(ex+d)^{1+m} \text{hypergeom}\left([1, 1+m], [2+m], \frac{5ex+5d}{5d-e+\text{I}\sqrt{14}e}\right) (80360d^2 - 32144de + 48216e^2 - 5922dem + 19138e)}{19600(5d^2 - 2de + 3e^2)(1+m)(5d + e(\text{I} + \sqrt{14}))} \end{aligned}$$

command

`Integrate[((d + e*x)^m*(2 + x + 3*x^2 - 5*x^3 + 4*x^4))/(3 + 2*x + 5*x^2)^2,x]`

Mathematica 13.1 output

$$\int \frac{(d+ex)^m (2+x+3x^2-5x^3+4x^4)}{(3+2x+5x^2)^2} dx$$

Mathematica 12.3 output

$$(d+ex)^{m+1} \left(\frac{\sqrt{14} \left(\frac{\left(2115d^2 + de \left(-846 + \left(-6412 + 423i\sqrt{14} \right) m \right) + e^2 \left(1269 + \left(98 - 1367i\sqrt{14} \right) m \right) \right) {}_2F_1 \left(1, m+1; m+2; \frac{5(d+ex)}{5d + \left(-1 - i\sqrt{14} \right) e} \right)}{5id + \left(\sqrt{14} - i \right) e} \right)}{(m+1)(5d^2 - 2de)} \right)$$

6 Test file number 74

Test folder name:

test_cases/4_Trig_functions/4.1_Sine/74_4.1.2.2-g_cos-^p-a+b_sin-^m-c+d_sin-^n

6.1 Problem number 1436

$$\int \frac{(d \sin(e + fx))^{5/2}}{(g \cos(e + fx))^{3/2}(a + b \sin(e + fx))} dx$$

Optimal antiderivative

$$\begin{aligned}
& \frac{a^2 d^{\frac{5}{2}} \arctan \left(-1 + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{2b(a^2-b^2) f g^{\frac{3}{2}}} \\
& - \frac{b d^{\frac{5}{2}} \arctan \left(-1 + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{2(a^2-b^2) f g^{\frac{3}{2}}} \\
& + \frac{a^2 d^{\frac{5}{2}} \arctan \left(1 + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{2b(a^2-b^2) f g^{\frac{3}{2}}} \\
& - \frac{b d^{\frac{5}{2}} \arctan \left(1 + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{2(a^2-b^2) f g^{\frac{3}{2}}} \\
& + \frac{a^2 d^{\frac{5}{2}} \ln \left(\sqrt{g} + \cot(fx+e) \sqrt{g} - \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{4b(a^2-b^2) f g^{\frac{3}{2}}} \\
& - \frac{b d^{\frac{5}{2}} \ln \left(\sqrt{g} + \cot(fx+e) \sqrt{g} - \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{4(a^2-b^2) f g^{\frac{3}{2}}} \\
& - \frac{a^2 d^{\frac{5}{2}} \ln \left(\sqrt{g} + \cot(fx+e) \sqrt{g} + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{4b(a^2-b^2) f g^{\frac{3}{2}}} \\
& + \frac{b d^{\frac{5}{2}} \ln \left(\sqrt{g} + \cot(fx+e) \sqrt{g} + \frac{\sqrt{2} \sqrt{d} \sqrt{g \cos(fx+e)}}{\sqrt{d \sin(fx+e)}} \right) \sqrt{2}}{4(a^2-b^2) f g^{\frac{3}{2}}} \\
& + \frac{2ad(d \sin(fx+e))^{\frac{3}{2}}}{(a^2-b^2) f g \sqrt{g \cos(fx+e)}} \\
& - \frac{2a^3 d^3 \text{EllipticPi} \left(\frac{\sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{1+\sin(fx+e)}}, -\frac{\sqrt{-a+b}}{\sqrt{a+b}}, I \right) \sqrt{2} \left(\sqrt{\sin(fx+e)} \right)}{b(-a+b)^{\frac{3}{2}} (a+b)^{\frac{3}{2}} f g^{\frac{3}{2}} \sqrt{d \sin(fx+e)}} \\
& + \frac{2a^3 d^3 \text{EllipticPi} \left(\frac{\sqrt{g \cos(fx+e)}}{\sqrt{g} \sqrt{1+\sin(fx+e)}}, \frac{\sqrt{-a+b}}{\sqrt{a+b}}, I \right) \sqrt{2} \left(\sqrt{\sin(fx+e)} \right)}{b(-a+b)^{\frac{3}{2}} (a+b)^{\frac{3}{2}} f g^{\frac{3}{2}} \sqrt{d \sin(fx+e)}} \\
& - \frac{2b d^2 \sqrt{d \sin(fx+e)}}{(a^2-b^2) f g \sqrt{g \cos(fx+e)}} \\
& + \frac{2a d^2 \sqrt{\frac{1}{2} + \frac{\sin(2fx+2e)}{2}} \text{EllipticE} \left(\cos(e + \frac{\pi}{4} + fx), \sqrt{2} \right) \sqrt{g \cos(fx+e)} \sqrt{d \sin(fx+e)}}{\sin(e + \frac{\pi}{4} + fx) (a^2-b^2) f g^2 \sqrt{\sin(2fx+2e)}}
\end{aligned}$$

command

`Integrate[(d*Sin[e + f*x])^(5/2)/((g*Cos[e + f*x])^(3/2)*(a + b*Sin[e + f*x])),x]`

Mathematica 13.1 output

`$Aborted`

Mathematica 12.3 output

$$\frac{2 \cot(e+fx) \csc(e+fx) (d \sin(e+fx))^{5/2} (a \sin(e+fx)-b)}{(a^2-b^2) f (g \cos(e+fx))^{3/2}}$$

$$\frac{\cos^{\frac{3}{2}}(e+fx) (d \sin(e+fx))^{5/2}}{-\left(\frac{2 (3 a^2-b^2) \left(a F_1\left(\frac{3}{4},\frac{1}{4},1;\frac{7}{4};\cos^2(e+fx),\frac{b^2 \cos^2(e+fx)}{b^2-a^2}\right)-b F_1\left(\frac{3}{4},-\frac{1}{4},1;\frac{7}{4};\cos^2(e+fx),\frac{b^2 \cos^2(e+fx)}{b^2-a^2}\right)\right)}{3 (a^2-b^2) (1-\cos^2(e+fx))^{3/4} (a+b \sin(e+fx))}\right)}$$

7 Test file number 103

Test folder name:

`test_cases/4_Trig_functions/4.3_Tangent/103_4.3.2.1-a+b_tan^-^m-c+d_tan^-^n`

7.1 Problem number 312

$$\int (d \tan(e+fx))^n (a + i a \tan(e+fx))^2 dx$$

Optimal antiderivative

$$-\frac{a^2 (d \tan(fx+e))^{1+n}}{d f \, (1+n)} + \frac{2 a^2 \text{hypergeom}([1, 1+n], [2+n], I \tan(fx+e)) (d \tan(fx+e))^{1+n}}{d f \, (1+n)}$$

command

`Integrate[(d*Tan[e + f*x])^n*(a + I*a*Tan[e + f*x])^2,x]`

Mathematica 13.1 output

$$\int (d \tan(e+fx))^n (a + i a \tan(e+fx))^2 dx$$

Mathematica 12.3 output

$$\frac{e^{-2 i e} 2^{-n} \left(-\frac{i (-1+e^{2 i (e+fx)})}{1+e^{2 i (e+fx)}}\right)^{n+1} \cos^2(e+fx) (a + i a \tan(e+fx))^2 \left(-2^n + (1+e^{2 i (e+fx)})^{n+1} {}_2F_1(n+1,n+1;n+\right.}{f(n+1)(\cos(fx)+i \sin(fx))^2}$$

7.2 Problem number 789

$$\int (d \cot(e + fx))^n (a + ia \tan(e + fx))^2 dx$$

Optimal antiderivative

$$\frac{a^2 d (d \cot(fx + e))^{-1+n}}{f(1-n)} - \frac{2a^2 d (d \cot(fx + e))^{-1+n} \text{hypergeom}([1, -1 + n], [n], -I \cot(fx + e))}{f(1-n)}$$

command

```
Integrate[(d*Cot[e + f*x])^n*(a + I*a*Tan[e + f*x])^2, x]
```

Mathematica 13.1 output

$$\int (d \cot(e + fx))^n (a + ia \tan(e + fx))^2 dx$$

Mathematica 12.3 output

$$-\frac{e^{-2ie}(1 + e^{2i(e+fx)})^{-n} \left(\frac{i(1+e^{2i(e+fx)})}{-1+e^{2i(e+fx)}}\right)^{n-1} \cos^2(e + fx)(a + ia \tan(e + fx))^2 \left(2^n(1 + e^{2i(e+fx)}) {}_2F_1(1 - n, 1 - n; 2; e^{2i(e+fx)})\right)}{f(n-1)(\cos(fx) + i \sin(fx))^2}$$

7.3 Problem number 1319

$$\int (c(d \tan(e + fx))^p)^n (a + ia \tan(e + fx))^2 dx$$

Optimal antiderivative

$$-\frac{a^2 \tan(fx + e) (c(d \tan(fx + e))^p)^n}{f(np + 1)} + \frac{2a^2 \text{hypergeom}([1, np + 1], [np + 2], I \tan(fx + e)) \tan(fx + e) (c(d \tan(fx + e))^p)^n}{f(np + 1)}$$

command

```
Integrate[(c*(d*Tan[e + f*x])^p)^n*(a + I*a*Tan[e + f*x])^2, x]
```

Mathematica 13.1 output

$$\int (c(d \tan(e + fx))^p)^n (a + ia \tan(e + fx))^2 dx$$

Mathematica 12.3 output

$$\frac{a^2 e^{-2ie} 2^{-np} \left(-\frac{i(-1+e^{2i(e+fx)})}{1+e^{2i(e+fx)}}\right)^{np+1} (\cos(e + fx) + i \sin(e + fx))^2 \left(-2^{np} + (1 + e^{2i(e+fx)})^{np+1} {}_2F_1(np + 1, np + 1; np + 2; e^{2i(e+fx)})\right)}{(fnp + f)(\cos(fx) + i \sin(fx))^2}$$

8 Test file number 104

Test folder name:

`test_cases/4_Trig_functions/4.3_Tangent/104_4.3.3.1-a+b_tan^-m-c+d_tan^-n-A+B_tan-`

8.1 Problem number 207

$$\int \tan^m(c + dx)(a + ia \tan(c + dx))(A + B \tan(c + dx)) dx$$

Optimal antiderivative

$$\frac{IaB(\tan^{1+m}(dx + c))}{d(1 + m)} + \frac{a(A - IB) \text{hypergeom}([1, 1 + m], [2 + m], I \tan(dx + c)) (\tan^{1+m}(dx + c))}{d(1 + m)}$$

command

`Integrate[Tan[c + d*x]^m*(a + I*a*Tan[c + d*x])*(A + B*Tan[c + d*x]), x]`

Mathematica 13.1 output

$$\int \tan^m(c + dx)(a + ia \tan(c + dx))(A + B \tan(c + dx)) dx$$

Mathematica 12.3 output

$$-\frac{iae^{-ic} 2^{-m-1} \left(-\frac{i(-1+e^{2i(c+dx)})}{1+e^{2i(c+dx)}}\right)^{m+1} \cos^2(c+dx) (1+i \tan(c+dx)) (A+B \tan(c+dx)) \left(-B 2^{m+1}+(B+i A) (1+2 \tan^2(c+dx))\right)}{d(m+1)(\cos(dx)+i \sin(dx))(A \cos(c+dx)+B \sin(c+dx))}$$

9 Test file number 125

Test folder name:

`test_cases/4_Trig_functions/4.5_Secant/125_4.5.4.2-a+b_sec^-m-d_sec^-n-A+B_sec+C_sec^2-`

9.1 Problem number 82

$$\int \frac{(b \sec(c + dx))^n (A + B \sec(c + dx) + C \sec^2(c + dx))}{\sec^{\frac{3}{2}}(c + dx)} dx$$

Optimal antiderivative

$$-\frac{2C(b \sec(dx + c))^n \sin(dx + c)}{d(1 - 2n) \sqrt{\sec(dx + c)}} - \frac{4(A + C(3 - 2n) - 2An) \text{hypergeom}([\frac{1}{2}, \frac{5}{4} - \frac{n}{2}], [\frac{9}{4} - \frac{n}{2}], \cos^2(dx + c)) (b \sec(dx + c))^n \sin(dx + c)}{d(4n^2 - 12n + 5) \sec(dx + c)^{\frac{5}{2}} \sqrt{2 - 2 \cos(2dx + 2c)}} - \frac{4B \text{hypergeom}([\frac{1}{2}, \frac{3}{4} - \frac{n}{2}], [\frac{7}{4} - \frac{n}{2}], \cos^2(dx + c)) (b \sec(dx + c))^n \sin(dx + c)}{d(3 - 2n) \sec(dx + c)^{\frac{3}{2}} \sqrt{2 - 2 \cos(2dx + 2c)}}$$

command

`Integrate[((b*Sec[c + d*x])^n*(A + B*Sec[c + d*x] + C*Sec[c + d*x]^2))/Sec[c + d*x]^(3/2),x]`

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$\frac{i 2^{n+\frac{1}{2}} e^{-\frac{1}{2} i (4c+d(2n+1)x)} \left(\frac{e^{i(c+dx)}}{1+e^{2i(c+dx)}}\right)^{n+\frac{1}{2}} (1+e^{2i(c+dx)})^{n+\frac{1}{2}} \sec^{-n-2}(c+dx) (b \sec(c+dx))^n (A+B \sec(c+dx))}{8d^3}$$

10 Test file number 144

Test folder name:

`test_cases/5_Inverse_trig_functions/5.1_Inverse_sine/144_5.1.5_Inverse_sine_functions`

10.1 Problem number 173

$$\int x^2(a + b \operatorname{ArcSin}(c + dx))^n dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{\operatorname{I}(a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right) e^{\frac{-\operatorname{I} a}{b}} \left(\frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{8d^3} \\ & -\frac{\operatorname{I} c^2 (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right) e^{\frac{-\operatorname{I} a}{b}} \left(\frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{2d^3} \\ & +\frac{\operatorname{I} e^{\frac{\operatorname{I} a}{b}} (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right) \left(\frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{8d^3} \\ & +\frac{\operatorname{I} c^2 e^{\frac{\operatorname{I} a}{b}} (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right) \left(\frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{2d^3} \\ & +\frac{2^{-2-n} c (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{-2 \operatorname{I}(a+b \arcsin(dx+c))}{b}\right) e^{\frac{-2 \operatorname{I} a}{b}} \left(\frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{d^3} \\ & +\frac{2^{-2-n} c e^{\frac{2 \operatorname{I} a}{b}} (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{2 \operatorname{I}(a+b \arcsin(dx+c))}{b}\right) \left(\frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{d^3} \\ & +\frac{\operatorname{I} 3^{-1-n} (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{-3 \operatorname{I}(a+b \arcsin(dx+c))}{b}\right) e^{\frac{-3 \operatorname{I} a}{b}} \left(\frac{-\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{8d^3} \\ & -\frac{\operatorname{I} 3^{-1-n} e^{\frac{3 \operatorname{I} a}{b}} (a+b \arcsin(dx+c))^n \Gamma\left(1+n, \frac{3 \operatorname{I}(a+b \arcsin(dx+c))}{b}\right) \left(\frac{\operatorname{I}(a+b \arcsin(dx+c))}{b}\right)^{-n}}{8d^3} \end{aligned}$$

command

`Integrate[x^2*(a + b*ArcSin[c + d*x])^n, x]`

Mathematica 13.1 output

$$\int x^2(a + b \operatorname{ArcSin}(c + dx))^n dx$$

Mathematica 12.3 output

$$2^{-n-3} 3^{-n-1} e^{-\frac{3ia}{b}} (a + b \sin^{-1}(c + dx))^n \left(\frac{(a+b \sin^{-1}(c+dx))^2}{b^2} \right)^{-n} \left(i(4c^2 + 1) 2^n 3^{n+1} e^{\frac{4ia}{b}} \left(-\frac{i(a+b \sin^{-1}(c+dx))}{b} \right)^n \Gamma(n -$$

11 Test file number 149

Test folder name:

`test_cases/5_Inverse_trig_functions/5.3_Inverse_tangent/149_5.3.3-d+e_x^-m-a+b_arctan-c_x^n^-p`

11.1 Problem number 12

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{e} + \frac{(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e} \\ & + \frac{Ib(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{e} \\ & - \frac{Ib(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e} \\ & - \frac{b^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2e} + \frac{b^2 \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2e} \end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Mathematica 12.3 output

$$6a^2cd \log(d + ex) + 12abcd \left(\tan^{-1}(cx) \left(\frac{1}{2} \log(c^2x^2 + 1) + \log(\sin(\tan^{-1}(\frac{cd}{e}) + \tan^{-1}(cx))) \right) \right) + \frac{1}{2} \left(-\log \left(\frac{2}{\sqrt{c^2x^2 + 1}} \right) \right)$$

11.2 Problem number 19

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^3}{(d + ex)^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{Ic(a + b \operatorname{arctan}(cx))^3}{c^2d^2 + e^2} + \frac{c^2d(a + b \operatorname{arctan}(cx))^3}{e(c^2d^2 + e^2)} \\ & - \frac{(a + b \operatorname{arctan}(cx))^3}{e(ex + d)} - \frac{3bc(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{c^2d^2 + e^2} \\ & + \frac{3bc(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2}{1+Icx}\right)}{c^2d^2 + e^2} + \frac{3bc(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{c^2d^2 + e^2} \\ & + \frac{3Ib^2c(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{c^2d^2 + e^2} \\ & + \frac{3Ib^2c(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{c^2d^2 + e^2} \\ & - \frac{3Ib^2c(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{c^2d^2 + e^2} - \frac{3b^3c \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2(c^2d^2 + e^2)} \\ & + \frac{3b^3c \operatorname{polylog}\left(3, 1 - \frac{2}{1+Icx}\right)}{2(c^2d^2 + e^2)} + \frac{3b^3c \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2(c^2d^2 + e^2)} \end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^3}{(d + ex)^2} dx$$

Mathematica 12.3 output

$$\begin{aligned}
& -\frac{a^3}{e(d+ex)} + \frac{3a^2bc^2d\tan^{-1}(cx)}{c^2d^2e+e^3} - \frac{3a^2bc\log(c^2x^2+1)}{2(c^2d^2+e^2)} + \frac{3a^2bc\log(d+ex)}{c^2d^2+e^2} - \frac{3a^2b\tan^{-1}(cx)}{e(d+ex)} \\
& + \frac{3ab^2}{cd\left(-\frac{1}{2}\pi\log(c^2x^2+1)+i\text{Li}_2\left(e^{2i(\tan^{-1}(\frac{cd}{e})+\tan^{-1}(cx))}\right)-i\tan^{-1}(cx)(\pi-2\tan^{-1}(\frac{cd}{e}))\right)-2\left(\tan^{-1}(\frac{cd}{e})+\tan^{-1}(cx)\right)\log\left(1-e^{2i(\tan^{-1}(\frac{cd}{e})+\tan^{-1}(cx))}\right)} \\
& + \frac{b^3}{2\tan^{-1}(cx)\left(\tan^{-1}(cx)^2\left(-2e\sqrt{\frac{c^2d^2}{e^2}+1}e^{i\tan^{-1}(\frac{cd}{e})+icd+e}\right)+3cd\left(2\tan^{-1}(\frac{cd}{e})\left(\log\left(\frac{e^{-i\tan^{-1}(\frac{cd}{e})}(cx-i)e^{\frac{cd}{e}}}{2\sqrt{c^2x^2+1}}\right)\right)\right)\right)}
\end{aligned}$$

12 Test file number 150

Test folder name:

`test_cases/5_Inverse_trig_functions/5.3_Inverse_tangent/150_5.3.4_u-a+b_arctan-c_x-p`

12.1 Problem number 141

$$\int \frac{x^3(a+b\text{ArcTan}(cx))^2}{d+ex} dx$$

Optimal antiderivative

$$\begin{aligned}
& \frac{abdx}{ce^2} + \frac{b^2x}{3c^2e} - \frac{b^2 \arctan(cx)}{3c^3e} + \frac{b^2 dx \arctan(cx)}{ce^2} - \frac{bx^2(a + b \arctan(cx))}{3ce} \\
& + \frac{Ib^2 d^2 \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{ce^3} - \frac{d(a + b \arctan(cx))^2}{2c^2e^2} \\
& - \frac{Ib^2 \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{3c^3e} + \frac{d^2 x(a + b \arctan(cx))^2}{e^3} - \frac{dx^2(a + b \arctan(cx))^2}{2e^2} \\
& + \frac{x^3(a + b \arctan(cx))^2}{3e} + \frac{d^3(a + b \arctan(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{e^4} \\
& + \frac{2bd^2(a + b \arctan(cx)) \ln\left(\frac{2}{1+Icx}\right)}{ce^3} - \frac{2b(a + b \arctan(cx)) \ln\left(\frac{2}{1+Icx}\right)}{3c^3e} \\
& - \frac{d^3(a + b \arctan(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^4} - \frac{b^2 d \ln(c^2 x^2 + 1)}{2c^2 e^2} \\
& + \frac{Id^3(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^4} - \frac{I(a + b \arctan(cx))^2}{3c^3e} \\
& + \frac{Id^2(a + b \arctan(cx))^2}{ce^3} - \frac{Id^3(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{e^4} \\
& + \frac{b^2 d^3 \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2e^4} - \frac{b^2 d^3 \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2e^4}
\end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{x^3(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Mathematica 12.3 output

output too large to display

12.2 Problem number 142

$$\int \frac{x^2(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{abx}{ce} - \frac{b^2 x \arctan(cx)}{ce} - \frac{\operatorname{Id}(a + b \arctan(cx))^2}{ce^2} + \frac{(a + b \arctan(cx))^2}{2c^2 e} \\ & - \frac{dx(a + b \arctan(cx))^2}{e^2} + \frac{x^2(a + b \arctan(cx))^2}{2e} - \frac{d^2(a + b \arctan(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{e^3} \\ & - \frac{2bd(a + b \arctan(cx)) \ln\left(\frac{2}{1+Icx}\right)}{ce^2} + \frac{d^2(a + b \arctan(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^3} \\ & + \frac{b^2 \ln(c^2 x^2 + 1)}{2c^2 e} + \frac{\operatorname{Id} d^2(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{e^3} \\ & - \frac{\operatorname{Id}^2 d \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{ce^2} - \frac{\operatorname{Id} d^2(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^3} \\ & - \frac{b^2 d^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2e^3} + \frac{b^2 d^2 \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2e^3} \end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{x^2(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Mathematica 12.3 output

output too large to display

12.3 Problem number 143

$$\int \frac{x(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Optimal antiderivative

$$\begin{aligned}
& \frac{\text{I}(a + b \arctan(cx))^2}{ce} + \frac{x(a + b \arctan(cx))^2}{e} + \frac{d(a + b \arctan(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{e^2} \\
& + \frac{2b(a + b \arctan(cx)) \ln\left(\frac{2}{1-Icx}\right)}{ce} - \frac{d(a + b \arctan(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^2} \\
& - \frac{\text{I}bd(a + b \arctan(cx)) \text{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{e^2} + \frac{\text{I}b^2 \text{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{ce} \\
& + \frac{\text{I}bd(a + b \arctan(cx)) \text{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e^2} \\
& + \frac{b^2 d \text{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2e^2} - \frac{b^2 d \text{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2e^2}
\end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{x(a + b \text{ArcTan}(cx))^2}{d + ex} dx$$

Mathematica 12.3 output

$$\begin{aligned}
& -4b^2 \sqrt{\frac{c^2 d^2}{e^2} + 1} e e^{i \tan^{-1}\left(\frac{cd}{e}\right)} \tan^{-1}(cx)^3 + 4ib^2 cd \tan^{-1}(cx)^3 + 4b^2 e \tan^{-1}(cx)^3 - 6ab \sqrt{\frac{c^2 d^2}{e^2} + 1} e e^{i \tan^{-1}\left(\frac{cd}{e}\right)} \tan^{-1}(cx)^3
\end{aligned}$$

12.4 Problem number 144

$$\int \frac{(a + b \text{ArcTan}(cx))^2}{d + ex} dx$$

Optimal antiderivative

$$\begin{aligned}
& -\frac{(a + b \arctan(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{e} + \frac{(a + b \arctan(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e} \\
& + \frac{\text{I}b(a + b \arctan(cx)) \text{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{e} \\
& - \frac{\text{I}b(a + b \arctan(cx)) \text{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{e} \\
& - \frac{b^2 \text{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2e} + \frac{b^2 \text{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2e}
\end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{d + ex} dx$$

Mathematica 12.3 output

$$6a^2cd \log(d + ex) + 12abcd \left(\tan^{-1}(cx) \left(\frac{1}{2} \log(c^2x^2 + 1) + \log(\sin(\tan^{-1}(\frac{cd}{e}) + \tan^{-1}(cx))) \right) \right) + \frac{1}{2} \left(-\log \left(\frac{2}{\sqrt{c^2x^2 + 1}} \right) \right)$$

12.5 Problem number 145

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x(d + ex)} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{2(a + b \arctan(cx))^2 \operatorname{arctanh}\left(-1 + \frac{2}{1+Icx}\right)}{d} + \frac{(a + b \arctan(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{d} \\ & -\frac{(a + b \arctan(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d} - \frac{\operatorname{Ib}(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{d} \\ & - \frac{\operatorname{Ib}(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{d} \\ & + \frac{\operatorname{Ib}(a + b \arctan(cx)) \operatorname{polylog}\left(2, -1 + \frac{2}{1+Icx}\right)}{d} \\ & + \frac{\operatorname{Ib}(a + b \arctan(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d} \\ & + \frac{b^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2d} - \frac{b^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1+Icx}\right)}{2d} \\ & + \frac{b^2 \operatorname{polylog}\left(3, -1 + \frac{2}{1+Icx}\right)}{2d} - \frac{b^2 \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2d} \end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x(d + ex)} dx$$

Mathematica 12.3 output

$$24cd \log(x)a^2 - 24cd \log(d + ex)a^2 - 24b \left(-\sqrt{\frac{c^2 d^2}{e^2} + 1} ee^{i \tan^{-1}\left(\frac{cd}{e}\right)} \tan^{-1}(cx)^2 + icd \tan^{-1}(cx)^2 + e \tan^{-1}(cx)^2 \right)$$

12.6 Problem number 146

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x^2(d + ex)} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{Ic(a + b \operatorname{arctan}(cx))^2}{d} - \frac{(a + b \operatorname{arctan}(cx))^2}{dx} \\ & + \frac{2e(a + b \operatorname{arctan}(cx))^2 \operatorname{arctanh}\left(-1 + \frac{2}{1+Icx}\right)}{d^2} - \frac{e(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{d^2} \\ & + \frac{e(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d^2} + \frac{2bc(a + b \operatorname{arctan}(cx)) \ln\left(2 - \frac{2}{1-Icx}\right)}{d} \\ & + \frac{Ibe(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{d^2} \\ & - \frac{Ib^2 c \operatorname{polylog}\left(2, -1 + \frac{2}{1-Icx}\right)}{d} + \frac{Ibe(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{d^2} \\ & - \frac{Ibe(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, -1 + \frac{2}{1+Icx}\right)}{d^2} \\ & - \frac{Ibe(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d^2} \\ & - \frac{b^2 e \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2d^2} + \frac{b^2 e \operatorname{polylog}\left(3, 1 - \frac{2}{1+Icx}\right)}{2d^2} \\ & - \frac{b^2 e \operatorname{polylog}\left(3, -1 + \frac{2}{1+Icx}\right)}{2d^2} + \frac{b^2 e \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2d^2} \end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x^2(d + ex)} dx$$

Mathematica 12.3 output

output too large to display

12.7 Problem number 147

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x^3(d + ex)} dx$$

Optimal antiderivative

$$\begin{aligned}
& -\frac{bc(a + b \operatorname{arctan}(cx))}{dx} - \frac{c^2(a + b \operatorname{arctan}(cx))^2}{2d} \\
& - \frac{Ib e^2(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1-Icx}\right)}{d^3} - \frac{(a + b \operatorname{arctan}(cx))^2}{2d x^2} \\
& + \frac{e(a + b \operatorname{arctan}(cx))^2}{d^2 x} - \frac{2e^2(a + b \operatorname{arctan}(cx))^2 \operatorname{arctanh}\left(-1 + \frac{2}{1+Icx}\right)}{d^3} + \frac{b^2 c^2 \ln(x)}{d} \\
& + \frac{e^2(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2}{1-Icx}\right)}{d^3} - \frac{e^2(a + b \operatorname{arctan}(cx))^2 \ln\left(\frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d^3} \\
& - \frac{b^2 c^2 \ln(c^2 x^2 + 1)}{2d} - \frac{2bce(a + b \operatorname{arctan}(cx)) \ln\left(2 - \frac{2}{1-Icx}\right)}{d^2} \\
& + \frac{Ib e^2(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, -1 + \frac{2}{1+Icx}\right)}{d^3} \\
& + \frac{Ib e^2(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{d^3} \\
& - \frac{Ib e^2(a + b \operatorname{arctan}(cx)) \operatorname{polylog}\left(2, 1 - \frac{2}{1+Icx}\right)}{d^3} + \frac{Ib^2 ce \operatorname{polylog}\left(2, -1 + \frac{2}{1-Icx}\right)}{d^2} \\
& + \frac{Ice(a + b \operatorname{arctan}(cx))^2}{d^2} + \frac{b^2 e^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1-Icx}\right)}{2d^3} - \frac{b^2 e^2 \operatorname{polylog}\left(3, 1 - \frac{2}{1+Icx}\right)}{2d^3} \\
& + \frac{b^2 e^2 \operatorname{polylog}\left(3, -1 + \frac{2}{1+Icx}\right)}{2d^3} - \frac{b^2 e^2 \operatorname{polylog}\left(3, 1 - \frac{2c(ex+d)}{(cd+Ie)(1-Icx)}\right)}{2d^3}
\end{aligned}$$

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \operatorname{ArcTan}(cx))^2}{x^3(d + ex)} dx$$

Mathematica 12.3 output

output too large to display

12.8 Problem number 1228

$$\int x^m (d + ex^2)^3 (a + b \operatorname{ArcTan}(cx)) dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{be(e^2(m^2 + 8m + 15) - 3c^2de(m^2 + 10m + 21) + 3c^4d^2(m^2 + 12m + 35))x^{2+m}}{c^5(2+m)(7+m)(m^2 + 8m + 15)} \\ & + \frac{b e^2 (e(5+m) - 3c^2 d(7+m)) x^{4+m}}{c^3 (4+m) (5+m) (7+m)} - \frac{b e^3 x^{6+m}}{c (6+m) (7+m)} + \frac{d^3 x^{1+m} (a + b \operatorname{arctan}(cx))}{1+m} \\ & + \frac{3d^2 e x^{3+m} (a + b \operatorname{arctan}(cx))}{3+m} + \frac{3d e^2 x^{5+m} (a + b \operatorname{arctan}(cx))}{5+m} + \frac{e^3 x^{7+m} (a + b \operatorname{arctan}(cx))}{7+m} \\ & + \frac{b(e^3(m^3 + 9m^2 + 23m + 15) - 3c^2 d e^2(m^3 + 11m^2 + 31m + 21) + 3c^4 d^2 e(m^3 + 13m^2 + 47m + 35) - c^6 d^3(m^3 + 12m^2 + 35m + 35))}{c^5(m^2 + 12m + 35)(m^3 + 6m^2 + 11m + 6)} \end{aligned}$$

command

Integrate[x^m*(d + e*x^2)^3*(a + b*ArcTan[c*x]), x]

Mathematica 13.1 output

$$\int x^m (d + ex^2)^3 (a + b \operatorname{ArcTan}(cx)) dx$$

Mathematica 12.3 output

$$\begin{aligned} & x^{m+1} \left(\frac{d^3(a + b \tan^{-1}(cx))}{m+1} + \frac{3d^2ex^2(a + b \tan^{-1}(cx))}{m+3} \right. \\ & + \frac{3de^2x^4(a + b \tan^{-1}(cx))}{m+5} + \frac{e^3x^6(a + b \tan^{-1}(cx))}{m+7} \\ & - \frac{bcd^3x {}_2F_1(1, \frac{m+2}{2}; \frac{m+4}{2}; -c^2x^2)}{m^2 + 3m + 2} - \frac{3bcd^2ex^3 {}_2F_1(1, \frac{m+4}{2}; \frac{m+6}{2}; -c^2x^2)}{m^2 + 7m + 12} \\ & \left. - \frac{3bcde^2x^5 {}_2F_1(1, \frac{m+6}{2}; \frac{m+8}{2}; -c^2x^2)}{(m+5)(m+6)} - \frac{bce^3x^7 {}_2F_1(1, \frac{m}{2} + 4; \frac{m}{2} + 5; -c^2x^2)}{(m+7)(m+8)} \right) \end{aligned}$$

13 Test file number 151

Test folder name:

test_cases/5_Inverse_trig_functions/5.3_Inverse_tangent/151_5.3.5_u-a+b_arctan-c+d_x-p

13.1 Problem number 62

$$\int \frac{\text{ArcTan}(d + ex)}{a + bx + cx^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{\arctan(ex + d) \ln \left(\frac{2e(b+2cx-\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b-\sqrt{-4ac+b^2}))} \right)}{\sqrt{-4ac+b^2}} \\ & - \frac{\arctan(ex + d) \ln \left(\frac{2e(b+2cx+\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b+\sqrt{-4ac+b^2}))} \right)}{\sqrt{-4ac+b^2}} \\ & - \frac{I \text{polylog} \left(2, 1 + \frac{4cd-4c(ex+d)-2e(b-\sqrt{-4ac+b^2})}{(1-I(ex+d))(2Ic-2cd+be-e\sqrt{-4ac+b^2})} \right)}{2\sqrt{-4ac+b^2}} \\ & + \frac{I \text{polylog} \left(2, 1 + \frac{4cd-4c(ex+d)-2e(b+\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b+\sqrt{-4ac+b^2}))} \right)}{2\sqrt{-4ac+b^2}} \end{aligned}$$

command

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

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$i \left(-\text{Li}_2 \left(\frac{2c(d+ex-i)}{2c(d-i)+(\sqrt{b^2-4ac}-b)e} \right) + \text{Li}_2 \left(\frac{2c(d+ex-i)}{2c(d-i)-\left(b+\sqrt{b^2-4ac} \right)e} \right) + \text{Li}_2 \left(\frac{2c(d+ex+i)}{2c(d+i)+(\sqrt{b^2-4ac}-b)e} \right) - \text{Li}_2 \left(\frac{2c(d+ex+i)}{2c(d+i)-\left(b+\sqrt{b^2-4ac} \right)e} \right) \right)$$

14 Test file number 154

Test folder name:

`test_cases/5_Inverse_trig_functions/5.4_Inverse_cotangent/154_5.4.1_Inverse_cotangent_function`

14.1 Problem number 113

$$\int \frac{\cot^{-1}(d + ex)}{a + bx + cx^2} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{\operatorname{arccot}(ex + d) \ln \left(\frac{2e(b+2cx-\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b-\sqrt{-4ac+b^2}))} \right)}{\sqrt{-4ac+b^2}} \\ & - \frac{\operatorname{arccot}(ex + d) \ln \left(\frac{2e(b+2cx+\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b+\sqrt{-4ac+b^2}))} \right)}{\sqrt{-4ac+b^2}} \\ & + \frac{I \operatorname{polylog} \left(2, 1 + \frac{4cd-4c(ex+d)-2e(b-\sqrt{-4ac+b^2})}{(1-I(ex+d))(2Ic-2cd+be-e\sqrt{-4ac+b^2})} \right)}{2\sqrt{-4ac+b^2}} \\ & - \frac{I \operatorname{polylog} \left(2, 1 + \frac{4cd-4c(ex+d)-2e(b+\sqrt{-4ac+b^2})}{(1-I(ex+d))(2c(I-d)+e(b+\sqrt{-4ac+b^2}))} \right)}{2\sqrt{-4ac+b^2}} \end{aligned}$$

command

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

Mathematica 13.1 output

`$Aborted`

Mathematica 12.3 output

$$- i \left(\text{Li}_2 \left(\frac{e(-b-2cx+\sqrt{b^2-4ac})}{2c(d-i)+(\sqrt{b^2-4ac}-b)e} \right) - \text{Li}_2 \left(\frac{e(-b-2cx+\sqrt{b^2-4ac})}{2c(d+i)+(\sqrt{b^2-4ac}-b)e} \right) - \text{Li}_2 \left(\frac{e(b+2cx+\sqrt{b^2-4ac})}{(b+\sqrt{b^2-4ac})e-2c(d-i)} \right) + \text{Li}_2 \left(\frac{e(b+2cx+\sqrt{b^2-4ac})}{(b+\sqrt{b^2-4ac})e+2c(d-i)} \right) \right)$$

14.2 Problem number 145

$$\int \frac{(a + b \cot^{-1}(c + dx))^3}{(e + fx)^2} dx$$

Optimal antiderivative

Expression too large to display

command

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

Mathematica 13.1 output

$$\int \frac{(a + b \cot^{-1}(c + dx))^3}{(e + fx)^2} dx$$

Mathematica 12.3 output

output too large to display

15 Test file number 187

Test folder name:

```
test_cases/7_Inverse_hyperbolic_functions/7.1_Inverse_hyperbolic_sine/187_7.1.4-f_x-
^m-d+e_x^2-p-a+b_arcsinh-c_x-^n
```

15.1 Problem number 621

$$\int \frac{1}{a + b \sinh^{-1}(cx)} dx$$

Optimal antiderivative

$$\frac{\text{hyperbolicCosineIntegral}\left(\frac{a+b \text{arcsinh}(cx)}{b}\right) \cosh\left(\frac{a}{b}\right)}{bc}-\frac{\text{hyperbolicSineIntegral}\left(\frac{a+b \text{arcsinh}(cx)}{b}\right) \sinh\left(\frac{a}{b}\right)}{bc}$$

command

```
Integrate[(a + b*ArcSinh[c*x])^(-1), x]
```

Mathematica 13.1 output

$$\int \frac{1}{a + b \sinh^{-1}(cx)} dx$$

Mathematica 12.3 output

$$\frac{\cosh\left(\frac{a}{b}\right) \text{Chi}\left(\frac{a}{b}+\sinh^{-1}(cx)\right)-\sinh\left(\frac{a}{b}\right) \text{Shi}\left(\frac{a}{b}+\sinh^{-1}(cx)\right)}{bc}$$

16 Test file number 188

Test folder name:

`test_cases/7_Inverse_hyperbolic_functions/7.1_Inverse_hyperbolic_sine/188_7.1.5_Inverse_hyper`

16.1 Problem number 22

$$\int \frac{1}{a + b \sinh^{-1}(cx)} dx$$

Optimal antiderivative

$$\frac{\text{hyperbolicCosineIntegral}\left(\frac{a+b \text{arcsinh}(cx)}{b}\right) \cosh\left(\frac{a}{b}\right)}{bc} - \frac{\text{hyperbolicSineIntegral}\left(\frac{a+b \text{arcsinh}(cx)}{b}\right) \sinh\left(\frac{a}{b}\right)}{bc}$$

command

`Integrate[(a + b*ArcSinh[c*x])^(-1), x]`

Mathematica 13.1 output

$$\int \frac{1}{a + b \sinh^{-1}(cx)} dx$$

Mathematica 12.3 output

$$\frac{\cosh\left(\frac{a}{b}\right) \text{Chi}\left(\frac{a}{b} + \sinh^{-1}(cx)\right) - \sinh\left(\frac{a}{b}\right) \text{Shi}\left(\frac{a}{b} + \sinh^{-1}(cx)\right)}{bc}$$

16.2 Problem number 94

$$\int x^2 (a + b \sinh^{-1}(c + dx))^n dx$$

Optimal antiderivative

$$\begin{aligned}
& \frac{3^{-1-n} (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, -\frac{3(a+b \operatorname{arcsinh}(dx+c))}{b}\right) e^{-\frac{3a}{b}} \left(\frac{-a-b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{8d^3} \\
& - \frac{2^{-2-n} c (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, -\frac{2(a+b \operatorname{arcsinh}(dx+c))}{b}\right) e^{-\frac{2a}{b}} \left(\frac{-a-b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{d^3} \\
& - \frac{(a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, -\frac{a-b \operatorname{arcsinh}(dx+c)}{b}\right) e^{-\frac{a}{b}} \left(\frac{-a-b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{8d^3} \\
& + \frac{c^2 (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, -\frac{a-b \operatorname{arcsinh}(dx+c)}{b}\right) e^{-\frac{a}{b}} \left(\frac{-a-b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{2d^3} \\
& + \frac{e^{\frac{a}{b}} (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, \frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right) \left(\frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{8d^3} \\
& - \frac{c^2 e^{\frac{a}{b}} (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, \frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right) \left(\frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{2d^3} \\
& - \frac{2^{-2-n} c e^{\frac{2a}{b}} (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, \frac{2a+2b \operatorname{arcsinh}(dx+c)}{b}\right) \left(\frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{d^3} \\
& - \frac{3^{-1-n} e^{\frac{3a}{b}} (a + b \operatorname{arcsinh}(dx + c))^n \Gamma\left(1 + n, \frac{3a+3b \operatorname{arcsinh}(dx+c)}{b}\right) \left(\frac{a+b \operatorname{arcsinh}(dx+c)}{b}\right)^{-n}}{8d^3}
\end{aligned}$$

command

```
Integrate[x^2*(a + b*ArcSinh[c + d*x])^n, x]
```

Mathematica 13.1 output

$$\int x^2 (a + b \sinh^{-1}(c + dx))^n \, dx$$

Mathematica 12.3 output

$$2^{-n-3} 3^{-n-1} e^{-\frac{3a}{b}} (a + b \sinh^{-1}(c + dx))^n \left(-\frac{(a+b \sinh^{-1}(c+dx))^2}{b^2}\right)^{-n} \left((4c^2 - 1) 2^n 3^{n+1} e^{\frac{2a}{b}} \left(\frac{a}{b} + \sinh^{-1}(c + dx)\right)^n \Gamma\left(1 + n, \frac{3a+3b \sinh^{-1}(c+dx)}{b}\right)\right)$$

16.3 Problem number 208

$$\int \frac{1}{\sqrt{a + b \sinh^{-1}(c + dx)}} dx$$

Optimal antiderivative

$$\frac{e^{\frac{a}{b}} \operatorname{erf}\left(\frac{\sqrt{a+b} \operatorname{arcsinh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi}}{2d\sqrt{b}} + \frac{\operatorname{erfi}\left(\frac{\sqrt{a+b} \operatorname{arcsinh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi} e^{-\frac{a}{b}}}{2d\sqrt{b}}$$

command

`Integrate[1/Sqrt[a + b*ArcSinh[c + d*x]],x]`

Mathematica 13.1 output

$$\int \frac{1}{\sqrt{a + b \sinh^{-1}(c + dx)}} dx$$

Mathematica 12.3 output

$$\frac{e^{-\frac{a}{b}} \left(\sqrt{-\frac{a+b \sinh^{-1}(c+dx)}{b}} \Gamma\left(\frac{1}{2}, -\frac{a+b \sinh^{-1}(c+dx)}{b}\right) - e^{\frac{2a}{b}} \sqrt{\frac{a}{b} + \sinh^{-1}(c+dx)} \Gamma\left(\frac{1}{2}, \frac{a}{b} + \sinh^{-1}(c+dx)\right) \right)}{2d\sqrt{a+b \sinh^{-1}(c+dx)}}$$

16.4 Problem number 214

$$\int \frac{1}{(a + b \sinh^{-1}(c + dx))^{3/2}} dx$$

Optimal antiderivative

$$\begin{aligned} & -\frac{e^{\frac{a}{b}} \operatorname{erf}\left(\frac{\sqrt{a+b} \operatorname{arcsinh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi}}{b^{\frac{3}{2}} d} \\ & + \frac{\operatorname{erfi}\left(\frac{\sqrt{a+b} \operatorname{arcsinh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi} e^{-\frac{a}{b}}}{b^{\frac{3}{2}} d} - \frac{2 \sqrt{1 + (dx+c)^2}}{bd\sqrt{a+b \operatorname{arcsinh}(dx+c)}} \end{aligned}$$

command

`Integrate[(a + b*ArcSinh[c + d*x])^(-3/2), x]`

Mathematica 13.1 output

$$\int \frac{1}{(a + b \sinh^{-1}(c + dx))^{3/2}} dx$$

Mathematica 12.3 output

$$\frac{e^{-\frac{a+b \sinh^{-1}(c+dx)}{b}} \left(-e^{a/b} \left(e^{2 \sinh^{-1}(c+dx)} + 1 \right) + e^{\frac{2a}{b} + \sinh^{-1}(c+dx)} \sqrt{\frac{a}{b} + \sinh^{-1}(c+dx)} \Gamma\left(\frac{1}{2}, \frac{a}{b} + \sinh^{-1}(c+dx)\right) + e^{\frac{2a}{b} + \sinh^{-1}(c+dx)} \sqrt{\frac{a}{b} + \sinh^{-1}(c+dx)} \Gamma\left(\frac{1}{2}, \frac{a}{b} + \sinh^{-1}(c+dx)\right) \right)}{bd \sqrt{a + b \sinh^{-1}(c + dx)}}$$

16.5 Problem number 220

$$\int \frac{1}{(a + b \sinh^{-1}(c + dx))^{5/2}} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{2 e^{\frac{a}{b}} \operatorname{erf}\left(\frac{\sqrt{a+b \operatorname{arcsinh}(d x+c)}}{\sqrt{b}}\right) \sqrt{\pi}}{3 b^{\frac{5}{2}} d}+\frac{2 \operatorname{erfi}\left(\frac{\sqrt{a+b \operatorname{arcsinh}(d x+c)}}{\sqrt{b}}\right) \sqrt{\pi} e^{-\frac{a}{b}}}{3 b^{\frac{5}{2}} d} \\ &-\frac{2 \sqrt{1+(d x+c)^2}}{3 b d(a+b \operatorname{arcsinh}(d x+c))^{\frac{3}{2}}}-\frac{4(d x+c)}{3 b^2 d \sqrt{a+b \operatorname{arcsinh}(d x+c)}} \end{aligned}$$

command

`Integrate[(a + b*ArcSinh[c + d*x])^(-5/2), x]`

Mathematica 13.1 output

$$\int \frac{1}{(a + b \sinh^{-1}(c + dx))^{5/2}} dx$$

Mathematica 12.3 output

$$\frac{e^{-\frac{a+b \sinh^{-1}(c+dx)}{b}} \left(-e^{a/b} \left(2a \left(e^{2 \sinh^{-1}(c+dx)} - 1 \right) - 2b \sinh^{-1}(c+dx) + b e^{2 \sinh^{-1}(c+dx)} (2 \sinh^{-1}(c+dx) + 1) + b \right) \right)}{bd \sqrt{a + b \sinh^{-1}(c + dx)}}$$

17 Test file number 190

Test folder name:

`test_cases/7_Inverse_hyperbolic_functions/7.2_Inverse_hyperbolic_cosine/190_7.2.4-f_x-^m-d+e_x^2-^p-a+b_arccosh-c_x-^n`

17.1 Problem number 519

$$\int (fx)^m (d + ex^2)^3 (a + b \cosh^{-1}(cx)) dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{d^3(fx)^{1+m} (a + b \operatorname{arccosh}(cx))}{f(1+m)} + \frac{3d^2e(fx)^{3+m} (a + b \operatorname{arccosh}(cx))}{f^3(3+m)} \\ & + \frac{3de^2(fx)^{5+m} (a + b \operatorname{arccosh}(cx))}{f^5(5+m)} + \frac{e^3(fx)^{7+m} (a + b \operatorname{arccosh}(cx))}{f^7(7+m)} \\ & + \frac{be \left(3c^2de(7+m)^2 (m^2 + 7m + 12) + 3c^4d^2(m^2 + 12m + 35)^2 + e^2(m^4 + 18m^3 + 119m^2 + 342m + 360) \right) (fx)^{2+m}}{c^5f^2(3+m)^2(5+m)^2(7+m)^2\sqrt{cx-1}\sqrt{cx+1}} \\ & + \frac{be^2 \left(3c^2d(7+m)^2 + e(m^2 + 11m + 30) \right) (fx)^{4+m} (-c^2x^2 + 1)}{c^3f^4(5+m)^2(7+m)^2\sqrt{cx-1}\sqrt{cx+1}} \\ & + \frac{be^3(fx)^{6+m} (-c^2x^2 + 1)}{cf^6(7+m)^2\sqrt{cx-1}\sqrt{cx+1}} \\ & - \frac{b \left(\frac{c^6d^3(3+m)(5+m)(7+m)}{1+m} + \frac{e(2+m) \left(3c^2de(7+m)^2(m^2 + 7m + 12) + 3c^4d^2(m^2 + 12m + 35)^2 + e^2(m^4 + 18m^3 + 119m^2 + 342m + 360) \right)}{m^3 + 15m^2 + 71m + 105} \right) (fx)^{5+m}}{c^5f^2(2+m)(3+m)(5+m)(7+m)\sqrt{cx-1}\sqrt{cx+1}} \end{aligned}$$

command

`Integrate[(f*x)^m*(d + e*x^2)^3*(a + b*ArcCosh[c*x]),x]`

Mathematica 13.1 output

$$\int (fx)^m (d + ex^2)^3 (a + b \cosh^{-1}(cx)) dx$$

Mathematica 12.3 output

$$\begin{aligned}
& x(fx)^m \left(\frac{d^3(a + b \cosh^{-1}(cx))}{m+1} + \frac{3d^2ex^2(a + b \cosh^{-1}(cx))}{m+3} + \frac{3de^2x^4(a + b \cosh^{-1}(cx))}{m+5} \right. \\
& + \frac{e^3x^6(a + b \cosh^{-1}(cx))}{m+7} - \frac{bcd^3x\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; c^2x^2)}{(m^2+3m+2)\sqrt{cx-1}\sqrt{cx+1}} \\
& - \frac{3bcd^2ex^3\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+4}{2}; \frac{m+6}{2}; c^2x^2)}{(m^2+7m+12)\sqrt{cx-1}\sqrt{cx+1}} \\
& - \frac{3bcde^2x^5\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+6}{2}; \frac{m+8}{2}; c^2x^2)}{(m+5)(m+6)\sqrt{cx-1}\sqrt{cx+1}} \\
& \left. - \frac{bce^3x^7\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m}{2}+4; \frac{m}{2}+5; c^2x^2)}{(m+7)(m+8)\sqrt{cx-1}\sqrt{cx+1}} \right)
\end{aligned}$$

17.2 Problem number 520

$$\int (fx)^m (d + ex^2)^2 (a + b \cosh^{-1}(cx)) dx$$

Optimal antiderivative

$$\begin{aligned}
& \frac{d^2(fx)^{1+m}(a + b \operatorname{arccosh}(cx))}{f(1+m)} + \frac{2de(fx)^{3+m}(a + b \operatorname{arccosh}(cx))}{f^3(3+m)} + \frac{e^2(fx)^{5+m}(a + b \operatorname{arccosh}(cx))}{f^5(5+m)} \\
& + \frac{be(2c^2d(5+m)^2 + e(m^2+7m+12))(fx)^{2+m}(-c^2x^2+1)}{c^3f^2(3+m)^2(5+m)^2\sqrt{cx-1}\sqrt{cx+1}} + \frac{be^2(fx)^{4+m}(-c^2x^2+1)}{cf^4(5+m)^2\sqrt{cx-1}\sqrt{cx+1}} \\
& - \frac{b\left(\frac{c^4d^2(3+m)(5+m)}{1+m} + \frac{e(2+m)(2c^2d(5+m)^2+e(m^2+7m+12))}{(3+m)(5+m)}\right)(fx)^{2+m} \operatorname{hypergeom}([\frac{1}{2}, 1+\frac{m}{2}], [2+\frac{m}{2}], c^2x^2) \sqrt{-c^2x^2}}{c^3f^2(2+m)(3+m)(5+m)\sqrt{cx-1}\sqrt{cx+1}}
\end{aligned}$$

command

`Integrate[(f*x)^m*(d + e*x^2)^2*(a + b*ArcCosh[c*x]),x]`

Mathematica 13.1 output

$$\int (fx)^m (d + ex^2)^2 (a + b \cosh^{-1}(cx)) dx$$

Mathematica 12.3 output

$$\begin{aligned}
& x(fx)^m \left(\frac{d^2(a + b \cosh^{-1}(cx))}{m+1} + \frac{2dex^2(a + b \cosh^{-1}(cx))}{m+3} + \frac{e^2x^4(a + b \cosh^{-1}(cx))}{m+5} \right. \\
& - \frac{bcd^2x\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; c^2x^2)}{(m^2+3m+2)\sqrt{cx-1}\sqrt{cx+1}} - \frac{2bcdex^3\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+4}{2}; \frac{m+6}{2}; c^2x^2)}{(m^2+7m+12)\sqrt{cx-1}\sqrt{cx+1}} \\
& \left. - \frac{bce^2x^5\sqrt{1-c^2x^2}{}_2F_1(\frac{1}{2}, \frac{m+6}{2}; \frac{m+8}{2}; c^2x^2)}{(m+5)(m+6)\sqrt{cx-1}\sqrt{cx+1}} \right)
\end{aligned}$$

17.3 Problem number 521

$$\int (fx)^m (d + ex^2) (a + b \cosh^{-1}(cx)) dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{d(fx)^{1+m} (a + b \operatorname{arccosh}(cx))}{f(1+m)} + \frac{e(fx)^{3+m} (a + b \operatorname{arccosh}(cx))}{f^3(3+m)} - \frac{be(fx)^{2+m} \sqrt{cx-1} \sqrt{cx+1}}{c f^2 (3+m)^2} \\ & - \frac{b \left(e(1+m)(2+m) + c^2 d(3+m)^2 \right) (fx)^{2+m} \operatorname{hypergeom}\left(\left[\frac{1}{2}, 1+\frac{m}{2}\right], \left[2+\frac{m}{2}\right], c^2 x^2\right) \sqrt{-c^2 x^2 + 1}}{c f^2 (1+m)(2+m)(3+m)^2 \sqrt{cx-1} \sqrt{cx+1}} \end{aligned}$$

command

```
Integrate[(f*x)^m*(d + e*x^2)*(a + b*ArcCosh[c*x]), x]
```

Mathematica 13.1 output

$$\int (fx)^m (d + ex^2) (a + b \cosh^{-1}(cx)) dx$$

Mathematica 12.3 output

$$x(fx)^m \left(\begin{array}{l} \frac{\frac{(d(m+3)+e(m+1)x^2)(a+b \cosh^{-1}(cx))}{m+1} - \frac{bcex^3 \sqrt{1-c^2 x^2} {}_2F_1\left(\frac{1}{2}, \frac{m+4}{2}; \frac{m+6}{2}; c^2 x^2\right)}{(m+4)\sqrt{cx-1} \sqrt{cx+1}}}{m+3} \\ - \frac{bcdx \sqrt{1-c^2 x^2} {}_2F_1\left(\frac{1}{2}, \frac{m+2}{2}; \frac{m+4}{2}; c^2 x^2\right)}{(m^2+3m+2)\sqrt{cx-1} \sqrt{cx+1}} \end{array} \right)$$

18 Test file number 191

Test folder name:

test_cases/7_Inverse_hyperbolic_functions/7.2_Inverse_hyperbolic_cosine/191_7.2.5_Inverse_hyp

18.1 Problem number 178

$$\int \frac{1}{\sqrt{a + b \cosh^{-1}(c + dx)}} dx$$

Optimal antiderivative

$$-\frac{e^{\frac{a}{b}} \operatorname{erf}\left(\frac{\sqrt{a+b} \operatorname{arccosh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi}}{2d\sqrt{b}} + \frac{\operatorname{erfi}\left(\frac{\sqrt{a+b} \operatorname{arccosh}(dx+c)}{\sqrt{b}}\right) \sqrt{\pi} e^{-\frac{a}{b}}}{2d\sqrt{b}}$$

command

```
Integrate[1/Sqrt[a + b*ArcCosh[c + d*x]],x]
```

Mathematica 13.1 output

$$\int \frac{1}{\sqrt{a + b \cosh^{-1}(c + dx)}} dx$$

Mathematica 12.3 output

$$\frac{e^{-\frac{a}{b}} \left(e^{\frac{2a}{b}} \sqrt{\frac{a}{b} + \cosh^{-1}(c+dx)} \Gamma\left(\frac{1}{2}, \frac{a}{b} + \cosh^{-1}(c+dx)\right) + \sqrt{-\frac{a+b \cosh^{-1}(c+dx)}{b}} \Gamma\left(\frac{1}{2}, -\frac{a+b \cosh^{-1}(c+dx)}{b}\right) \right)}{2d\sqrt{a + b \cosh^{-1}(c + dx)}}$$

19 Test file number 197

Test folder name:

```
test_cases/7_Inverse_hyperbolic_functions/7.3_Inverse_hyperbolic_tangent/197_7.3.7_Inverse_hy
```

19.1 Problem number 4

$$\int \frac{\tanh^{-1}\left(\frac{\sqrt{e} x}{\sqrt{d+e x^2}}\right)}{x} dx$$

Optimal antiderivative

$$\begin{aligned}
& \operatorname{arctanh}\left(\frac{x\sqrt{e}}{\sqrt{ex^2+d}}\right) \ln(x) - \frac{\operatorname{arcsinh}\left(\frac{x\sqrt{e}}{\sqrt{d}}\right)^2 \sqrt{d} \sqrt{1+\frac{ex^2}{d}}}{2\sqrt{ex^2+d}} \\
& + \frac{\operatorname{arcsinh}\left(\frac{x\sqrt{e}}{\sqrt{d}}\right) \ln\left(1 - \left(\frac{x\sqrt{e}}{\sqrt{d}} + \sqrt{1+\frac{ex^2}{d}}\right)^2\right) \sqrt{d} \sqrt{1+\frac{ex^2}{d}}}{\sqrt{ex^2+d}} \\
& - \frac{\operatorname{arcsinh}\left(\frac{x\sqrt{e}}{\sqrt{d}}\right) \ln(x) \sqrt{d} \sqrt{1+\frac{ex^2}{d}}}{\sqrt{ex^2+d}} \\
& + \frac{\operatorname{polylog}\left(2, \left(\frac{x\sqrt{e}}{\sqrt{d}} + \sqrt{1+\frac{ex^2}{d}}\right)^2\right) \sqrt{d} \sqrt{1+\frac{ex^2}{d}}}{2\sqrt{ex^2+d}}
\end{aligned}$$

command

```
Integrate[ArcTanh[(Sqrt[e]*x)/Sqrt[d + e*x^2]]/x,x]
```

Mathematica 13.1 output

$$\int \frac{\tanh^{-1}\left(\frac{\sqrt{e}x}{\sqrt{d+ex^2}}\right)}{x} dx$$

Mathematica 12.3 output

$$\begin{aligned}
& \frac{\sqrt{e} \sqrt{\frac{ex^2}{d} + 1} \left(-\text{Li}_2\left(e^{-2 \sinh^{-1}\left(\sqrt{\frac{e}{d}} x\right)}\right) - 2 \log(x) \log\left(\sqrt{\frac{ex^2}{d} + 1} + x \sqrt{\frac{e}{d}}\right) + \sinh^{-1}\left(x \sqrt{\frac{e}{d}}\right)^2 + 2 \sinh^{-1}\left(x \sqrt{\frac{e}{d}}\right)\right)}{2 \sqrt{\frac{e}{d}} \sqrt{d+ex^2}} \\
& + \log(x) \tanh^{-1}\left(\frac{\sqrt{e}x}{\sqrt{d+ex^2}}\right)
\end{aligned}$$

20 Test file number 201

Test folder name:

test_cases/7_Inverse_hyperbolic_functions/7.5_Inverse_hyperbolic_secant/201_7.5.2_Inverse_hyp

20.1 Problem number 18

$$\int \frac{\operatorname{sech}^{-1}(a + bx)^3}{x^2} dx$$

Optimal antiderivative

$$\begin{aligned}
& - \frac{\text{barcsech}(bx + a)^3}{a} - \frac{\text{arcsech}(bx + a)^3}{x} \\
& + \frac{3 \text{barcsech}(bx + a)^2 \ln \left(1 - \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 - \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}} \\
& - \frac{3 \text{barcsech}(bx + a)^2 \ln \left(1 - \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 + \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}} \\
& + \frac{6b \text{arcsech}(bx + a) \text{polylog} \left(2, \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 - \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}} \\
& - \frac{6b \text{arcsech}(bx + a) \text{polylog} \left(2, \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 + \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}} \\
& - \frac{6b \text{polylog} \left(3, \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 - \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}} \\
& + \frac{6b \text{polylog} \left(3, \frac{a \left(\frac{1}{bx+a} + \sqrt{\frac{1}{bx+a} - 1} \right) \sqrt{1 + \frac{1}{bx+a}}}{1 + \sqrt{-a^2 + 1}} \right)}{a \sqrt{-a^2 + 1}}
\end{aligned}$$

command

`Integrate[ArcSech[a + b*x]^3/x^2, x]`

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

output too large to display

20.2 Problem number 58

$$\int e^{\operatorname{sech}^{-1}(ax)} x^m dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{x^m}{am(1+m)} + \frac{\left(\frac{1}{ax} + \sqrt{\frac{1}{ax} - 1}\right) \sqrt{1 + \frac{1}{ax}}}{1+m} x^{1+m} \\ & + \frac{x^m \operatorname{hypergeom}\left(\left[\frac{1}{2}, \frac{m}{2}\right], \left[1 + \frac{m}{2}\right], a^2 x^2\right) \sqrt{\frac{1}{ax+1}} \sqrt{ax+1}}{am(1+m)} \end{aligned}$$

command

```
Integrate[E^ArcSech[a*x]*x^m,x]
```

Mathematica 13.1 output

$$\int e^{\operatorname{sech}^{-1}(ax)} x^m dx$$

Mathematica 12.3 output

$$\begin{aligned} & \frac{2^{m+1} x^m (ax)^{-m} e^{2\operatorname{sech}^{-1}(ax)} \left(\frac{e^{\operatorname{sech}^{-1}(ax)}}{e^{2\operatorname{sech}^{-1}(ax)} + 1}\right)^m \left(e^{2\operatorname{sech}^{-1}(ax)} + 1\right)^m ((m+2)e^{2\operatorname{sech}^{-1}(ax)} {}_2F_1\left(\frac{m}{2} + 2, m+2; \frac{m}{2} + 3; \right. \\ & \left. \left.e^{2\operatorname{sech}^{-1}(ax)}\right) \right)}{a(m+2)(m+4)} \end{aligned}$$

21 Test file number 209

Test folder name:

`test_cases/209_Blake_problems`

21.1 Problem number 3046

$$\int \frac{x^4}{\sqrt[4]{b+ax^4} (b+2ax^4+2x^8)} dx$$

Optimal antiderivative

$$\begin{aligned} & \frac{\left(-1 + (-1)^{\frac{1}{4}}\right) \arctan\left(\frac{(-1)^{\frac{7}{8}} \sqrt{2+\sqrt{2}} (a^2-2b)^{\frac{1}{8}} x (a x^4+b)^{\frac{1}{4}}}{(-1)^{\frac{3}{4}} (a^2-2b)^{\frac{1}{4}} x^2 + \sqrt{a x^4 + b}}\right)}{8 (a^2 - 2b)^{\frac{5}{8}}} \\ & + \frac{I\left(I\sqrt{2} + 2 + \sqrt{2}\right) \arctan\left(\frac{(-1)^{\frac{7}{8}} (-2+\sqrt{2}) (a^2-2b)^{\frac{1}{8}} x (a x^4+b)^{\frac{1}{4}}}{(-1)^{\frac{3}{4}} \sqrt{2-\sqrt{2}} (a^2-2b)^{\frac{1}{4}} x^2 + \sqrt{2-\sqrt{2}} \sqrt{a x^4 + b}}\right)}{16 (a^2 - 2b)^{\frac{5}{8}}} \\ & + \frac{\left(\sqrt{2} - I(2 + \sqrt{2})\right) \operatorname{arctanh}\left(\frac{(-1)^{\frac{7}{8}} (a^2-2b)^{\frac{1}{4}} x^2 - (-1)^{\frac{1}{8}} \sqrt{a x^4 + b}}{\sqrt{2-\sqrt{2}} (a^2-2b)^{\frac{1}{8}} x (a x^4+b)^{\frac{1}{4}}}\right)}{16 (a^2 - 2b)^{\frac{5}{8}}} \\ & + \frac{\left(-1 + (-1)^{\frac{1}{4}}\right) \operatorname{arctanh}\left(\frac{(-1)^{\frac{7}{8}} (a^2-2b)^{\frac{1}{4}} x^2 - (-1)^{\frac{1}{8}} \sqrt{a x^4 + b}}{\sqrt{2+\sqrt{2}} (a^2-2b)^{\frac{1}{8}} x (a x^4+b)^{\frac{1}{4}}}\right)}{8 (a^2 - 2b)^{\frac{5}{8}}} \end{aligned}$$

command

`Integrate[x^4/((b + a*x^4)^(1/4)*(b + 2*a*x^4 + 2*x^8)), x]`

Mathematica 13.1 output

$$\int \frac{x^4}{\sqrt[4]{b+ax^4} (b+2ax^4+2x^8)} dx$$

Mathematica 12.3 output

$$\begin{aligned} & -\frac{\sqrt[4]{a - \sqrt{a^2 - 2b}} \tan^{-1}\left(\frac{\sqrt[4]{-a \sqrt{a^2 - 2b}} + a^2 - 2b}{\sqrt[4]{a - \sqrt{a^2 - 2b}} \sqrt[4]{a x^4 + b}}\right)}{\sqrt[4]{-a \sqrt{a^2 - 2b}} + a^2 - 2b} + \frac{\sqrt[4]{\sqrt{a^2 - 2b} + a} \tan^{-1}\left(\frac{\sqrt[4]{a \sqrt{a^2 - 2b}} + a^2 - 2b}{\sqrt[4]{\sqrt{a^2 - 2b} + a} \sqrt[4]{a x^4 + b}}\right)}{\sqrt[4]{a \sqrt{a^2 - 2b}} + a^2 - 2b} \end{aligned}$$

22 Test file number 210

Test folder name:

`test_cases/210_Hebisch`

22.1 Problem number 8

$$\int \frac{(-8 - 3x) \log^2(x) + (-4 - x) \log^2(x) \log(4x^2 + x^3) + (-8 - 2x + (-8 - 2x) \log(x) + (20x^2 + 5x^3) \log^2(x)) \log(4x^2 + x^3)}{(4x + x^2) \log^2(x) \log(4x^2 + x^3) + ((8x + 2x^2) \log(x) + (8x^2 + 22x^3 + 5x^4) \log^2(x)) \log^2(4x^2 + x^3)}$$

Optimal antiderivative

$$\ln \left(5x + \frac{\frac{2 + \frac{\ln(x)}{\ln(x^2(4+x))}}{\ln(x)}}{x} + 2x \right)$$

command

```
Integrate[((-8 - 3*x)*Log[x]^2 + (-4 - x)*Log[x]^2*Log[4*x^2 + x^3] + (-8 - 2*x + (-8 - 2*x)*Log[x] + (20*x^2 + 5*x^3)*Log[x]^2)*Log[4*x^2 + x^3]^2)/((4*x + x^2)*Log[x]^2*Log[4*x^2 + x^3])]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$\begin{aligned} & \log(2 + 5x) - \log(x(2 + 5x)) - \log(\log(x)) - \log(\log(x^2(4 + x))) \\ & + \log(\log(x) + 2 \log(x^2(4 + x)) + 2x \log(x) \log(x^2(4 + x)) + 5x^2 \log(x) \log(x^2(4 + x))) \end{aligned}$$

22.2 Problem number 19

$$\int \frac{-1728x^3 + 1728x^4 - 576x^5 + 64x^6 + (864x^2 - 576x^3 + 96x^4) \log(4) + (-144x + 48x^2) \log^2(4) + 8 \log^3(4) + e^{3x}}{-1728x^3 + 1728x^4 - 576x^5 + 64x^6 + (864x^2 - 576x^3 + 96x^4) \log(4) + (-144x + 48x^2) \log^2(4) + 8 \log^3(4) + e^{3x}}$$

Optimal antiderivative

$$\left(\frac{e^x}{(2 \ln(2) - x(6 - 2x))(2 + e^x)} + 1 \right)^2$$

command

```
Integrate[(E^(3*x)*(12 - 80*x + 72*x^2 - 16*x^3 + (12 - 8*x)*Log[4]) + E^(2*x)*(24 - 328*x + 288*x + 576*x^2 - 256*x^3 + 32*x^4 + (48 - 128*x + 32*x^2)*Log[4] + 8*Log[4]^2))/(-1728*x^3 + 1728*x^4 - 576*x^5 + 64*x^6 + (864*x^2 - 576*x^3 + 96*x^4)*Log[4] + (-144*x + 48*x^2)*x^3 + 216*x^4 - 72*x^5 + 8*x^6 + (108*x^2 - 72*x^3 + 12*x^4)*Log[4] + (-18*x + 6*x^2)*Log[4]^2 + 1296*x^3 + 1296*x^4 - 432*x^5 + 48*x^6 + (648*x^2 - 432*x^3 + 72*x^4)*Log[4] + (-108*x + 36*x^2)*x^3 + 2592*x^4 - 864*x^5 + 96*x^6 + (1296*x^2 - 864*x^3 + 144*x^4)*Log[4] + (-216*x + 72*x^2)*Log[4]^2 + 12*Log[4]^3)),x]
```

Mathematica 13.1 output

$$\int \frac{-1728x^3 + 1728x^4 - 576x^5 + 64x^6 + (864x^2 - 576x^3 + 96x^4)\log(4) + (-144x + 48x^2)\log^2(4) + 8\log^3(4) + e^{3x}}{-1728x^3 + 1728x^4 - 576x^5 + 64x^6 + (864x^2 - 576x^3 + 96x^4)\log(4) + (-144x + 48x^2)\log^2(4) + 8\log^3(4) + e^{3x}}$$

Mathematica 12.3 output

$$-\frac{e^x \left(-e^x \left(-6 x+2 x^2+\log (4)\right)^2 \left(1-12 x+4 x^2+\log (16)\right)-4 \left(-72 x^5+8 x^6+\log ^3(4)-4 x^3 (54+28 \log (4)-5 \log ^2(4))\right.\right.\left.\left.-4 x^2 (144+28 \log (4)-5 \log ^2(4))+8 x^3 (28+2 \log (4))+8 x^4 (4+2 \log (4))+8 x^5 (1+2 \log (4))+8 x^6 (1+2 \log (4))+8 e^x \left(-6 x^2+2 x^3\right) \log (x)+\left(x^2-x^3+(-2 x^2+2 x^3)\right) \log (x)+e^{2 x} \left(8 x^2-16 x^2 \log (x)\right)+e^{3 x} \left(8 x^3-16 x^3 \log (x)\right)+e^{4 x} \left(8 x^4-16 x^4 \log (x)\right)+e^{5 x} \left(8 x^5-16 x^5 \log (x)\right)+e^{6 x} \left(8 x^6-16 x^6 \log (x)\right)\right)\right)}{(2+e^x)^2 (-1-8 e^x-4 e^{2 x})^2}$$

22.3 Problem number 38

$$\int \frac{-x^3 \log (x)+8 e^{e^x+x} x^3 \log (x)+8 e^{2 e^x+x} x^3 \log (x)+\left(x^2-x^3+(-2 x^2+2 x^3)\right) \log (x)+e^{e^x} \left(8 x^2-16 x^2 \log (x)\right)+e^{2 e^x} \left(8 x^3-16 x^3 \log (x)\right)+e^{3 e^x} \left(8 x^4-16 x^4 \log (x)\right)+e^{4 e^x} \left(8 x^5-16 x^5 \log (x)\right)+e^{5 e^x} \left(8 x^6-16 x^6 \log (x)\right)}{x^5+8 e^{e^x} x^5+4 e^{2 e^x} x^5-x^6+(4 x^3+32 e^{e^x} x^3+16 e^{2 e^x} x^3-4 x^4) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^7+(8 x^5+32 e^{e^x} x^5+16 e^{2 e^x} x^5-4 x^6) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^8+(16 x^7+64 e^{e^x} x^7+32 e^{2 e^x} x^7-8 x^8) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^9+(32 x^9+128 e^{e^x} x^9+64 e^{2 e^x} x^9-16 x^{10}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{11}+(64 x^{11}+256 e^{e^x} x^{11}+128 e^{2 e^x} x^{11}-32 x^{12}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{13}+(128 x^{13}+512 e^{e^x} x^{13}+256 e^{2 e^x} x^{13}-64 x^{14}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{15}+(256 x^{15}+1024 e^{e^x} x^{15}+512 e^{2 e^x} x^{15}-128 x^{16}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{17}+(512 x^{17}+2048 e^{e^x} x^{17}+1024 e^{2 e^x} x^{17}-256 x^{18}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{19}+(1024 x^{19}+4096 e^{e^x} x^{19}+2048 e^{2 e^x} x^{19}-4096 e^{3 e^x} x^{19}-4096 e^{4 e^x} x^{19}+4096 e^{5 e^x} x^{19}-4096 e^{6 e^x} x^{19}+4096 e^{7 e^x} x^{19}-4096 e^{8 e^x} x^{19}+4096 e^{9 e^x} x^{19}-4096 e^{10 e^x} x^{19}+4096 e^{11 e^x} x^{19}-4096 e^{12 e^x} x^{19}+4096 e^{13 e^x} x^{19}-4096 e^{14 e^x} x^{19}+4096 e^{15 e^x} x^{19}-4096 e^{16 e^x} x^{19}+4096 e^{17 e^x} x^{19}-4096 e^{18 e^x} x^{19}+4096 e^{19 e^x} x^{19}-4096 e^{20 e^x} x^{19}+4096 e^{21 e^x} x^{19}-4096 e^{22 e^x} x^{19}+4096 e^{23 e^x} x^{19}-4096 e^{24 e^x} x^{19}+4096 e^{25 e^x} x^{19}-4096 e^{26 e^x} x^{19}+4096 e^{27 e^x} x^{19}-4096 e^{28 e^x} x^{19}+4096 e^{29 e^x} x^{19}-4096 e^{30 e^x} x^{19}+4096 e^{31 e^x} x^{19}-4096 e^{32 e^x} x^{19}+4096 e^{33 e^x} x^{19}-4096 e^{34 e^x} x^{19}+4096 e^{35 e^x} x^{19}-4096 e^{36 e^x} x^{19}+4096 e^{37 e^x} x^{19}-4096 e^{38 e^x} x^{19}+4096 e^{39 e^x} x^{19}-4096 e^{40 e^x} x^{19}+4096 e^{41 e^x} x^{19}-4096 e^{42 e^x} x^{19}+4096 e^{43 e^x} x^{19}-4096 e^{44 e^x} x^{19}+4096 e^{45 e^x} x^{19}-4096 e^{46 e^x} x^{19}+4096 e^{47 e^x} x^{19}-4096 e^{48 e^x} x^{19}+4096 e^{49 e^x} x^{19}-4096 e^{50 e^x} x^{19}+4096 e^{51 e^x} x^{19}-4096 e^{52 e^x} x^{19}+4096 e^{53 e^x} x^{19}-4096 e^{54 e^x} x^{19}+4096 e^{55 e^x} x^{19}-4096 e^{56 e^x} x^{19}+4096 e^{57 e^x} x^{19}-4096 e^{58 e^x} x^{19}+4096 e^{59 e^x} x^{19}-4096 e^{60 e^x} x^{19}+4096 e^{61 e^x} x^{19}-4096 e^{62 e^x} x^{19}+4096 e^{63 e^x} x^{19}-4096 e^{64 e^x} x^{19}+4096 e^{65 e^x} x^{19}-4096 e^{66 e^x} x^{19}+4096 e^{67 e^x} x^{19}-4096 e^{68 e^x} x^{19}+4096 e^{69 e^x} x^{19}-4096 e^{70 e^x} x^{19}+4096 e^{71 e^x} x^{19}-4096 e^{72 e^x} x^{19}+4096 e^{73 e^x} x^{19}-4096 e^{74 e^x} x^{19}+4096 e^{75 e^x} x^{19}-4096 e^{76 e^x} x^{19}+4096 e^{77 e^x} x^{19}-4096 e^{78 e^x} x^{19}+4096 e^{79 e^x} x^{19}-4096 e^{80 e^x} x^{19})$$

Optimal antiderivative

$$\frac{\ln (x)}{2+\frac{x^2}{\ln \left(\frac{3}{4}+\frac{x}{4}-\left(e^{e^x}+1\right)^2\right)}}$$

command

```
Integrate[((-x^3 Log[x]) + 8*E^(E^x + x)*x^3 Log[x] + 8*E^(2*E^x + x)*x^3 Log[x] + (x^2 - x^3 + (-2 x^2 + 2 x^3) Log[x] + e^{e^x} (8 x^2 - 16 x^2 Log[x]) + e^{2 e^x} (8 x^3 - 16 x^3 Log[x]) + e^{3 e^x} (8 x^4 - 16 x^4 Log[x]) + e^{4 e^x} (8 x^5 - 16 x^5 Log[x]) + e^{5 e^x} (8 x^6 - 16 x^6 Log[x])) Log[-1 - 8 e^x - 4 e^{2 x}]),x]
```

Mathematica 13.1 output

$$\int \frac{-x^3 \log (x)+8 e^{e^x+x} x^3 \log (x)+8 e^{2 e^x+x} x^3 \log (x)+\left(x^2-x^3+(-2 x^2+2 x^3)\right) \log (x)+e^{e^x} \left(8 x^2-16 x^2 \log (x)\right)+e^{2 e^x} \left(8 x^3-16 x^3 \log (x)\right)+e^{3 e^x} \left(8 x^4-16 x^4 \log (x)\right)+e^{4 e^x} \left(8 x^5-16 x^5 \log (x)\right)+e^{5 e^x} \left(8 x^6-16 x^6 \log (x)\right)}{x^5+8 e^{e^x} x^5+4 e^{2 e^x} x^5-x^6+(4 x^3+32 e^{e^x} x^3+16 e^{2 e^x} x^3-4 x^4) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^7+(8 x^5+32 e^{e^x} x^5+16 e^{2 e^x} x^5-4 x^6) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^8+(16 x^7+64 e^{e^x} x^7+32 e^{2 e^x} x^7-8 x^8) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^9+(32 x^9+128 e^{e^x} x^9+64 e^{2 e^x} x^9-16 x^{10}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{11}+(64 x^{11}+256 e^{e^x} x^{11}+128 e^{2 e^x} x^{11}-32 x^{12}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{13}+(128 x^{13}+512 e^{e^x} x^{13}+256 e^{2 e^x} x^{13}-64 x^{14}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{15}+(256 x^{15}+1024 e^{e^x} x^{15}+512 e^{2 e^x} x^{15}-128 x^{16}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{17}+(512 x^{17}+2048 e^{e^x} x^{17}+1024 e^{2 e^x} x^{17}-256 x^{18}) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x})\right)+x^{19}+(1024 x^{19}+4096 e^{e^x} x^{19}+2048 e^{2 e^x} x^{19}-4096 e^{3 e^x} x^{19}-4096 e^{4 e^x} x^{19}+4096 e^{5 e^x} x^{19}-4096 e^{6 e^x} x^{19}+4096 e^{7 e^x} x^{19}-4096 e^{8 e^x} x^{19}+4096 e^{9 e^x} x^{19}-4096 e^{10 e^x} x^{19}+4096 e^{11 e^x} x^{19}-4096 e^{12 e^x} x^{19}+4096 e^{13 e^x} x^{19}-4096 e^{14 e^x} x^{19}+4096 e^{15 e^x} x^{19}-4096 e^{16 e^x} x^{19}+4096 e^{17 e^x} x^{19}-4096 e^{18 e^x} x^{19}+4096 e^{19 e^x} x^{19}-4096 e^{20 e^x} x^{19}+4096 e^{21 e^x} x^{19}-4096 e^{22 e^x} x^{19}+4096 e^{23 e^x} x^{19}-4096 e^{24 e^x} x^{19}+4096 e^{25 e^x} x^{19}-4096 e^{26 e^x} x^{19}+4096 e^{27 e^x} x^{19}-4096 e^{28 e^x} x^{19}+4096 e^{29 e^x} x^{19}-4096 e^{30 e^x} x^{19}+4096 e^{31 e^x} x^{19}-4096 e^{32 e^x} x^{19}+4096 e^{33 e^x} x^{19}-4096 e^{34 e^x} x^{19}+4096 e^{35 e^x} x^{19}-4096 e^{36 e^x} x^{19}+4096 e^{37 e^x} x^{19}-4096 e^{38 e^x} x^{19}+4096 e^{39 e^x} x^{19}-4096 e^{40 e^x} x^{19}+4096 e^{41 e^x} x^{19}-4096 e^{42 e^x} x^{19}+4096 e^{43 e^x} x^{19}-4096 e^{44 e^x} x^{19}+4096 e^{45 e^x} x^{19}-4096 e^{46 e^x} x^{19}+4096 e^{47 e^x} x^{19}-4096 e^{48 e^x} x^{19}+4096 e^{49 e^x} x^{19}-4096 e^{50 e^x} x^{19}+4096 e^{51 e^x} x^{19}-4096 e^{52 e^x} x^{19}+4096 e^{53 e^x} x^{19}-4096 e^{54 e^x} x^{19}+4096 e^{55 e^x} x^{19}-4096 e^{56 e^x} x^{19}+4096 e^{57 e^x} x^{19}-4096 e^{58 e^x} x^{19}+4096 e^{59 e^x} x^{19}-4096 e^{60 e^x} x^{19}+4096 e^{61 e^x} x^{19}-4096 e^{62 e^x} x^{19}+4096 e^{63 e^x} x^{19}-4096 e^{64 e^x} x^{19}+4096 e^{65 e^x} x^{19}-4096 e^{66 e^x} x^{19}+4096 e^{67 e^x} x^{19}-4096 e^{68 e^x} x^{19}+4096 e^{69 e^x} x^{19}-4096 e^{70 e^x} x^{19}+4096 e^{71 e^x} x^{19}-4096 e^{72 e^x} x^{19}+4096 e^{73 e^x} x^{19}-4096 e^{74 e^x} x^{19}+4096 e^{75 e^x} x^{19}-4096 e^{76 e^x} x^{19}+4096 e^{77 e^x} x^{19}-4096 e^{78 e^x} x^{19}+4096 e^{79 e^x} x^{19}-4096 e^{80 e^x} x^{19})$$

Mathematica 12.3 output

$$\frac{\log (x) \left(2 \left(8 e^{e^x+x}+8 e^{2 e^x+x}+8 e^{e^x} x+4 e^{2 e^x} x-x^2\right) \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x}+x)\right)-(-1+x) \left(\log (16)-2 \log \left(-1+8 e^{e^x+x}+8 e^{2 e^x+x}+x+8 e^{e^x} x+4 e^{2 e^x} x-x^2\right)\right)\right)}{2 \left(-1+8 e^{e^x+x}+8 e^{2 e^x+x}+x+8 e^{e^x} x+4 e^{2 e^x} x-x^2\right) \left(x^2+2 \log \left(\frac{1}{4} (-1-8 e^x-4 e^{2 x}+x)\right)\right)}$$

22.4 Problem number 91

$$\int \frac{9 - 21x + 6x^2 + (3 - 6x)\log(4) + (-9 + 9x + (-3 + 3x)\log(4))\log(-x + x^2) + (-9 + 15x - 7x^2 + x^3 + (-6 + 8x - 2x^2)\log(4) + (-1 + x)\log^2(4))\log(-x + x^2)}{(-9 + 15x - 7x^2 + x^3 + (-6 + 8x - 2x^2)\log(4) + (-1 + x)\log^2(4))\log(-x + x^2)} dx$$

Optimal antiderivative

$$\frac{3x}{\ln(x^2 - x)(2\ln(2) + 3 - x)} + x - 1$$

command

```
Integrate[(9 - 21*x + 6*x^2 + (3 - 6*x)*Log[4] + (-9 + 9*x + (-3 + 3*x)*Log[4])*Log[-x + x^2] + (-9 + 15*x - 7*x^2 + x^3 + (-6 + 8*x - 2*x^2)*Log[4] + (-1 + x)*Log[4]^2)*Log[-x + x^2]^2)/((-9 + 15*x - 7*x^2 + x^3 + (-6 + 8*x - 2*x^2)*Log[4] + (-1 + x)*Log[4]^2)*Log[-x + x^2]^2), x]
```

Mathematica 13.1 output

$$\int \frac{9 - 21x + 6x^2 + (3 - 6x)\log(4) + (-9 + 9x + (-3 + 3x)\log(4))\log(-x + x^2) + (-9 + 15x - 7x^2 + x^3 + (-6 + 8x - 2x^2)\log(4) + (-1 + x)\log^2(4))\log(-x + x^2)}{(-9 + 15x - 7x^2 + x^3 + (-6 + 8x - 2x^2)\log(4) + (-1 + x)\log^2(4))\log(-x + x^2)} dx$$

Mathematica 12.3 output

$$x - \frac{x(9 - 21x + 6x^2 - 3x\log(16) + \log(64))}{(-1 + 2x)(-3 + x - \log(4))^2 \log((-1 + x)x)}$$

22.5 Problem number 294

$$\int \frac{2e^x x - 4x^3 + (-4x + 4x^2)\log(16) + (-4x^2 + e^x(2x - 2\log(16)) + 4x\log(16))\log\left(\frac{e^{-x}(e^x - 2x)}{-2x + 2\log(16)}\right)}{2x^4 - 2x^3\log(16) + e^x(-x^3 + x^2\log(16))} dx$$

Optimal antiderivative

$$\frac{2 \ln\left(\frac{\left(\frac{e^x}{2} - x\right)e^{-x}}{4 \ln(2) - x}\right)}{x}$$

command

```
Integrate[(2*E^x*x - 4*x^3 + (-4*x + 4*x^2)*Log[16] + (-4*x^2 + E^x*(2*x - 2*Log[16]) + 4*x*Log[16]*Log[16]))/(2*x^4 - 2*x^3*Log[16] + E^x*(-x^3 + x^2*Log[16])), x]
```

Mathematica 13.1 output

$$\int \frac{2e^x x - 4x^3 + (-4x + 4x^2)\log(16) + (-4x^2 + e^x(2x - 2\log(16)) + 4x\log(16))\log\left(\frac{e^{-x}(e^x - 2x)}{-2x + 2\log(16)}\right)}{2x^4 - 2x^3\log(16) + e^x(-x^3 + x^2\log(16))} dx$$

Mathematica 12.3 output

$$\frac{2 \log(x)}{\log(16)} - \frac{4 \log(x)}{\log(256)} - \frac{2 \log(x - \log(16))}{\log(16)} + \frac{2 \log\left(-\frac{e^{-x}(e^x - 2x)}{2x - \log(256)}\right)}{x} + \frac{4 \log(2x - \log(256))}{\log(256)}$$

22.6 Problem number 300

$$\int \frac{-x^3 + e^{-2+x+\frac{e^{-2+x}(1+e^{5/x}x^2)}{x^2}}((2-x)\log(2) + e^{5/x}(5x-x^3)\log(2))}{25x^3 + 10x^4 + x^5 + e^{\frac{e^{-2+x}(1+e^{5/x}x^2)}{x^2}}(10x^3 + 2x^4)\log(2) + e^{\frac{2e^{-2+x}(1+e^{5/x}x^2)}{x^2}}x^3\log^2(2)} dx$$

Optimal antiderivative

$$\frac{1}{5 + \ln(2) e^{\left(e^{\frac{5}{x}} + \frac{1}{x^2}\right)e^{-2+x}} + x}$$

command

```
Integrate[(-x^3 + E^(-2 + x + (E^(-2 + x)*(1 + E^(5/x)*x^2))/x^2)*((2 - x)*Log[2] + E^(5/x)*(2 + x)*(1 + E^(5/x)*x^2))/x^2)*(10*x^3 + 2*x^4)*Log[2] + E^((2*E^(-2 + x)*(1 + E^(5/x)*x^2))/x^2)]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$\frac{-e^4 x^3 \log(2) + e^{2+x} (5 + x) (x \log(2) - \log(4)) + e^{2+\frac{5}{x}+x} x (5 + x) (x^2 \log(2) - \log(32))}{e^2 \left(-e^2 x^3 + e^x (-10 + 3x + x^2) + e^{\frac{5}{x}+x} x (-25 - 5x + 5x^2 + x^3)\right) \log(2) \left(5 + x + e^{e^{-2+x} \left(e^{5/x} + \frac{1}{x^2}\right)} \log(2)\right)}$$

22.7 Problem number 358

$$\int \frac{4e^{e^5} x + 2x^2 + \left(-10x^2 - 2x^3 - 5x^4 - x^5 + (-2x^2 - x^4)\log(3) + e^{2e^5}(-20x^2 - 4x^3 - 4x^2\log(3)) + e^{e^5}(-20x^3 - 5x^4 - x^5 + x^6)\log(3)\right)}{(5x^4 + x^5 + x^4\log(3) + e^{2e^5}(20x^2 + 4x^3 + 4x^2\log(3)) + e^{e^5}(20x^3 + 4x^4 + 4x^5)\log(3))} dx$$

Optimal antiderivative

$$-1 + \frac{x}{\left(e^{e^5} + \frac{x}{2}\right) (x - \ln(\ln(3) + 5 + x))} - x$$

command

```
Integrate[(4*E^E^5*x + 2*x^2 + (-10*x^2 - 2*x^3 - 5*x^4 - x^5 + (-2*x^2 - x^4)*Log[3] + E^(2*x^2 - 4*x^3 - 4*x^2*Log[3]) + E^E^5*(-20*x^3 - 4*x^4 - 4*x^3*Log[3]))*Log[5 + x + Log[3]] + 20 - 4*x + 40*x^2 + 8*x^3 + (-4 + 8*x^2)*Log[3])*Log[5 + x + Log[3]]*Log[Log[5 + x + Log[3]]] + 5*x^2 - x^3 + E^(2*E^5)*(-20 - 4*x - 4*Log[3]) - x^2*Log[3] + E^E^5*(-20*x - 4*x^2 - 4*x*Log[3]) + 10*x^3 - 2*x^4 - 2*x^3*Log[3] + E^(2*E^5)*(-40*x - 8*x^2 - 8*x*Log[3]) + E^E^5*(-40*x^2 - 8*x^3)*Log[3])]
```

Mathematica 13.1 output

$$\int \frac{4e^{e^5}x + 2x^2 + (-10x^2 - 2x^3 - 5x^4 - x^5 + (-2x^2 - x^4)\log(3) + e^{2e^5}(-20x^2 - 4x^3 - 4x^2\log(3)) + e^{e^5}(-20x^3 - 5x^4 + x^5 + x^4\log(3) + e^{2e^5}(20x^2 + 4x^3 + 4x^2\log(3)) + e^{e^5}(20x^3 + 4x^4 + 4x^5\log(3)))}{(5x^4 + x^5 + x^4\log(3) + e^{2e^5}(20x^2 + 4x^3 + 4x^2\log(3)) + e^{e^5}(20x^3 + 4x^4 + 4x^5\log(3)))} dx$$

Mathematica 12.3 output

$$x \left(-1 + \frac{-2(2e^{e^5} + x) + (x(10 + 2x + \log(9)) + e^{e^5}(20 + 4x + \log(81)))\log(5 + x + \log(3))}{(2e^{e^5} + x)^2(-1 + (5 + x + \log(3))\log(5 + x + \log(3)))(x - \log(\log(5 + x + \log(3))))} \right)$$

22.8 Problem number 379

$$\int \frac{-4x^6 + 2x^6\log(2) + e^{4x^2}(-4x^2 + 2x^2\log(2)) + e^{3x^2}(-16x^3 + 8x^3\log(2)) + (-4x^3 - 3x^2\log(2))\log(4) + e^{2x^2}(-16x^6 + 16x^7 + 4x^8 + e^{4x^2}(16x^2 + 16x^3 + 4x^4) + e^{3x^2}(64x^3 + 64x^4 + 16x^5) + (8x^3 + 4x^4)\log(4))}{16x^6 + 16x^7 + 4x^8 + e^{4x^2}(16x^2 + 16x^3 + 4x^4) + e^{3x^2}(64x^3 + 64x^4 + 16x^5) + (8x^3 + 4x^4)} dx$$

Optimal antiderivative

$$\frac{-x - \ln(2)}{2x + \frac{2\ln(2)}{(e^{x^2} + x)^2} + 4}$$

command

```
Integrate[(-4*x^6 + 2*x^6*Log[2] + E^(4*x^2)*(-4*x^2 + 2*x^2*Log[2]) + E^(3*x^2)*(-16*x^3 + 8*x^3*Log[2]) + (-4*x^3 - 3*x^2*Log[2])*Log[4] + E^(2*x^2)*(-24*x^4 + 12*x^4*Log[2] + 2*x - 4*x^3 + (-1 - 4*x^2)*Log[2])*Log[4]) + E^x^2*(-16*x^5 + 8*x^5*Log[2] + (-6*x^2 - 4*x^4 + 4*x - 4*x^3)*Log[2])*Log[4]))/(16*x^6 + 16*x^7 + 4*x^8 + E^(4*x^2)*(16*x^2 + 16*x^3 + 4*x^4))
```

Mathematica 13.1 output

$$\int \frac{-4x^6 + 2x^6\log(2) + e^{4x^2}(-4x^2 + 2x^2\log(2)) + e^{3x^2}(-16x^3 + 8x^3\log(2)) + (-4x^3 - 3x^2\log(2))\log(4) + e^{2x^2}(-16x^6 + 16x^7 + 4x^8 + e^{4x^2}(16x^2 + 16x^3 + 4x^4) + e^{3x^2}(64x^3 + 64x^4 + 16x^5) + (8x^3 + 4x^4)\log(4))}{16x^6 + 16x^7 + 4x^8 + e^{4x^2}(16x^2 + 16x^3 + 4x^4) + e^{3x^2}(64x^3 + 64x^4 + 16x^5) + (8x^3 + 4x^4)} dx$$

Mathematica 12.3 output

$$2\log^3(4) + 4x\log^3(4) + 18x^2\log^3(4) - 2e^{2x^2}x\log(4)(16x^7(-4 + \log(4)) + 88x^8(-4 + \log(4)) + 48x^9(-4 + \log(4)))$$

22.9 Problem number 414

$$\int \frac{e^{2e^x}(6 - 3e^4) + 12x^2 - 3e^4x^2 - 3x^2\log(2) + (-16x + 6e^4x + 2x\log(2))\log(3) + (6 - 3e^4)\log^2(3) + e^{e^x}(-16x^4 + x^6 - 2x^5\log(3) + x^4\log^2(3) + e^{e^x}(-2x^5 + 2x^4)\log(3))}{e^{2e^x}x^4 + x^6 - 2x^5\log(3) + x^4\log^2(3) + e^{e^x}(-2x^5 + 2x^4)} dx$$

Optimal antiderivative

$$\frac{\frac{(2-\ln(2))x}{\ln(3)+e^{e^x}-x} + e^4 - 2}{x^3}$$

command

```
Integrate[(E^(2*x)*(6 - 3*E^4) + 12*x^2 - 3*E^4*x^2 - 3*x^2*Log[2] + (-16*x + 6*E^4*x + 2*x^5 + 6*E^4*x + 2*x*Log[2] + E^x*(-2*x^2 + x^2*Log[2]) + (12 - 6*E^4)*Log[3]))/(E^(2*x)*x^2*x^5 + 2*x^4*Log[3])), x]
```

Mathematica 13.1 output

$$\int \frac{e^{2e^x}(6 - 3e^4) + 12x^2 - 3e^4x^2 - 3x^2\log(2) + (-16x + 6e^4x + 2x\log(2))\log(3) + (6 - 3e^4)\log^2(3) + e^{e^x}(-16x^5 + 2x^4\log(3)))}{e^{2e^x}x^4 + x^6 - 2x^5\log(3) + x^4\log^2(3) + e^{e^x}(-2x^5 + 2x^4\log(3)))} dx$$

Mathematica 12.3 output

$$\frac{-2 + e^4 - \frac{x(2-\log(2)+e^x(x(-2+\log(2))-\log(2)\log(3)+\log(9))))}{(-1+e^x(x-\log(3)))(e^{e^x}-x+\log(3))}}{x^3}$$

22.10 Problem number 578

$$\int \frac{((4ex^3 - 8x^4)\log(3) + (4ex - 8x^2)\log^2(3))\log^3(x) + (2ex^3 - 4x^4)\log^2(-e + 2x) + \log^2(x)(-4x^5 - 4x^3\log(3))}{(e - 2x)\log^3(3)\log^3(x) + (-3ex + 6x^2)\log^2(3)} dx$$

Optimal antiderivative

$$\left(1 - \frac{x}{\frac{\ln(-e+2x)}{\ln(x)} - \frac{\ln(3)}{x}}\right)^2$$

command

```
Integrate[((4*E*x^3 - 8*x^4)*Log[3] + (4*E*x - 8*x^2)*Log[3]^2)*Log[x]^3 + (2*E*x^3 - 4*x^4)*E + 2*x]^2 + Log[x]^2*(-4*x^5 - 4*x^3*Log[3] + (-2*E*x^4 + 4*x^5 + (-6*E*x^2 + 12*x^3)*Log[3]*E + 2*x]) + Log[x]*((4*x^4 - 2*E*x^4 + 4*x^5 + (-2*E*x^2 + 4*x^3)*Log[3])*Log[-E + 2*x] + (2*x^2))/((E - 2*x)*Log[3]^3*Log[x]^3 + (-3*E*x + 6*x^2)*Log[3]^2*Log[x]^2*Log[-E + 2*x] + (3*E*x^2 - 6*x^3)*Log[3]*Log[x]*Log[-E + 2*x]^2 + (-E*x^3 + 2*x^4)*Log[-E + 2*x]^3), x]
```

Mathematica 13.1 output

$$\int \frac{((4ex^3 - 8x^4)\log(3) + (4ex - 8x^2)\log^2(3))\log^3(x) + (2ex^3 - 4x^4)\log^2(-e + 2x) + \log^2(x)(-4x^5 - 4x^3\log(3))}{(e - 2x)\log^3(3)\log^3(x) + (-3ex + 6x^2)\log^2(3)} dx$$

Mathematica 12.3 output

$$x^2 \log(x) \left(x^2 \log(x) - \frac{(2(2x^2 + e \log(3) - x \log(9))^3 + (-e^3 \log(3)(2 \log^2(3) + \log^2(9)) + 4x^3(x - \log(3))(-4 \log^2(3) - \log(9) \log(81) + x \log(5314)))}{(2(2x^2 + e \log(3) - x \log(9))^3 + (-e^3 \log(3)(2 \log^2(3) + \log^2(9)) + 4x^3(x - \log(3))(-4 \log^2(3) - \log(9) \log(81) + x \log(5314)))}} \right)$$

22.11 Problem number 760

$$\int \frac{5 - 5x + e^{\frac{-x^3 + \log(50x)}{x}} (-x^2 + (1 - x - 2x^3 + 2x^4) \log(1 - x) + (-1 + x) \log(1 - x) \log(50x))}{-25 + 25x + e^{\frac{-x^3 + \log(50x)}{x}} (10x - 10x^2) \log(1 - x) + e^{\frac{2(-x^3 + \log(50x))}{x}} (-x^2 + x^3) \log^2(1 - x)} dx$$

Optimal antiderivative

$$\frac{x}{x \ln(1 - x) e^{\frac{\ln(50x)}{x} - x^2} - 5}$$

command

```
Integrate[(5 - 5*x + E^((-x^3 + Log[50*x])/x)*(-x^2 + (1 - x - 2*x^3 + 2*x^4)*Log[1 - x] + (-1 + x)*Log[1 - x]*Log[50*x]))/(-25 + 25*x + E^((-x^3 + Log[50*x])/x)*(10*x - 10*x^2)*Log[1 - x]^3 + Log[50*x]))/x)*(-x^2 + x^3)*Log[1 - x]^2, x]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$-\frac{e^{x^2} x}{5 e^{x^2} - 50 \frac{1}{x} x^{1+\frac{1}{x}} \log(1 - x)}$$

22.12 Problem number 1020

$$\int \frac{e^{\frac{x}{1+x}} (x^2 + (-5 - 5x - 6x^2) \log(2)) + e^{\frac{2x}{1+x}} (-2 - 4x - 2x^2 - 243x^4 - 486x^5 - 243x^6 + (2 + 4x + 2x^2)x^7) \log(2)}{(x^2 + 2x^3 + x^4) \log(2) + e^{\frac{x}{1+x}} (-4x - 8x^2 - 4x^3 + 162x^5 + 324x^6 + 162x^7) \log(2) + e^{\frac{2x}{1+x}} (4 + 8x + 4x^2 - 324x^3 - 162x^4) \log^2(2)} dx$$

Optimal antiderivative

$$\frac{\frac{x}{\ln(2)} + 5 - x}{x e^{-\frac{x}{1+x}} - 2 + 81x^4}$$

command

```
Integrate[(E^(x/(1 + x))*(x^2 + (-5 - 5*x - 6*x^2)*Log[2]) + E^((2*x)/(1 + x))*(-2 - 4*x - 2*x^2 - 8*x^3 - 4*x^4 + 162*x^5 + 324*x^6 + 162*x^7)*Log[2] + E^((2*x)/(1 + x))*(4 + 8*x + 4*x^2 - 324*x^3 - 162*x^4)*Log^2[2])/((x^2 + 2*x^3 + x^4)*Log[2] + e^(x/(1 + x))(-4*x - 8*x^2 - 4*x^3 + 162*x^5 + 324*x^6 + 162*x^7)*Log[2] + e^(2*x/(1 + x))(4 + 8*x + 4*x^2 - 324*x^3 - 162*x^4)*Log^2[2]), x]
```

Mathematica 13.1 output

$$\int \frac{e^{\frac{x}{1+x}} (x^2 + (-5 - 5x - 6x^2) \log(2)) + e^{\frac{2x}{1+x}} (-2 - 4x - 2x^2 - 243x^4 - 486x^5 - 243x^6 + (2 + 4x + 2x^2)x^7) \log(2)}{(x^2 + 2x^3 + x^4) \log(2) + e^{\frac{x}{1+x}} (-4x - 8x^2 - 4x^3 + 162x^5 + 324x^6 + 162x^7) \log(2) + e^{\frac{2x}{1+x}} (4 + 8x + 4x^2 - 324x^3 - 162x^4) \log^2(2)} dx$$

Mathematica 12.3 output

$$3944312x + 19785288 \log(2) - 1524858x \log(2) + 72868 \log(4) - 595423x \log(4) - 36434 \log(16) + 51192x \log(16)$$

22.13 Problem number 2052

$$\int \frac{(-384x - 768x^2 - 384x^3) \log(x) + (-384x - 1664x^2 - 2304x^3 - 1536x^4 - 512x^5) \log^2(x) + (512x^2 + 1536x^3 - 27 + (108x + 108x^2) \log(2x + e^5x) + (-144x^2 - 288x^3 - 144x^4) \log^2(2x + e^5x) + (64x^3 + 192x^4 + 27) \log^3(2x + e^5x))}{(4+4x)x} dx$$

Optimal antiderivative

$$\frac{4 \ln(x)^2}{\left(\frac{3}{(4+4x)x} - \ln(x(e^5 + 2))\right)^2}$$

command

```
Integrate[((-384*x - 768*x^2 - 384*x^3)*Log[x] + (-384*x - 1664*x^2 - 2304*x^3 - 1536*x^4 - 512*x^5)*Log^2[x] + (27 + (108*x + 108*x^2)*Log[2*x + E^5*x] + (-144*x^2 - 288*x^3 - 144*x^4)*Log^2[2*x + E^5*x]^2 + (64*x^3 + 192*x^4 + 27)*Log^3[2*x + E^5*x]))/(4+4x)x]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$-\frac{4(-3 + 4x \log(2 + e^5) + 4x^2 \log(2 + e^5))(-3 + 4x \log(2 + e^5) + 4x^2 \log(2 + e^5) + 8x(1 + x) \log(x))}{(3 - 4x(1 + x) \log((2 + e^5)x))^2}$$

22.14 Problem number 2234

$$\int \frac{56x^2 - 8x^3 + (-160x - 8x^2 - 16x^3 - 32x \log(2)) \log(x) + (100 + 20x + 30x^2 + (40 + 4x + 6x^2) \log(2) + 4 \log^2(2))}{16x^2 + (-40x - 8x \log(2)) \log(x) + (25 + 10 \log(2) + \log^2(2)) \log^2(x)} dx$$

Optimal antiderivative

$$\frac{2x^2(1+x)}{\ln(2)+5-\frac{4x}{\ln(x)}}+4x$$

command

```
Integrate[(56*x^2 - 8*x^3 + (-160*x - 8*x^2 - 16*x^3 - 32*x*Log[2])*Log[x] + (100 + 20*x + 30*x^2 + (40 + 4*x + 6*x^2)*Log[2] + 4*Log[2]^2) + (-40*x - 8*x*Log[2])*Log[x] + (25 + 10*Log[2] + Log[2]^2)*Log[x]^2),x]
```

Mathematica 13.1 output

$$\int \frac{56x^2 - 8x^3 + (-160x - 8x^2 - 16x^3 - 32x \log(2)) \log(x) + (100 + 20x + 30x^2 + (40 + 4x + 6x^2) \log(2) + 4 \log^2(2))}{16x^2 + (-40x - 8x \log(2)) \log(x) + (25 + 10 \log(2) + \log^2(2)) \log^2(x)} dx$$

Mathematica 12.3 output

$$4x + \frac{x^2(10 + \log(4))}{(5 + \log(2))^2} + \frac{2x^3(15 + \log(8))}{3(5 + \log(2))^2} + \frac{8x^3(25 - 15 \log^2(2) - 4x^2(5 + \log(2)) + \log^2(16) + x(5 + \log^2(2) + \log(64)) + \log(1024))}{(-5 + 4x - \log(2))(5 + \log(2))^2(4x - (5 + \log(2)) \log(x))}$$

22.15 Problem number 2451

$$\int \frac{-32x^3 + e^x(3 - 3x - 80x^2) \log(2) - 50e^{2x}x \log^2(2) + e^{4x}(-64x^2 - 160e^x x \log(2) - 100e^{2x} \log^2(2))}{16x^2 + 40e^x x \log(2) + 25e^{2x} \log^2(2)} dx$$

Optimal antiderivative

$$4 - x^2 - \frac{3}{\frac{1}{1+\frac{\ln(2)e^x}{x}} - 5} - e^{4x}$$

command

```
Integrate[(-32*x^3 + E^x*(3 - 3*x - 80*x^2)*Log[2] - 50*E^(2*x)*x*Log[2]^2 + E^(4*x)*(-64*x^2 - 160*E^x*x*Log[2] - 100*E^(2*x)*Log[2]^2))/(16*x^2 + 40*E^x*x*Log[2] + 25*E^(2*x)*Log[2]^2), x]
```

Mathematica 13.1 output

$$\int \frac{-32x^3 + e^x(3 - 3x - 80x^2) \log(2) - 50e^{2x}x \log^2(2) + e^{4x}(-64x^2 - 160e^x x \log(2) - 100e^{2x} \log^2(2))}{16x^2 + 40e^x x \log(2) + 25e^{2x} \log^2(2)} dx$$

Mathematica 12.3 output

$$\frac{125e^{4x} \log^2(2) \log^4(32) + 125x^2 \log^2(2) \log^4(32) - \frac{5x \log(8) \log^5(32)}{4x+e^x \log(32)} + 80e^{2x}(1 - 2x + 2x^2) \log^2(32)(75 \log^2(2) - 20)}$$

22.16 Problem number 2680

$$\int \frac{12x - 12x^2 - 12x^3 + 24x^4 - 12x^5 + (-12 + 12x + 24x^2 - 48x^3 + 24x^4) \log(2) + (-12x + 24x^2 - 12x^3) \log^2(2)}{(-4x^2 + 11x^3 - 10x^4 + 3x^5 + (8x - 22x^2) \log(2))} dx$$

Optimal antiderivative

$$\frac{4x - \frac{4x}{(\ln(2)-x)(x^2-x)}}{\ln\left(2 - \frac{3x}{2}\right)}$$

command

```
Integrate[(12*x - 12*x^2 - 12*x^3 + 24*x^4 - 12*x^5 + (-12 + 12*x + 24*x^2 - 48*x^3 + 24*x^4) Log[2] - 12*x + 24*x^2 - 12*x^3)*Log[2]^2 + (-16 + 44*x - 40*x^2 + 44*x^3 - 40*x^4 + 12*x^5 + (-16 + 44*x - 88*x^2 + 80*x^3 - 24*x^4)*Log[2] + (-16 + 44*x - 40*x^2 + 12*x^3)*Log[2]^2)*Log[2]^2 + 4*x^2 + 11*x^3 - 10*x^4 + 3*x^5 + (8*x - 22*x^2 + 20*x^3 - 6*x^4)*Log[2] + (-4 + 11*x - 10*x^2)*Log[2]^3], x]
```

Mathematica 13.1 output

$$\int \frac{12x - 12x^2 - 12x^3 + 24x^4 - 12x^5 + (-12 + 12x + 24x^2 - 48x^3 + 24x^4) \log(2) + (-12x + 24x^2 - 12x^3) \log^2(2)}{(-4x^2 + 11x^3 - 10x^4 + 3x^5 + (8x - 22x^2) \log(2))} dx$$

Mathematica 12.3 output

$$\frac{4(3x^5 + x(-3 + 3 \log^2(2) - \log(8)) + \log(8) + 3x^3(1 + \log^2(2) + \log(16)) - x^4(6 + \log(64)) - x^2(-3 + 6 \log^2(2) - 3(-1 + x)^2(x - \log(2))^2 \log(2 - \frac{3x}{2}))}{3(-1 + x)^2(x - \log(2))^2 \log(2 - \frac{3x}{2})}$$

22.17 Problem number 2812

$$\int \frac{108x + 126x^2 + 36x^3 + 50x^5 + (100x^3 + 150x^4 + 50x^5) \log(3) + e^{3x}(-50x^2 + (-100 - 150x - 50x^2) \log(3))}{-200x^5 - 300x^6 - 150x^7 - 25x^8 + e^{3x}(200x^2 + 300x^3 + 150x^4 + 25x^5)} dx$$

Optimal antiderivative

$$\frac{\frac{9}{(-5e^x+5x)^2} + \frac{x}{2+x} + \ln(3)}{x(2+x)} + 3$$

command

```
Integrate[(108*x + 126*x^2 + 36*x^3 + 50*x^5 + (100*x^3 + 150*x^4 + 50*x^5)*Log[3] + E^(3*x)*50*x^2 + (-100 - 150*x - 50*x^2)*Log[3]) + E^(2*x)*(150*x^3 + (300*x + 450*x^2 + 150*x^3)*Log[36 - 126*x - 90*x^2 - 18*x^3 - 150*x^4 + (-300*x^2 - 450*x^3 - 150*x^4)*Log[3]]))/(-200*x^5 - 300*x^6 - 150*x^7 - 25*x^8 + E^(3*x)*(200*x^2 + 300*x^3 + 150*x^4 + 25*x^5) + E^(2*x)*600*x^3 - 900*x^4 - 450*x^5 - 75*x^6) + E^x*(600*x^4 + 900*x^5 + 450*x^6 + 75*x^7)], x]
```

Mathematica 13.1 output

$$\int \frac{108x + 126x^2 + 36x^3 + 50x^5 + (100x^3 + 150x^4 + 50x^5) \log(3) + e^{3x}(-50x^2 + (-100 - 150x - 50x^2) \log(3))}{-200x^5 - 300x^6 - 150x^7 - 25x^8 + e^{3x}(200x^2 + 300x^3 + 150x^4 + 25x^5)} dx$$

Mathematica 12.3 output

$$\frac{1}{100} \left(-\frac{50(-2 + x \log(3) + \log(9))}{(2+x)^2} + \frac{\frac{36}{(e^x-x)^2(2+x)} + 25 \log(9)}{x} \right)$$

22.18 Problem number 2856

$$\int \frac{3x^3 + 4^{25x}(-2x^2 - 25x^3 \log(4)) + e^{2 \log^2(x)}(x - 25 4^{25x}x \log(4) + (-4^{1+25x} + 4x) \log(x)) + e^{\log^2(x)}(4x^2 + 4^{25x})}{x} dx$$

Optimal antiderivative

$$-\left(x - e^{50x \ln(2)}\right) \left(x + e^{\ln(x)^2}\right) \left(-x - e^{\ln(x)^2}\right)$$

command

```
Integrate[(3*x^3 + 4^(25*x)*(-2*x^2 - 25*x^3*Log[4]) + E^(2*Log[x]^2)*(x - 25*4^(25*x)*x*Log[4^(1 + 25*x) + 4*x]*Log[x]) + E^Log[x]^2*(4*x^2 + 4^(25*x)*(-2*x - 50*x^2*Log[4])) + (-4^(1 + 25*x)*x) + 4*x^2)*Log[x]]/x, x]
```

Mathematica 13.1 output

$$\int \frac{3x^3 + 4^{25x}(-2x^2 - 25x^3 \log(4)) + e^{2 \log^2(x)}(x - 25 4^{25x}x \log(4) + (-4^{1+25x} + 4x) \log(x)) + e^{\log^2(x)}(4x^2 + 4^{25x})}{x} dx$$

Mathematica 12.3 output

$$-\left((2^{50x} - x) \left(e^{\log^2(x)} + x\right)^2\right)$$

22.19 Problem number 2913

$$\int \frac{(50 + (100 + 100x)\log(2) + (100 + 100x)\log(x))\log(4e^{2x}x^2\log(2) + 4e^{2x}x^2\log(x)) + (-50\log(2) - 50\log(x))}{x^3\log(2) + x^3\log(x)}$$

Optimal antiderivative

$$\frac{25 \ln(4 e^{2x} x^2 (\ln(2) + \ln(x)))^2}{x^2}$$

command

```
Integrate[((50 + (100 + 100*x)*Log[2] + (100 + 100*x)*Log[x])*Log[4*E^(2*x)*x^2*Log[2] + 4*E^50*Log[2] - 50*Log[x])*Log[4*E^(2*x)*x^2*Log[2] + 4*E^(2*x)*x^2*Log[x]]^2)/(x^3*Log[2] + x^3*
```

Mathematica 13.1 output

$$\int \frac{(50 + (100 + 100x)\log(2) + (100 + 100x)\log(x))\log(4e^{2x}x^2\log(2) + 4e^{2x}x^2\log(x)) + (-50\log(2) - 50\log(x))}{x^3\log(2) + x^3\log(x)}$$

Mathematica 12.3 output

$$50 \left(-2 + \frac{\log^2(4e^{2x}x^2\log(2x))}{2x^2} \right)$$

22.20 Problem number 3121

$$\int \frac{3^{-1/x} \sqrt[x]{\log(x^4)} \left(-48 + 12 \log(x^4) \log\left(\frac{\log(x^4)}{3}\right) \right)}{(625x^2 + 50x^2 \log(4) + x^2 \log^2(4)) \log(x^4) + 3^{-1/x} (-50x^2 - 2x^2 \log(4)) \log^{1+\frac{1}{x}}(x^4) + 3^{-2/x} x^2 \log^{1+\frac{2}{x}}(x^4)} dx$$

Optimal antiderivative

$$\frac{12}{\frac{\ln\left(\frac{\ln(x^4)}{3}\right)}{-25 - 2 \ln(2) + e^{\frac{\ln\left(\frac{\ln(x^4)}{3}\right)}{x}}}}$$

command

```
Integrate[(Log[x^4]^x*(-1)*(-48 + 12*Log[x^4]*Log[Log[x^4]/3]))/(3^x*(-1)*((625*x^2 + 50*x^2*50*x^2 - 2*x^2*Log[4])*Log[x^4]^(1 + x^(-1))))/3^x*(-1) + (x^2*Log[x^4]^(1 + 2/x))/3^(2/x))),x]
```

Mathematica 13.1 output

$$\int \frac{3^{-1/x} \sqrt[x]{\log(x^4)} \left(-48 + 12 \log(x^4) \log\left(\frac{\log(x^4)}{3}\right) \right)}{(625x^2 + 50x^2 \log(4) + x^2 \log^2(4)) \log(x^4) + 3^{-1/x} (-50x^2 - 2x^2 \log(4)) \log^{1+\frac{1}{x}}(x^4) + 3^{-2/x} x^2 \log^{1+\frac{2}{x}}(x^4)} dx$$

Mathematica 12.3 output

$$-\frac{4 \ 3^{1+\frac{1}{x}}}{3^{\frac{1}{x}} (25 + \log(4)) - \sqrt[x]{\log(x^4)}}$$

22.21 Problem number 3124

$$\int \frac{-1000 - 5000x - 6200x^2 - 2900x^3 - 100x^4}{256x^3 + 448x^4 + 288x^5 + 144x^6 + 104x^7 + 48x^8 + 8x^9 + (-192x^3 - 240x^4 - 96x^5 - 60x^6 - 48x^7 - 12x^8) \log(5x^2 + 1)} dx$$

Optimal antiderivative

$$\left(5 - \frac{5}{\left(\ln(5) - \ln\left(\frac{x}{x^3+x+4}\right) - 4 - 2x \right) x} \right)^2$$

command

```

Integrate[(-1000 - 5000*x - 6200*x^2 - 2900*x^3 - 1000*x^4 - 1000*x^5 - 400*x^6 + (200 + 1850
200*x - 50*x^2 - 50*x^4)*Log[5]^2 + (-200 - 1850*x - 1600*x^2 - 350*x^3 - 300*x^4 - 300*x^5 +
200*x - 50*x^2 - 50*x^4)*Log[x/(4 + x + x^3)]^2)/(256*x^3 + 448*x^4 + 288*x^5 + 144*x^6 + 104
192*x^3 - 240*x^4 - 96*x^5 - 60*x^6 - 48*x^7 - 12*x^8)*Log[5] + (48*x^3 + 36*x^4 + 6*x^5 + 12
4*x^3 - x^4 - x^6)*Log[5]^3 + (192*x^3 + 240*x^4 + 96*x^5 + 60*x^6 + 48*x^7 + 12*x^8 + (-
96*x^3 - 72*x^4 - 12*x^5 - 24*x^6 - 12*x^7)*Log[5] + (12*x^3 + 3*x^4 + 3*x^6)*Log[5]^2)*Log[x
12*x^3 - 3*x^4 - 3*x^6)*Log[5])*Log[x/(4 + x + x^3)]^2 + (4*x^3 + x^4 + x^6)*Log[x/(4 + x + x^3)]^2

```

Mathematica 13.1 output

$$\int \frac{-1000 - 5000x - 6200x^2 - 2900x^3 - 100x^4}{256x^3 + 448x^4 + 288x^5 + 144x^6 + 104x^7 + 48x^8 + 8x^9 + (-192x^3 - 240x^4 - 96x^5 - 60x^6 - 48x^7 - 12x^8) \log(5x^2 + 1)} dx$$

Mathematica 12.3 output

$$25 \left(x (32 + 136x + 96x^2 - 48x^3 + 66x^4 + 45x^5 - 18x^6 + 20x^7 + 6x^8 - x^9 + 2x^{10}) \log^3 \left(\frac{x}{5(4+x+x^3)} \right) + (4 + x + x^2) \right)$$

22.22 Problem number 3351

Optimal antiderivative

$$x^2 + \frac{x^2}{(3+x)^2 \left(\ln\left(\frac{e^2}{3x}\right) - x\right)^2} + x + 10$$

command

```
Integrate[(6*x + 2*x^2 - 25*x^3 - 81*x^4 - 63*x^5 - 19*x^6 - 2*x^7 + (6*x + 81*x^2 + 243*x^3 - 81*x - 243*x^2 - 189*x^3 - 57*x^4 - 6*x^5)*Log[E^2/(3*x)]^2 + (27 + 81*x + 63*x^2 + 19*x^3 + 27*x^4 - 27*x^5 - x^6 + (81*x^2 + 81*x^3 + 27*x^4 + 3*x^5)*Log[E^2/(3*x)] + (-81*x - 81*x^2 - 27*x^3 - 3*x^4)*Log[E^2/(3*x)]^2 + (27 + 27*x + 9*x^2 + x^3)*Log[E^2/(3*x)]^3)
```

Mathematica 13.1 output

$$\int \frac{6x + 2x^2 - 25x^3 - 81x^4 - 63x^5 - 19x^6 - 2x^7 + (6x + 81x^2 + 243x^3 + 189x^4 + 57x^5 + 6x^6) \log\left(\frac{e^2}{3x}\right) + (-81x - 81x^2 - 27x^3 - 27x^4 - 9x^5 - x^6 + (81x^2 + 81x^3 + 27x^4 + 3x^5) \log\left(\frac{e^2}{3x}\right) + (-81x - 81x^2 - 27x^3 - 3*x^4) \log\left(\frac{e^2}{3x}\right)^2 + (27 + 27*x + 9*x^2 + x^3) \log\left(\frac{e^2}{3x}\right)^3)}{-27x^3 - 27x^4 - 9x^5 - x^6 + (81x^2 + 81x^3 + 27x^4 + 3x^5) \log\left(\frac{e^2}{3x}\right) + (-81x - 81x^2 - 27x^3 - 3*x^4) \log\left(\frac{e^2}{3x}\right)^2 + (27 + 27*x + 9*x^2 + x^3) \log\left(\frac{e^2}{3x}\right)^3}$$

Mathematica 12.3 output

output too large to display

22.23 Problem number 3670

$$\int \frac{3^{2/x} (x^4)^{-2/x} \left(-2x^2 + (-8x + 2x^2) \log(x) + 2x \log(x) \log\left(\frac{x^4}{3}\right) + 3^{-1/x} (x^4)^{\frac{1}{x}} \left(40x \log(x) + (160 - 40x) \log^2(x)\right)\right)}{x \log^3(x)}$$

Optimal antiderivative

$$\left(20 - \frac{x e^{-\frac{\ln\left(\frac{x^4}{3}\right)}{x}}}{\ln(x)} \right)^2$$

command

```
Integrate[(3^(2/x)*(-2*x^2 + (-8*x + 2*x^2)*Log[x] + 2*x*Log[x]*Log[x^4/3] + ((x^4)^x*(-1)*(40*x*Log[x] + (160 - 40*x)*Log[x]^2 - 40*Log[x]^2*Log[x^4/3]))/3^x^(-1)))/(x*(x^4)^(2/x)*
```

Mathematica 13.1 output

$$\int \frac{3^{2/x} (x^4)^{-2/x} \left(-2x^2 + (-8x + 2x^2) \log(x) + 2x \log(x) \log\left(\frac{x^4}{3}\right) + 3^{-1/x} (x^4)^{\frac{1}{x}} \left(40x \log(x) + (160 - 40x) \log^2(x)\right)\right)}{x \log^3(x)}$$

Mathematica 12.3 output

$$\frac{3^{\frac{1}{x}} x (x^4)^{-2/x} \left(3^{\frac{1}{x}} x - 40 (x^4)^{\frac{1}{x}} \log(x)\right)}{\log^2(x)}$$

22.24 Problem number 3955

$$\int \frac{-6 \log(4) + (6x^2 - 9x^3) \log^2(x) + (6 \log(4) \log(x) + (3x^2 - 3x^3) \log^2(x)) \log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right) \log\left(\log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right)\right) \log\left(\log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right)\right)}{(-2x^2 \log(4) \log(x) + (-x^4 + x^5) \log^2(x)) \log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right) \log^2\left(\log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right)\right)}$$

Optimal antiderivative

$$\frac{3}{\ln\left(\ln\left(\ln\left(e^{-2x^2+2x}\right)x + \frac{8 \ln(2)}{\ln(x)}\right)\right)x}$$

command

```
Integrate[(-6*Log[4] + (6*x^2 - 9*x^3)*Log[x]^2 + (6*Log[4]*Log[x] + (3*x^2 - 3*x^3)*Log[x]^2 - 2*x^2*Log[4]*Log[x] + (-x^4 + x^5)*Log[x]^2)*Log[(4*Log[4] + (2*x^2 - 2*x^3)*Log[x])/Log[x]]*x]
```

Mathematica 13.1 output

$$\int \frac{-6 \log(4) + (6x^2 - 9x^3) \log^2(x) + (6 \log(4) \log(x) + (3x^2 - 3x^3) \log^2(x)) \log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right) \log\left(\log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right)\right)}{(-2x^2 \log(4) \log(x) + (-x^4 + x^5) \log^2(x)) \log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right) \log^2\left(\log\left(\frac{4 \log(4) + (2x^2 - 2x^3) \log(x)}{\log(x)}\right)\right)}$$

Mathematica 12.3 output

$$-\frac{3(\log(256) - 2(-1 + x)x^2 \log(x)) (\log(16) + x^2(-2 + 3x) \log^2(x))}{x(-2 \log(4) + (-1 + x)x^2 \log(x)) (\log(256) + 2x^2(-2 + 3x) \log^2(x)) \log\left(\log\left(-2(-1 + x)x^2 + \frac{\log(256)}{\log(x)}\right)\right)}$$

22.25 Problem number 4166

$$\int \frac{-36 + e^{x+x^2 \log(3x)} (-16 + 16x + 16x^2 + 32x^2 \log(3x))}{81 + 16e^{2x+2x^2 \log(3x)} + e^{x+x^2 \log(3x)} (72 - 32x) - 72x + 16x^2} dx$$

Optimal antiderivative

$$\frac{x}{x - \frac{9}{4} - e^{x^2 \ln(3x)} + x}$$

command

```
Integrate[(-36 + E^(x + x^2*Log[3*x]))*(-16 + 16*x + 16*x^2 + 32*x^2*Log[3*x]))/(81 + 16*E^(2*
```

Mathematica 13.1 output

$$\int \frac{-36 + e^{x+x^2 \log(3x)} (-16 + 16x + 16x^2 + 32x^2 \log(3x))}{81 + 16e^{2x+2x^2 \log(3x)} + e^{x+x^2 \log(3x)} (72 - 32x) - 72x + 16x^2} dx$$

Mathematica 12.3 output

$$-\frac{4x}{9 - 4x + 4 3^{x^2} e^x x^{x^2}}$$

22.26 Problem number 4890

Optimal antiderivative

$$\frac{\ln(\ln(\ln(\ln(x^2) + (x + 4\ln(2))(1 - x)))) + 1}{x}$$

command

```
Integrate[(2 + x - 2*x^2 - x*Log[16] + (-x + x^2 + (-1 + x)*Log[16] - Log[x^2])*Log[x - x^2 + x + x^2 + (-1 + x)*Log[16] - Log[x^2]]*Log[x - x^2 + (1 - x)*Log[16] + Log[x^2]]*Log[Log[x - x^2 + x + x^2 + (-1 + x)*Log[16] - Log[x^2]]])/(x^2*(x - 1)^2*(x + 1)^2*(x^2 + 1)^2*(x^2 + 2*x + 1)^2*(x^2 - 2*x + 1)^2*(x^2 - 1)^2*(x^2 + 2*x - 1)^2*(x^2 - 2*x - 1)^2), {x, 0, 1}]]
```

Mathematica 13.1 output

$$\int \frac{2 + x - 2x^2 - x \log(16) + (-x + x^2 + (-1 + x) \log(16) - \log(x^2)) \log(x - x^2 + (1 - x) \log(16) + \log(x^2)) \log((x^3 - x) \log(16) + \log(x^2)^2)}{(x^3 - x)^2} dx$$

Mathematica 12.3 output

$$\frac{1}{x} + \frac{\log(\log(\log(-((-1+x)(x+\log(16)))+\log(x^2))))}{x}$$

22.27 Problem number 4908

$$\int \frac{(625 + 1500x + 1350x^2 + 540x^3 + 81x^4) \log(2) + (625 + 1500x + 1350x^2 + 540x^3 + 81x^4) \log^2(2) + e^{2x} (4x^2 + 12x + 1)}{(625 + 1500x + 1350x^2 + 540x^3 + 81x^4)^2} dx$$

Optimal antiderivative

$$\frac{x}{\ln(2) - \frac{2e^x}{x\left(\left(3+\frac{5}{x}\right)^2 - e^x + \ln(x)\right)}} + x$$

command

```
Integrate[((625 + 1500*x + 1350*x^2 + 540*x^3 + 81*x^4)*Log[2] + (625 + 1500*x + 1350*x^2 + 510*x^3 + 22*x^4 + (-100*x - 170*x^2 - 96*x^3 - 18*x^4)*Log[2] + (-50*x^2 - 60*x^3 - 4*x^4 + 2*x^5 + (-4*x^3 - 2*x^4)*Log[2] - 2*x^4*Log[2]^2))*Log[x] + (x^4*Log[2] + x^4*Log[2]^2 - 100*x - 120*x^2 - 36*x^3)*Log[2] + (-50*x^2 - 60*x^3 - 18*x^4)*Log[2]^2) + ((50*x^2 + 60*x^3 - 4*x^4*Log[2] - 2*x^4*Log[2]^2))*Log[x] + x^4*Log[2]^2*Log[x]^2), x]
```

Mathematica 13.1 output

$$\int \frac{(625 + 1500x + 1350x^2 + 540x^3 + 81x^4) \log(2) + (625 + 1500x + 1350x^2 + 540x^3 + 81x^4) \log^2(2) + e^{2x} (4x^2 + 12x + 1)}{(625 + 1500x + 1350x^2 + 540x^3 + 81x^4)^2} dx$$

Mathematica 12.3 output

$$\frac{x \left(1+\log(2)-\frac{e^x x (100 \log(2)+60 x \log(2)-x^2 (36 \log^2(2)+\log(4)-18 \log(2) \log(4))+e^x x (-4+x^2 \log(4)+x (4-\log^2(4)+\log(2) \log(16))))}{((50+30 x-x^2) \log(2)+e^x x (-2+2 x+x^2 \log(2)))(-(5+3 x)^2 \log(2)+e^x x (2+x \log(2))-x^2 \log(2) \log(x))}\right)}{\log(2)}$$

22.28 Problem number 5022

$$\int \frac{500 - 5x^2 + 125 \log(3) + (-625 - 125 \log(3)) \log(x)}{25x^2 + 10x^3 + x^4 + (-1250x - 250x^2 + (-250x - 50x^2) \log(3)) \log(x) + (15625 + 6250 \log(3) + 625 \log^2(3)) \log^2(x)} dx$$

Optimal antiderivative

$$\frac{x}{x \left(1 + \frac{x}{5}\right) + 5 (\ln(\ln(x)) - 5 - \ln(3)) \ln(x)}$$

command

```
Integrate[(500 - 5*x^2 + 125*Log[3] + (-625 - 125*Log[3])*Log[x] + (-125 + 125*Log[x])*Log[Log[x]] + 1250*x - 250*x^2 + (-250*x - 50*x^2)*Log[3])*Log[x] + (15625 + 6250*Log[3] + 625*Log[3]^2)*Log[Log[x]] + 6250 - 1250*Log[3])*Log[x]^2)*Log[Log[x]] + 625*Log[x]^2*Log[Log[x]]^2), x]
```

Mathematica 13.1 output

$$\int \frac{500 - 5x^2 + 125 \log(3) + (-625 - 125 \log(3)) \log(x)}{25x^2 + 10x^3 + x^4 + (-1250x - 250x^2 + (-250x - 50x^2) \log(3)) \log(x) + (15625 + 6250 \log(3) + 625 \log^2(3)) \log^2(x)} dx$$

Mathematica 12.3 output

$$\frac{5x}{x(5+x) + 25 \log(x) \left(-5 + \log\left(\frac{\log(x)}{3}\right) \right)}$$

22.29 Problem number 5264

$$\int -1000x^2 - 600x^3 - 620x^4 - 308x^5 - 60x^6 - 4x^7 + (40x - 1192x^2 - 660x^3 - 1124x^4 - 608x^5 - 120x^6 - 8x^7 +$$

Optimal antiderivative

$$\left(\ln(5) \left(x^2 + \frac{\ln(2) + 2}{5 + x - \ln(x)^2} \right) + x^2 + 2 \right)^2$$

command

Mathematica 13.1 output

$\$Aborted$

Mathematica 12.3 output

$$\begin{aligned} & 4x^2(1 + \log(5)) + x^4(1 + \log(5))^2 \\ & + \frac{x^2(\log^2(2) \log^2(5) + 5 \log(4) \log(5)(9 + 10 \log(5)) + \log^2(25) + \log(2) \log(5)(-90 - 98 \log(5) + \log(25))) + x^4(1 - \\ & + \frac{-8000 \log(5)(8 + \log(16)) - 4800x \log(5)(8 + \log(16)) - 160x^2 \log(5)(188 + 200 \log(5) + 5 \log(4)(9 + 10 \log(5)) - \log^2(2) \log^2(5) - \log^2(25) - \log(2) \log(5)(-90 - 98 \log(5) + \log(25)))}{36x + e^{2x}x + 12x \log(2) + x \log^2(2) + e^x(12x + 2x \log(2))} \end{aligned}$$

22.30 Problem number 5265

$$\int \frac{36 - e^{3x}x + 12 \log(2) + \log^2(2) + e^{2x}(1 - 12x - 2x \log(2)) + e^x(12 - 32x + (2 - 12x) \log(2) - x \log^2(2)) + (72x^2 - 12x \log(2) - 24 \log^2(2) - 24 \log(2)x)}{36x + e^{2x}x + 12x \log(2) + x \log^2(2) + e^x(12x + 2x \log(2))} dx$$

Optimal antiderivative

$$\ln(2x) - e^x - \frac{4}{6 + \ln(2) + e^x} + \ln(x)^2$$

command

`Integrate[(36 - E^(3*x)*x + 12*Log[2] + Log[2]^2 + E^(2*x)*(1 - 12*x - 2*x*Log[2]) + E^x*(12*x^2 - 12*x*Log[2] - 24*Log[2]^2 - 24*Log[2]*x))`

Mathematica 13.1 output

$$\int \frac{36 - e^{3x}x + 12 \log(2) + \log^2(2) + e^{2x}(1 - 12x - 2x \log(2)) + e^x(12 - 32x + (2 - 12x) \log(2) - x \log^2(2)) + (72x^2 - 12x \log(2) - 24 \log^2(2) - 24 \log(2)x)}{36x + e^{2x}x + 12x \log(2) + x \log^2(2) + e^x(12x + 2x \log(2))} dx$$

Mathematica 12.3 output

$$\begin{aligned} & -e^x - \frac{24 - 2 \log^3(2) + \log^2(2)(-12 + \log(4)) + \log(16) - \log(2) \log(4096) + \log(4) \log(4096)}{(6 + \log(2))(6 + e^x + \log(2))} \\ & + \log(x) + \log^2(x) \end{aligned}$$

22.31 Problem number 5410

$$\int \frac{-5x^6 + ex^6 + e^{-\frac{3x}{-5+e}}(320 - 240x + 60x^2 - 5x^3 + e(-64 + 48x - 12x^2 + x^3)) + e^{-\frac{2x}{-5+e}}(-240x^2 + 120x^3 - 15x^4 + 32x^5 + 320)}{-5x^6 + ex^6 + e^{-\frac{3x}{-5+e}}(320 - 240x + 60x^2 - 5x^3 + e(-64 + 48x - 12x^2 + x^3)) + e^{-\frac{2x}{-5+e}}(-240x^2 + 120x^3 - 15x^4 + 32x^5 + 320)} dx$$

Optimal antiderivative

$$x - \frac{4x^2}{\left(\frac{(-4+x)e^{\frac{x}{5-e}}}{x} + x\right)^2}$$

command

```
Integrate[(-5*x^6 + E*x^6 + (320 - 240*x + 60*x^2 - 5*x^3 + E*(-64 + 48*x - 12*x^2 + x^3))/E^5 + E) + (-240*x^2 + 120*x^3 - 15*x^4 + E*(48*x^2 - 24*x^3 + 3*x^4))/E^((2*x)/(-5 + E)) + (-320*x^3 + 132*x^4 - 23*x^5 + E*(64*x^3 - 20*x^4 + 3*x^5))/E^(x/(-5 + E)))/(-5*x^6 + E*x^6 + (64 + 48*x - 12*x^2 + x^3))/E^((3*x)/(-5 + E)) + (-240*x^2 + 120*x^3 - 15*x^4 + E*(48*x^2 - 24*x^3 + 3*x^4))/E^((2*x)/(-5 + E)) + (60*x^4 - 15*x^5 + E*(-12*x^4 + 3*x^5))/E^(x/(-5 + E))), x]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$e^{-\frac{20}{-5+e}}(-4+x)x \left(2e^{\frac{4e}{-5+e}}(-8+x)^3(-4+x) + 4e^{\frac{4e+x}{-5+e}}(-8+x)^3x^2 + 2e^{\frac{2(2e+x)}{-5+e}}(-8+x)^3x^3 + 4e^{\frac{15+e+x}{-5+e}}x^2(160 - 24x)\right)$$

22.32 Problem number 5820

$$\int \frac{5x - x^3 + e^2(5 - x^2) + e^{2e^{\log(x)\log(e^2+x)}} \left(e^2 + x + e^{2e^{\log(x)\log(e^2+x)} + \log(x)\log(e^2+x)} (-4x\log(x) + \dots) \right)}{25x - 10x^2 + 11x^3 - 2x^4 + x^5 + e^{4e^{2e^{\log(x)\log(e^2+x)}}} (e^2 + x) + e^2(25 - 10x + 11x^2 - 2x^3 + x^4) + e^{2e^{2e^{\log(x)\log(e^2+x)}}}} dx$$

Optimal antiderivative

$$\frac{x}{x^2 - x + e^{2e^{\ln(x) \ln(x+e^2)}} + 5}$$

command

```
Integrate[(5*x - x^3 + E^2*(5 - x^2) + E^(2*E^(2*E^(Log[x]*Log[E^2 + x])))*(E^2 + x + E^(2*E^4*x*Log[x] + (-4*E^2 - 4*x)*Log[E^2 + x])))/(25*x - 10*x^2 + 11*x^3 - 2*x^4 + x^5 + E^(4*E^(2*x*Log[x] + (-4*E^2 - 4*x)*Log[E^2 + x])))]
```

Mathematica 13.1 output

$$\int \frac{5x - x^3 + e^2(5 - x^2) + e^{2e^{\log(x)\log(e^2+x)}} \left(e^2 + x + e^{2e^{\log(x)\log(e^2+x)} + \log(x)\log(e^2+x)} (-4x\log(x) + \dots) \right)}{25x - 10x^2 + 11x^3 - 2x^4 + x^5 + e^{4e^{2e^{\log(x)\log(e^2+x)}}} (e^2 + x) + e^2(25 - 10x + 11x^2 - 2x^3 + x^4) + e^{2e^{2e^{\log(x)\log(e^2+x)}}}} dx$$

Mathematica 12.3 output

$$\frac{x \left(4 e^{2 x \log(e^2+x)} + \log(x) \log(e^2+x) x (5 - x + x^2) \log(x) + (e^2 + x) \left(x - 2 x^2 + 4 e^{2 x \log(e^2+x)} + \log(x) \log(e^2+x)\right) (5 - x + x^2) \log(x)\right)}{\left(5 + e^{2 x \log(e^2+x)} - x + x^2\right) \left(4 e^{2 x \log(e^2+x)} x^{1+\log(e^2+x)} (5 - x + x^2) \log(x) + (e^2 + x) \left(x - 2 x^2 + 4 e^{2 x \log(e^2+x)} x \log(x)\right) (5 - x + x^2) \log(x)\right)}$$

22.33 Problem number 5856

$$\int \frac{96 + 96x - 36x^2 + 12x^2 \log(5) + e^x (-96 - 96x + 30x^2 - 6x^3 - 3x^4 - 12x^2 \log(5)) +}{64 + 48x^2 + 9x^4 + (32x + 12x^3) \log(5) + 4x^2 \log^2(5) + e^x (-64 - 40x^2 - 6x^4 + (-32x - 10x^3) \log(5) - 4x^2 \log^2(5))} dx$$

Optimal antiderivative

$$\frac{3(2+x)x}{x^2 + x \left(\frac{x}{-e^x+2} + \ln(5) \right) + 4} + 9$$

command

Mathematica 13.1 output

$$\int \frac{96 + 96x - 36x^2 + 12x^2 \log(5) + e^x (-96 - 96x + 30x^2 - 6x^3 - 3x^4 - 12x^2 \log(5)) +}{64 + 48x^2 + 9x^4 + (32x + 12x^3) \log(5) + 4x^2 \log^2(5) + e^x (-64 - 40x^2 - 6x^4 + (-32x - 10x^3) \log(5) - 4x^2 \log^2(5))} dx$$

Mathematica 12.3 output

$$\frac{3(256 + 3x^6 + 96x(-2 + \log(25)) + x^5(-12 + 9\log(5) + \log(25)) + 4x^2(56 + 4\log(5)(-3 + \log(25)) - 5\log(25) + \dots))}{(-$$

22.34 Problem number 6066

$$\int \frac{10x - 20x^2 + 30x^3 - 20x^4 - 2x^5 + 10x^6 - 20x^7 + 20x^8 - 10x^9 + 2x^{10} + (5x - 16x^3 + 52x^4 - 60x^5 + 28x^6 - 4x^7 + 10x^8 - 10x^9 + 2x^{10})}{x^5 - 4x^6 + 6x^7 - 4x^8 + x^9 + (8x^3 - 18x^4 + 30x^5 - 20x^6 + 10x^7 - 2x^8 + 2x^9)} dx$$

Optimal antiderivative

$$x^2 - 2x + \frac{5}{(4-x)\ln(3) + (x - \ln(x) - x^2)^2}$$

command

```

Integrate[(10*x - 20*x^2 + 30*x^3 - 20*x^4 - 2*x^5 + 10*x^6 - 20*x^7 + 20*x^8 - 10*x^9 + 2*x^
32*x + 48*x^2 - 18*x^3 + 2*x^4)*Log[3]^2 + (-10 + 10*x - 20*x^2 + 8*x^4 - 32*x^5 + 48*x^6 - 3
12*x^3 + 36*x^4 - 36*x^5 + 12*x^6 + (-16*x + 20*x^2 - 4*x^3)*Log[3])*Log[x]^2 + (8*x^2 - 16*x
2*x + 2*x^2)*Log[x]^4)/(x^5 - 4*x^6 + 6*x^7 - 4*x^8 + x^9 + (8*x^3 - 18*x^4 + 12*x^5 - 2*x^6)
4*x^4 + 12*x^5 - 12*x^6 + 4*x^7 + (-16*x^2 + 20*x^3 - 4*x^4)*Log[3])*Log[x] + (6*x^3 - 12*x^4
4*x^2 + 4*x^3)*Log[x]^3 + x*Log[x]^4), x]

```

Mathematica 13.1 output

$$\int \frac{10x - 20x^2 + 30x^3 - 20x^4 - 2x^5 + 10x^6 - 20x^7 + 20x^8 - 10x^9 + 2x^{10} + (5x - 16x^3 + 52x^4 - 60x^5 + 28x^6 - 4x^7 + 10x^9)}{x^5 - 4x^6 + 6x^7 - 4x^8 + x^9 + (8x^3 - 18x^4 + 20x^5 - 12x^6 + 4x^7 + 2x^9)} dx$$

Mathematica 12.3 output

$$16x^{11}\log(3) - 20\log(81) + x^3(-48\log^3(3) + 88\log(81) + (84 + \log(9))\log^2(81) + 6\log^2(3)(28 + \log(81)) - 24\log(3)\log^2(81) - 16\log^3(3)\log(81) - 16\log^4(3))$$

22.35 Problem number 6250

$$\int \frac{e^{2x}(4x + 16x^2) + e^x(-8x - 32x^2)\log(3) + (4x + 16x^2)\log^2(3) + (e^{2x}(-8x - 16x^2) - 8x^3\log(3) + (-8x - 16x^2)\log^2(3))\log(3) + (1 + 8x + 16x^2)\log^2(3)}{(e^{2x}(1 + 8x + 16x^2) + e^x(-2 - 16x - 32x^2)\log(3) + (1 + 8x + 16x^2)\log^2(3))\log^2(x) + (e^x(2x^2 - 8x^3)\log(3))\log[x]^3 + x^4\log[x]^4)} dx$$

Optimal antiderivative

$$\frac{4x}{\ln(x) \left(\frac{x \ln(x)}{\ln(3) - e^x} - \frac{1+4x}{x} \right)}$$

command

```
Integrate[(E^(2*x)*(4*x + 16*x^2) + E^x*(-8*x - 32*x^2)*Log[3] + (4*x + 16*x^2)*Log[3]^2 + (E^x*(8*x - 16*x^2) - 8*x^3*Log[3] + (-8*x - 16*x^2)*Log[3]^2 + E^x*(8*x^3 + (16*x + 32*x^2)*Log[3]^2 - 16*x - 32*x^2)*Log[3] + (1 + 8*x + 16*x^2)*Log[3]^2)*Log[x]^2 + (E^x*(2*x^2 + 8*x^3) + (-2*x^2 - 8*x^3)*Log[3])*Log[x]^3 + x^4*Log[x]^4), x]
```

Mathematica 13.1 output

$$\int \frac{e^{2x}(4x + 16x^2) + e^x(-8x - 32x^2)\log(3) + (4x + 16x^2)\log^2(3) + (e^{2x}(-8x - 16x^2) - 8x^3\log(3) + (-8x - 16x^2)\log^2(3))\log(3) + (1 + 8x + 16x^2)\log^2(3)\log^2(x) + (e^x(2x^2 - 8x^3)\log(3))\log[x]^3 + x^4\log[x]^4)}{(e^{2x}(1 + 8x + 16x^2) + e^x(-2 - 16x - 32x^2)\log(3) + (1 + 8x + 16x^2)\log^2(3))\log^2(x) + (e^x(2x^2 - 8x^3)\log(3))\log[x]^3 + x^4\log[x]^4)} dx$$

Mathematica 12.3 output

$$\frac{4x^2 \left(\frac{e^{2x}(1+4x)+(1+4x)\log^2(3)-e^x(8x\log(3)+\log(9))}{\log(x)} - \frac{x^2(e^{3x}(-2-11x-8x^2+16x^3)+2\log^3(3)+12x\log^3(3)+x^2\log^2(3)(1+16\log(3))+x^3\log^2(3))}{\log(x)} \right)}{1}$$

22.36 Problem number 6633

$$\int \frac{-4x - 2e^3x - 6x^2 + (10 + 4e^3)\log(3) + (-6x - 2e^3x)}{(-6x - 2e^3x + 6x^2 + (6 + 2e^3 - 6x)\log(3))\log^2(x - \log(3)) + (-x + \log(3))\log(2x)\log^2(x - \log(3)) + ((-12x - 2e^3x + 6x^2 + (6 + 2e^3 - 6x)\log(3))\log^2(x - \log(3)))^2} dx$$

Optimal antiderivative

$$\frac{x}{\ln(-\ln(3) + x) + \ln\left(\left(\frac{e^3 + \frac{\ln(2x)}{2} + 3}{x} - 3\right)^2\right)}$$

command

```
Integrate[(-4*x - 2*E^3*x - 6*x^2 + (10 + 4*E^3)*Log[3] + (-6*x - 2*E^3*x + 6*x^2 + (6 + 2*E^3*x + 2*Log[3] + (-x + Log[3])*Log[x - Log[3]])) + (-6*x - 2*E^3*x + 6*x^2 + (6 + 2*E^3 - 6*x)*Log[x + Log[3]]*Log[2*x])*Log[(36 + 4*E^6 + E^3*(24 - 24*x) - 72*x + 36*x^2 + (12 + 4*E^3 - 12*x)*6*x - 2*E^3*x + 6*x^2 + (6 + 2*E^3 - 6*x)*Log[3])*Log[x - Log[3]]]^2 + (-x + Log[3])*Log[2*x]*12*x - 4*E^3*x + 12*x^2 + (12 + 4*E^3 - 12*x)*Log[3])*Log[x - Log[3]] + (-2*x + 2*Log[3])*Log[6*x - 2*E^3*x + 6*x^2 + (6 + 2*E^3 - 6*x)*Log[3] + (-x + Log[3])*Log[2*x])*Log[(36 + 4*E^6 + 4*E^3*(24 - 24*x) - 72*x + 36*x^2 + (12 + 4*E^3 - 12*x)*6*x - 2*E^3*x + 6*x^2 + (6 + 2*E^3 - 6*x)*Log[3])*Log[x - Log[3]]]^2 + (-x + Log[3])*Log[2*x]]*Log[3], x]
```

Mathematica 13.1 output

$$\int \frac{-4x - 2e^3x - 6x^2 + (10 + 4e^3) \log(3) + (-6x - 2e^3x)}{(-6x - 2e^3x + 6x^2 + (6 + 2e^3 - 6x) \log(3)) \log^2(x - \log(3)) + (-x + \log(3)) \log(2x) \log^2(x - \log(3)) + ((-12x + 12) \log(3) + 12) \log(x - \log(3))} dx$$

Mathematica 12.3 output

$$\frac{x}{\log\left(\frac{1}{4}(x - \log(3))\right) + \log\left(\frac{(6+2e^3-6x+\log(2x))^2}{x^2}\right)}$$

22.37 Problem number 6675

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

Optimal antiderivative

$$\frac{x}{x + \ln\left(\frac{\ln(x)}{x - \frac{1-2e^{-x}}{\ln(5)} + 2}\right)} + 2$$

command

```
Integrate[(-2 + E^x*(1 + (-2 - x)*Log[5]) + (-2*x + E^x*x*Log[5])*Log[x] + (2 + E^x*(-1 + (2 + x)*Log[5]))*Log[x]*Log[(E^x*Log[5]*Log[x])/(2 + E^x*(-1 + (2 + x)*Log[5]))])/((2*x^2 + (2*x^2 + x^3)*Log[5]))*Log[x] + (4*x + E^x*(-2*x + (4*x + 2*x^2)*Log[5]))*Log[x]*Log[(E^x*Log[5]*Log[x])/(2 + E^x*(-1 + (2 + x)*Log[5]))] + (2 + E^x*(-1 + (2 + x)*Log[5]))*Log[x]*Log[(E^x*Log[5]*Log[x])/(2 + E^x*(-1 + (2 + x)*Log[5]))]^2), x]
```

Mathematica 13.1 output

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

Mathematica 12.3 output

$$\frac{x}{x + \log\left(\frac{e^x \log(5) \log(x)}{2 + e^x(-1 + (2 + x) \log(5))}\right)}$$

22.38 Problem number 6680

$$\int e^{-7+x^2-25\frac{4x}{e^2}}(x^2)^{\frac{4x}{e^2}} \left(e^2(1+2x^2) + 25\frac{4x}{e^2}(x^2)^{\frac{4x}{e^2}}(-8x - 4x \log(25x^2))\right) dx$$

Optimal antiderivative

$$x e^{-e^{4x \ln(25x^2)} e^{-2} + x^2 - 5}$$

command

```
Integrate[E^(-7 + x^2 - 25^((4*x)/E^2)*(x^2)^((4*x)/E^2))*(E^2*(1 + 2*x^2) + 25^((4*x)/E^2)*(8*x - 4*x*Log[25*x^2])), x]
```

Mathematica 13.1 output

$$\int e^{-7+x^2-25\frac{4x}{e^2}}(x^2)^{\frac{4x}{e^2}} \left(e^2(1+2x^2) + 25\frac{4x}{e^2}(x^2)^{\frac{4x}{e^2}}(-8x - 4x \log(25x^2))\right) dx$$

Mathematica 12.3 output

$$e^{-5+x^2-25\frac{4x}{e^2}}(x^2)^{\frac{4x}{e^2}} x$$

22.39 Problem number 6838

$$\int \frac{4x - 5x^2 - 8x^3 + 10x^4 + (-x + 2x^3) \log(5) + (4x - 10x^2 + e^{x^2}(40 - 100x - 10 \log(5)) - x \log(5)) \log(e^{-x^2}(10e^{x^2} + x))}{10e^{x^2} + x} dx$$

Optimal antiderivative

$$(4 - 5x - \ln(5)) \ln(10 + x e^{-x^2}) x$$

command

```
Integrate[(4*x - 5*x^2 - 8*x^3 + 10*x^4 + (-x + 2*x^3)*Log[5] + (4*x - 10*x^2 + E^x^2*(40 - 100*x - 10*Log[5]) - x*Log[5])*Log[e^-x^2*(10*e^x^2 + x)]], x]
```

Mathematica 13.1 output

$$\int \frac{4x - 5x^2 - 8x^3 + 10x^4 + (-x + 2x^3) \log(5) + (4x - 10x^2 + e^{x^2}(40 - 100x - 10 \log(5)) - x \log(5)) \log(e^{-x^2}(10e^{x^2} + x))}{10e^{x^2} + x} dx$$

Mathematica 12.3 output

$$-x(-4 + 5x + \log(5)) \log(10 + e^{-x^2} x)$$

22.40 Problem number 7310

$$\int \frac{-108 + 144x^3 + 2x^6 + e^{-1+x}(-54 + 72x^3 + x^6) + (e^{-1+x}(9x - 24x^4 + 16x^7) + e^{-1+x}x^7 \log(x)) \log\left(\frac{9-24x^3+16x^6}{9x-24x^4+16x^7+x^7 \log(x)}\right)}{9x - 24x^4 + 16x^7 + x^7 \log(x)}$$

Optimal antiderivative

$$\ln\left(\ln(x) + \left(4 - \frac{3}{x^3}\right)^2\right) (2 + e^{-1+x})$$

command

```
Integrate[(-108 + 144*x^3 + 2*x^6 + E^(-1 + x)*(-54 + 72*x^3 + x^6) + (E^(-1 + x)*(9*x - 24*x^4 + 16*x^7) + e^(-1+x)*x^7*Log[x])*Log[(9 - 24*x^3 + 16*x^6 + x^6*Log[x])/x^6])/(9*x - 24*x^4 + 16*x^7 + x^7*Log[x])]
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$\frac{-12e \log(x) + e^x \log\left(\frac{(3-4x^3)^2}{x^6} + \log(x)\right) + 2e \log(9 - 24x^3 + 16x^6 + x^6 \log(x))}{e}$$

22.41 Problem number 7387

$$\int \frac{180x^3 - 120x^4 \log(3) + e^{2x}(200x - 600x^2 + 200x^3 \log(3)) + e^x(360x^2 - 120x^3 - 180x^4 + (-200x^3 + 60x^4 + 60x^5) \log(3))}{9x^2 - 27x^3 + 9x^4 \log(3) + e^{2x}(25 - 10x^2 + 30x^3 - 15x^4) \log(3)}$$

Optimal antiderivative

$$\frac{4(e^x - \ln(x(x \ln(3) - 3) + 1)) x}{\frac{e^x}{x} + \frac{3}{5}}$$

command

```
Integrate[(180*x^3 - 120*x^4*Log[3] + E^(2*x)*(200*x - 600*x^2 + 200*x^3*Log[3]) + E^x*(360*x^2 - 120*x^3 - 180*x^4 + (-200*x^3 + 60*x^4 + 60*x^5)*Log[3]) + (-60*x^2 + 180*x^3 - 60*x^4*Log[3] + E^x*(-200*x + 700*x^2 - 200*x^3 + 100*x^4)*Log[3]))*Log[1 - 3*x + x^2*Log[3]])/(9*x^2 - 27*x^3 + 9*x^4*Log[3] + E^(2*x)*(25 - 10*x^2 + 30*x^3 - 15*x^4)*Log[3])]
```

Mathematica 13.1 output

$$\int \frac{180x^3 - 120x^4 \log(3) + e^{2x}(200x - 600x^2 + 200x^3 \log(3)) + e^x(360x^2 - 120x^3 - 180x^4 + (-200x^3 + 60x^4 + 60x^5) \log(3))}{9x^2 - 27x^3 + 9x^4 \log(3) + e^{2x}(25 - 10x^2 + 30x^3 - 15x^4) \log(3)}$$

Mathematica 12.3 output

$$\frac{4x^2(5 - 15x + x^2 \log(243)) (e^x - \log(1 - 3x + x^2 \log(3)))}{(5e^x + 3x)(1 - 3x + x^2 \log(3))}$$

22.42 Problem number 7414

$$\int \frac{e^{\frac{2(4x^2+x^3+\log(\frac{15}{40+3e^x}))}{4x^2+x^3}} \left(e^x(-24x - 6x^2) + (-640 + e^x(-48 - 18x) - 240x) \log\left(\frac{15}{40+3e^x}\right) \right)}{640x^3 + 320x^4 + 40x^5 + e^x(48x^3 + 24x^4 + 3x^5)} dx$$

Optimal antiderivative

$$e^{\frac{2x + \frac{(4+x)x}{x}}{2 \ln\left(\frac{5}{e^x + \frac{40}{3}}\right)}}$$

command

```
Integrate[(E^((2*(4*x^2 + x^3 + Log[15/(40 + 3*E^x)]))/(4*x^2 + x^3))*(E^x*(-24*x - 6*x^2) + 640 + E^x*(-48 - 18*x) - 240*x)*Log[15/(40 + 3*E^x)])/(640*x^3 + 320*x^4 + 40*x^5 + E^x*(48*
```

Mathematica 13.1 output

$$\int \frac{e^{\frac{2(4x^2+x^3+\log(\frac{15}{40+3e^x}))}{4x^2+x^3}} \left(e^x(-24x - 6x^2) + (-640 + e^x(-48 - 18x) - 240x) \log\left(\frac{15}{40+3e^x}\right) \right)}{640x^3 + 320x^4 + 40x^5 + e^x(48x^3 + 24x^4 + 3x^5)} dx$$

Mathematica 12.3 output

$$15^{\frac{2}{x^2(4+x)}} e^2 \left(\frac{1}{40 + 3e^x} \right)^{\frac{2}{x^2(4+x)}}$$

22.43 Problem number 7882

$$\int \frac{120x^2 - 120x \log\left(\frac{x}{4}\right) + 120x \log^2\left(\frac{x}{4}\right)}{4x^2 - 4x^3 + x^4 + (4x - 2x^2) \log^2\left(\frac{x}{4}\right) + \log^4\left(\frac{x}{4}\right)} dx$$

Optimal antiderivative

$$\frac{\frac{60x}{\ln\left(\frac{x}{4}\right)^2} - x + 2}{x}$$

command

```
Integrate[(120*x^2 - 120*x*Log[x/4] + 120*x*Log[x/4]^2)/(4*x^2 - 4*x^3 + x^4 + (4*x - 2*x^2)*
```

Mathematica 13.1 output

\$Aborted

Mathematica 12.3 output

$$-\frac{120x^2}{2(-2 + x)x - 2 \log^2\left(\frac{x}{4}\right)}$$

22.44 Problem number 8195

$$\int \frac{-12 + e^x(-3 - 3x - x^2) + (e^{3x}(6x + 2x^2) + e^{2x}(24x + 8x^2)) \log\left(\frac{16+4e^x}{3+x}\right) + (e^{3x}(6x + 2x^2) + e^{2x}(24x + 8x^2))}{(12x + 4x^2 + e^x(3x + x^2)) \log\left(\frac{16+4e^x}{3+x}\right) + (12x + 4x^2 + e^x(3x + x^2)) \log\left(\frac{x}{\log(3)}\right)}$$

Optimal antiderivative

$$e^{2x} - \ln\left(\ln\left(\frac{x}{\ln(3)}\right) + \ln\left(\frac{4e^x + 16}{3 + x}\right)\right)$$

command

```
Integrate[(-12 + E^x*(-3 - 3*x - x^2) + (E^(3*x)*(6*x + 2*x^2) + E^(2*x)*(24*x + 8*x^2))*Log[
```

Mathematica 13.1 output

$$\int \frac{-12 + e^x(-3 - 3x - x^2) + (e^{3x}(6x + 2x^2) + e^{2x}(24x + 8x^2)) \log\left(\frac{16+4e^x}{3+x}\right) + (e^{3x}(6x + 2x^2) + e^{2x}(24x + 8x^2))}{(12x + 4x^2 + e^x(3x + x^2)) \log\left(\frac{16+4e^x}{3+x}\right) + (12x + 4x^2 + e^x(3x + x^2)) \log\left(\frac{x}{\log(3)}\right)}$$

Mathematica 12.3 output

$$e^{2x} - \log\left(\log\left(\frac{4 + e^x}{3 + x}\right) + \log\left(\frac{4x}{\log(3)}\right)\right)$$

22.45 Problem number 8361

$$\int \frac{12x^2 \log(2) + 3e^{2/x}x^2 \log(2) + 3e^{\frac{2(x^3+x^3 \log(2))}{\log(2)}}x^2 \log(2) + e^{\frac{1}{x}}(5 + 12x^2) \log(2) + e^{\frac{x^3+x^3 \log(2)}{\log(2)}}(15x^4 - 6e^{\frac{1}{x}}x^2 \log(2))}{12x^2 \log(2) + 12e^{\frac{1}{x}}x^2 \log(2) + 3e^{2/x}x^2 \log(2) + 3e^{\frac{2(x^3+x^3 \log(2))}{\log(2)}}x^2 \log(2) + e^{\frac{x^3+x^3 \log(2)}{\log(2)}}(-12x^2 \log(2))}$$

Optimal antiderivative

$$\frac{5}{3\left(e^{\frac{1}{x}} - e^{\frac{x^2(x \ln(2) + x)}{\ln(2)}} + 2\right)} + x$$

command

```
Integrate[(12*x^2*Log[2] + 3*E^(2/x)*x^2*Log[2] + 3*E^((2*(x^3 + x^3*Log[2]))/Log[2])*x^2*Log[1]*(5 + 12*x^2)*Log[2] + E^((x^3 + x^3*Log[2])/Log[2])*(15*x^4 - 6*E^x*(-1)*x^2*Log[2] + (-12*x^2 + 15*x^4)*Log[2]))/(12*x^2*Log[2] + 12*E^x*(-1)*x^2*Log[2] + 3*E^(2/x)*x^2*Log[2] + 3*12*x^2*Log[2] - 6*E^x*(-1)*x^2*Log[2])), x]
```

Mathematica 13.1 output

$$\int \frac{12x^2 \log(2) + 3e^{2/x} x^2 \log(2) + 3e^{\frac{2(x^3+x^3 \log(2))}{\log(2)}} x^2 \log(2) + e^{\frac{1}{x}} (5 + 12x^2) \log(2) + e^{\frac{x^3+x^3 \log(2)}{\log(2)}} (15x^4 - 6e^{\frac{1}{x}} x^2 \log(2))}{12x^2 \log(2) + 12e^{\frac{1}{x}} x^2 \log(2) + 3e^{2/x} x^2 \log(2) + 3e^{\frac{2(x^3+x^3 \log(2))}{\log(2)}} x^2 \log(2) + e^{\frac{x^3+x^3 \log(2)}{\log(2)}} (-12x^2 \log(2))}$$

Mathematica 12.3 output

$$\frac{1}{3} \left(3x + \frac{15 \left(2 + e^{\frac{1}{x}} \right) x^4 (1 + \log(2)) + e^{\frac{1}{x}} \log(32)}{\left(2 + e^{\frac{1}{x}} - e^{x^3 \left(1 + \frac{1}{\log(2)} \right)} \right) \left(e^{\frac{1}{x}} \log(2) + x^4 \left(6 + e^{\frac{1}{x}} (3 + \log(8)) + \log(64) \right) \right)} \right)$$

22.46 Problem number 8653

$$\int \frac{2x^3 \log^2(3) - 4x \log^3(3) + (-2x^5 \log(3) + 14x^3 \log^2(3)) \log(x) - 12x^5 \log(3) \log^2(x) + 2x^7 \log^3(x)}{-8 \log^3(3) + 12x^2 \log^2(3) \log(x) - 6x^4 \log(3) \log^2(x) + x^6 \log^3(x)} dx$$

Optimal antiderivative

$$\left(x - \frac{x}{-\frac{\ln(x)x^2}{\ln(3)} + 2} \right)^2$$

command

```
Integrate[(2*x^3*Log[3]^2 - 4*x*Log[3]^3 + (-2*x^5*Log[3] + 14*x^3*Log[3]^2)*Log[x] - 12*x^5*Log[3]*Log^2[x] + 2*x^7*Log^3[x]), x]
```

Mathematica 13.1 output

$$\int \frac{2x^3 \log^2(3) - 4x \log^3(3) + (-2x^5 \log(3) + 14x^3 \log^2(3)) \log(x) - 12x^5 \log(3) \log^2(x) + 2x^7 \log^3(x)}{-8 \log^3(3) + 12x^2 \log^2(3) \log(x) - 6x^4 \log(3) \log^2(x) + x^6 \log^3(x)} dx$$

Mathematica 12.3 output

$$x^2 \left(8 \log^2(3) \log^3(9) - x^6 (\log^2(3) + \log(3) \log(9) - \log^2(9)) + 4x^2 \log^2(9) (\log^2(3) - \log(3) \log(9) + \log^2(9)) + x^4 ($$

22.47 Problem number 8762

$$\int \frac{-5x + 6x^2 - x^3 + (5x - 6x^2 + x^3) \log(5) + (5x - 6x^2 + x^3) \log(5 - x) + (e^5 (-15x + 18x^2 - 3x^3) + e^5 (15x - 12x^2 + 3x^3))}{-5x + 6x^2 - x^3 + (5x - 6x^2 + x^3) \log(5) + (5x - 6x^2 + x^3) \log(5 - x) + (e^5 (-15x + 18x^2 - 3x^3) + e^5 (15x - 12x^2 + 3x^3))} dx$$

Optimal antiderivative

$$\frac{x^2}{\left(x \ln\left(\frac{x^2-x}{\ln(5-x)+\ln(5)-1}\right) + x e^{-5}\right)^2}$$

command

```
Integrate[(E^15*(10 - 24*x + 6*x^2) + E^15*(-10 + 22*x - 4*x^2)*Log[5] + E^15*(-10 + 22*x - 4*x^2 - x^3 + (5*x - 6*x^2 + x^3)*Log[5] + (5*x - 6*x^2 + x^3)*Log[5 - x] + (E^5*(-15*x + 18*x^2 - 3*x^3) + E^5*(15*x - 18*x^2 + 3*x^3)*Log[x + x^2])/(-1 + Log[5] + Log[5 - x])) + (E^10*(-15*x + 18*x^2 - 3*x^3) + E^10*(15*x - 18*x^2 + x^3))/(-1 + Log[5] + Log[5 - x]))^2 + (E^15*(-5*x + 6*x^2 - x^3) + E^15*(5*x - 6*x^2 + x^3))/(-1 + Log[5] + Log[5 - x]))^3],x]
```

Mathematica 13.1 output

$$\int \frac{-5x + 6x^2 - x^3 + (5x - 6x^2 + x^3) \log(5) + (5x - 6x^2 + x^3) \log(5 - x) + (e^5 (-15x + 18x^2 - 3x^3) + e^5 (15x - 12x^2 + 3x^3))}{-5x + 6x^2 - x^3 + (5x - 6x^2 + x^3) \log(5) + (5x - 6x^2 + x^3) \log(5 - x) + (e^5 (-15x + 18x^2 - 3x^3) + e^5 (15x - 12x^2 + 3x^3))} dx$$

Mathematica 12.3 output

$$\frac{e^{10}}{\left(1 + e^5 \log\left(\frac{(-1+x)x}{-1+\log(-5(-5+x))}\right)\right)^2}$$

22.48 Problem number 8818

$$\int \frac{-2 + x + ((-12 + 7x) \log(3) + (12 - 7x) \log(x)) \log(-\log(3) + \log(x))}{(-256x^7 + 256x^8 - 64x^9) \log(3) + (256x^7 - 256x^8 + 64x^9) \log(x)} dx$$

Optimal antiderivative

$$\frac{\ln(\ln(x) - \ln(3))}{64x^6 (-2 + x)}$$

command

```
Integrate[(-2 + x + ((-12 + 7*x)*Log[3] + (12 - 7*x)*Log[x])*Log[-Log[3] + Log[x]])/((-256*x^7 + 256*x^8 - 64*x^9)*Log[3] + (256*x^7 - 256*x^8 + 64*x^9)*Log[x]),x]
```

Mathematica 13.1 output

$$\int \frac{-2 + x + ((-12 + 7x) \log(3) + (12 - 7x) \log(x)) \log(-\log(3) + \log(x))}{(-256x^7 + 256x^8 - 64x^9) \log(3) + (256x^7 - 256x^8 + 64x^9) \log(x)} dx$$

Mathematica 12.3 output

$$\frac{\log(\log(\frac{x}{3}))}{64(-2+x)x^6}$$

22.49 Problem number 9331

$$\int \frac{-32 \log(3) + 32 \log(3) \log(\frac{x}{3}) + (-8 + 16x) \log(3) \log^2(\frac{x}{3}) - 8 \log(3) \log^2(\frac{x}{3}) \log(x)}{(-4x \log(\frac{x}{3}) - x^2 \log^2(\frac{x}{3}) + x \log^2(\frac{x}{3}) \log(x)) \log^2(\frac{16x^2 + 8x^3 \log(\frac{x}{3}) + x^4 \log^2(\frac{x}{3}) + (-8x^2 \log(\frac{x}{3}) - 2x^3 \log^2(\frac{x}{3})) \log(x) + x^2 \log^2(\frac{x}{3})}{\log^2(\frac{x}{3})})} dx$$

Optimal antiderivative

$$\frac{4 \ln(3)}{\ln\left(x^2 \left(\frac{4}{\ln(\frac{x}{3})} - \ln(x) + x\right)^2\right)}$$

command

```
Integrate[(-32*Log[3] + 32*Log[3]*Log[x/3] + (-8 + 16*x)*Log[3]*Log[x/3]^2 - 8*Log[3]*Log[x/3]^4*x*Log[x/3] - x^2*Log[x/3]^2 + x*Log[x/3]^2*Log[x])*Log[(16*x^2 + 8*x^3*Log[x/3] + x^4*Log[x/3]^2*x^2*Log[x/3] - 2*x^3*Log[x/3]^2)*Log[x] + x^2*Log[x/3]^2*Log[x]^2]/Log[x/3]^2], x]
```

Mathematica 13.1 output

$$\int \frac{-32 \log(3) + 32 \log(3) \log(\frac{x}{3}) + (-8 + 16x) \log(3) \log^2(\frac{x}{3}) - 8 \log(3) \log^2(\frac{x}{3}) \log(x)}{(-4x \log(\frac{x}{3}) - x^2 \log^2(\frac{x}{3}) + x \log^2(\frac{x}{3}) \log(x)) \log^2(\frac{16x^2 + 8x^3 \log(\frac{x}{3}) + x^4 \log^2(\frac{x}{3}) + (-8x^2 \log(\frac{x}{3}) - 2x^3 \log^2(\frac{x}{3})) \log(x) + x^2 \log^2(\frac{x}{3})}{\log^2(\frac{x}{3})})} dx$$

Mathematica 12.3 output

$$\frac{4 \log(3) (-4 - \log(81) + \log^2(\frac{x}{3}) (-1 + 2x - \log(x))) + 4 \log(x)}{(-4 + 4 \log(\frac{x}{3}) + \log^2(\frac{x}{3}) (-1 + 2x - \log(x))) \log\left(\frac{x^2 (4 + \log(\frac{x}{3}) (x - \log(x)))^2}{\log^2(\frac{x}{3})}\right)}$$

22.50 Problem number 9462

$$\int \frac{8x - 9 \log(2) + (-2x + 2 \log(2)) \log(2) + (49 - 28x + 4x^2) \log(2) + (-4x + 4 \log(2)) \log^2(x) + (-14x + 4x^2 + (14 - 4x) \log(2)) \log^3(x)}{-49x + 28x^2 - 4x^3 + (49 - 28x + 4x^2) \log(2) + (-4x + 4 \log(2)) \log^2(x) + (-14x + 4x^2 + (14 - 4x) \log(2)) \log^3(x)} dx$$

Optimal antiderivative

$$-\frac{x}{\ln(-2 \ln(2) + 2x) - 2 \ln(x) - 2x + 7}$$

command

```
Integrate[(8*x - 9*Log[2] + (-2*x + 2*Log[2])*Log[x] + (x - Log[2])*Log[2*x - 2*Log[2]])/(-49*x + 28*x^2 - 4*x^3 + (49 - 28*x + 4*x^2)*Log[2] + (-4*x + 4*Log[2])*Log[x]^2 + (-14*x + 4*x^2 + (14 - 4*x)*Log[2])*Log[2*x - 2*Log[2]] + (-x + Log[2])*Log[2*x - 2*Log[2]]^2 + 28 + 8*x)*Log[2] + (4*x - 4*Log[2])*Log[2*x - 2*Log[2]]), x]
```

Mathematica 13.1 output

$$\int \frac{8x - 9\log(2) + (-2x + 2\log(2))\log(x) + (-14x + 4x^2 + (14 - 4x)\log(2))\log^2(x)}{-49x + 28x^2 - 4x^3 + (49 - 28x + 4x^2)\log(2) + (-4x + 4\log(2))\log^2(x) + (-14x + 4x^2 + (14 - 4x)\log(2))\log^3(x)}$$

Mathematica 12.3 output

$$\frac{x(2x - \log(4))}{2(x - \log(2))(-7 + 2x + 2\log(x) - \log(2x - \log(4)))}$$

22.51 Problem number 9582

$$\int \frac{-16x - 16x^2\log(2) + (-20 + 20x - 4x^3)\log^2(2) + (16x\log(2) - 4x\log(2)^2)\log(-x)}{64x - 32x^2 + 4x^3 + (-80x + 84x^2 - 32x^3 + 4x^4)\log(2) + (25x - 40x^2 + 26x^3 - 8x^4 + x^5)\log^2(2) + ((-64x + 16x^2)\log(2)^3 - 16x^2\log(2)^2\log(-x) + (-20 + 20x - 4x^3)\log(2)\log(-x)^2 + (16x\log(2) - 4x\log(2)^2)\log(-x)^3)} dx$$

Optimal antiderivative

$$\frac{4}{\frac{5}{\frac{2}{\ln(2)} + x - \ln(-x)} + x - 4}$$

command

```
Integrate[(-16*x - 16*x^2*Log[2] + (-20 + 20*x - 4*x^3)*Log[2]^2 + (16*x*Log[2] + 8*x^2*Log[2]*x) - 4*x*Log[2]^2*Log[-x]^2)/(64*x - 32*x^2 + 4*x^3 + (-80*x + 84*x^2 - 32*x^3 + 4*x^4)*Log[2] + (40*x - 42*x^2 + 16*x^3 - 2*x^4)*Log[2]^2)*Log[-x] + (16*x - x^2), x]
```

Mathematica 13.1 output

$$\int \frac{-16x - 16x^2\log(2) + (-20 + 20x - 4x^3)\log^2(2) + (16x\log(2) - 4x\log(2)^2)\log(-x)}{64x - 32x^2 + 4x^3 + (-80x + 84x^2 - 32x^3 + 4x^4)\log(2) + (25x - 40x^2 + 26x^3 - 8x^4 + x^5)\log^2(2) + ((-64x + 16x^2)\log(2)^3 - 16x^2\log(2)^2\log(-x) + (-20 + 20x - 4x^3)\log(2)\log(-x)^2 + (16x\log(2) - 4x\log(2)^2)\log(-x)^3)} dx$$

Mathematica 12.3 output

$$-\frac{4(-x^4\log^3(2) + x^3\log(2)(5\log^2(2) - \log(4) + \log(2)\log(16)) + x^2(-15\log^3(2) - \log^2(2)(-2 + \log(16)) + \log^2(16)\log(-x)))}{(x^3\log^2(2) - \log^2(16)\log(-x))^2}$$

22.52 Problem number 9617

$$\int \frac{(10 + e^x(2 - 2x) + e^{x^2}(2 - 4x^2) + 8\log(2)) \log\left(\frac{4x}{5+e^x+e^{x^2}-3x+4\log(2)}\right)}{5x + e^x x + e^{x^2} x - 3x^2 + 4x \log(2)} dx$$

Optimal antiderivative

$$\ln\left(\frac{x}{\ln(2) - \frac{3x}{4} + \frac{5}{4} + \frac{e^x}{4} + \frac{e^{x^2}}{4}}\right)^2$$

command

```
Integrate[((10 + E^x*(2 - 2*x) + E^x*x^2*(2 - 4*x^2) + 8*Log[2])*Log[(4*x)/(5 + E^x + E^x*x^2 - 3*x^2 + 4*x*Log[2])]]
```

Mathematica 13.1 output

$$\int \frac{(10 + e^x(2 - 2x) + e^{x^2}(2 - 4x^2) + 8\log(2)) \log\left(\frac{4x}{5+e^x+e^{x^2}-3x+4\log(2)}\right)}{5x + e^x x + e^{x^2} x - 3x^2 + 4x \log(2)} dx$$

Mathematica 12.3 output

$$\log^2\left(\frac{4x}{e^x + e^{x^2} - 3x + 5\left(1 + \frac{4\log(2)}{5}\right)}\right)$$

22.53 Problem number 9713

$$\int \frac{42 + 144x + 108x^2 + 3 \cdot 2^{2+\frac{4x}{3}} \left(\frac{1}{x^2}\right)^{2x/3} x^4 + 2^{2x/3} \left(\frac{1}{x^2}\right)^{x/3} (51x^2 + 70x^3 + x^3 \log(\frac{4}{x^2}))}{48 + 144x + 108x^2 + 3 \cdot 2^{2+\frac{4x}{3}} \left(\frac{1}{x^2}\right)^{2x/3} x^4 + 2^{2x/3} \left(\frac{1}{x^2}\right)^{x/3} (48x^2 + 72x^3)} dx$$

Optimal antiderivative

$$x - \frac{x}{4 \left(3x + e^{\frac{x \ln\left(\frac{4}{x^2}\right)}{3}} x^2 + 2\right)}$$

command

```
Integrate[(42 + 144*x + 108*x^2 + 3*2^(2 + (4*x)/3)*(x^(-2))^((2*x)/3)*x^4 + 2^((2*x)/3)*(x^(-2))^((x/3)*(51*x^2 + 70*x^3 + x^3*Log[4/x^2]))/(48 + 144*x + 108*x^2 + 3*2^(2 + (4*x)/3)*(x^(-2))^((2*x)/3)*x^4 + 2^((2*x)/3)*(x^(-2))^((x/3)*(48*x^2 + 72*x^3))),x]
```

Mathematica 13.1 output

$$\int \frac{42 + 144x + 108x^2 + 3 \cdot 2^{2+\frac{4x}{3}} \left(\frac{1}{x^2}\right)^{2x/3} x^4 + 2^{2x/3} \left(\frac{1}{x^2}\right)^{x/3} (51x^2 + 70x^3 + x^3 \log(\frac{4}{x^2}))}{48 + 144x + 108x^2 + 3 \cdot 2^{2+\frac{4x}{3}} \left(\frac{1}{x^2}\right)^{2x/3} x^4 + 2^{2x/3} \left(\frac{1}{x^2}\right)^{x/3} (48x^2 + 72x^3)} dx$$

Mathematica 12.3 output

$$\frac{1}{4}x \left(4 - \frac{1}{2 + 2^{2x/3} \left(\frac{1}{x^2}\right)^{-1+\frac{x}{3}} + 3x} \right)$$

22.54 Problem number 10072

$$\int \frac{-700 + e^{\frac{1}{25}(-125+145x-16x^2+25x \log(3x))} (25 - 170x + 32x^2 - 25x \log(3x))}{19600 - 1400e^{\frac{1}{25}(-125+145x-16x^2+25x \log(3x))} + 25e^{\frac{2}{25}(-125+145x-16x^2+25x \log(3x))}} dx$$

Optimal antiderivative

$$\frac{x}{e^{x+4+x \ln(3x)-\left(\frac{4x}{5}-3\right)^2}-28}$$

command

```
Integrate[(-700 + E^((-125 + 145*x - 16*x^2 + 25*x*Log[3*x])/25)*(25 - 170*x + 32*x^2 - 25*x*125 + 145*x - 16*x^2 + 25*x*Log[3*x])/25) + 25*E^((2*(-125 + 145*x - 16*x^2 + 25*x*Log[3*x]))/25)]
```

Mathematica 13.1 output

$$\int \frac{-700 + e^{\frac{1}{25}(-125+145x-16x^2+25x \log(3x))} (25 - 170x + 32x^2 - 25x \log(3x))}{19600 - 1400e^{\frac{1}{25}(-125+145x-16x^2+25x \log(3x))} + 25e^{\frac{2}{25}(-125+145x-16x^2+25x \log(3x))}} dx$$

Mathematica 12.3 output

$$-\frac{e^{5+\frac{16x^2}{25}} x}{28e^{5+\frac{16x^2}{25}} - 3^x e^{29x/5} x^x}$$

22.55 Problem number 10272

$$\int \frac{6x^3 - 4x^2 \log(2) + e^x (-16x^5 + (-16x^3 + 32x^4) \log(2) + (20x^2 - 24x^3) \log^2(2) + (-8x + 8x^2) \log^3(2) + (1 - x)x^4 \log^4(2))}{x^2 + e^x (8x^3 - 8x^2 \log(2) + 2x \log^2(2)) + e^{2x} (16x^4 - 32x^3 \log(2) + 16x^2 \log^3(2) + 4x \log^4(2))} dx$$

Optimal antiderivative

$$\frac{4x}{4e^x + \frac{4x}{(2x-\ln(2))^2}} - x^2$$

command

Integrate[(6*x^3 - 4*x^2*Log[2] + E^x*(-16*x^5 + (-16*x^3 + 32*x^4)*Log[2] + (20*x^2 - 24*x^3)*Log[2]^2 + (8*x + 8*x^2)*Log[2]^3 + (1 - x)*Log[2]^4) + E^(2*x)*(-32*x^5 + 64*x^4*Log[2] - 48*x^3*Log[2]^2 + 16*x^2*Log[2]^3 + 8*x*Log[2]^4) + E^(3*x)*(-16*x^7 + 64*x^6*Log[2] - 96*x^5*Log[2]^2 + 48*x^4*Log[2]^3 + 16*x^3*Log[2]^4 + 8*x^2*Log[2]^5 + 2*x*Log[2]^6) + E^(4*x)*(-32*x^9 + 192*x^8*Log[2] - 48*x^7*Log[2]^2 - 192*x^6*Log[2]^3 + 96*x^5*Log[2]^4 + 32*x^4*Log[2]^5 + 8*x^3*Log[2]^6 + 2*x^2*Log[2]^7 + Log[2]^8) + E^(5*x)*(-64*x^11 + 448*x^10*Log[2] - 144*x^9*Log[2]^2 - 448*x^8*Log[2]^3 + 144*x^7*Log[2]^4 + 48*x^6*Log[2]^5 + 16*x^5*Log[2]^6 + 4*x^4*Log[2]^7 + Log[2]^8) + E^(6*x)*(-128*x^13 + 960*x^12*Log[2] - 384*x^11*Log[2]^2 - 960*x^10*Log[2]^3 + 384*x^9*Log[2]^4 + 128*x^8*Log[2]^5 + 48*x^7*Log[2]^6 + 16*x^6*Log[2]^7 + 4*x^5*Log[2]^8 + Log[2]^9) + E^(7*x)*(-256*x^15 + 2240*x^14*Log[2] - 896*x^13*Log[2]^2 - 2240*x^12*Log[2]^3 + 896*x^11*Log[2]^4 + 256*x^10*Log[2]^5 + 128*x^9*Log[2]^6 + 48*x^8*Log[2]^7 + 16*x^7*Log[2]^8 + 4*x^6*Log[2]^9 + Log[2]^10) + E^(8*x)*(-512*x^17 + 5120*x^16*Log[2] - 2048*x^15*Log[2]^2 - 5120*x^14*Log[2]^3 + 2048*x^13*Log[2]^4 + 512*x^12*Log[2]^5 + 256*x^11*Log[2]^6 + 128*x^10*Log[2]^7 + 48*x^9*Log[2]^8 + 16*x^8*Log[2]^9 + 4*x^7*Log[2]^10 + Log[2]^11) + E^(9*x)*(-1024*x^19 + 10240*x^18*Log[2] - 4096*x^17*Log[2]^2 - 10240*x^16*Log[2]^3 + 4096*x^15*Log[2]^4 + 1024*x^14*Log[2]^5 + 512*x^13*Log[2]^6 + 256*x^12*Log[2]^7 + 128*x^11*Log[2]^8 + 48*x^10*Log[2]^9 + 16*x^9*Log[2]^10 + 4*x^8*Log[2]^11 + Log[2]^12) + E^(10*x)*(-2048*x^21 + 20480*x^20*Log[2] - 8192*x^19*Log[2]^2 - 20480*x^18*Log[2]^3 + 8192*x^17*Log[2]^4 + 2048*x^16*Log[2]^5 + 1024*x^15*Log[2]^6 + 512*x^14*Log[2]^7 + 256*x^13*Log[2]^8 + 128*x^12*Log[2]^9 + 48*x^11*Log[2]^10 + 16*x^10*Log[2]^11 + 4*x^9*Log[2]^12 + Log[2]^13) + E^(11*x)*(-4096*x^23 + 40960*x^22*Log[2] - 16384*x^21*Log[2]^2 - 40960*x^20*Log[2]^3 + 16384*x^19*Log[2]^4 + 4096*x^18*Log[2]^5 + 2048*x^17*Log[2]^6 + 1024*x^16*Log[2]^7 + 512*x^15*Log[2]^8 + 256*x^14*Log[2]^9 + 128*x^13*Log[2]^10 + 48*x^12*Log[2]^11 + 16*x^11*Log[2]^12 + 4*x^10*Log[2]^13 + Log[2]^14) + E^(12*x)*(-8192*x^25 + 81920*x^24*Log[2] - 32768*x^23*Log[2]^2 - 81920*x^22*Log[2]^3 + 32768*x^21*Log[2]^4 + 8192*x^20*Log[2]^5 + 4096*x^19*Log[2]^6 + 2048*x^18*Log[2]^7 + 1024*x^17*Log[2]^8 + 512*x^16*Log[2]^9 + 256*x^15*Log[2]^10 + 128*x^14*Log[2]^11 + 48*x^13*Log[2]^12 + 16*x^12*Log[2]^13 + 4*x^11*Log[2]^14 + Log[2]^15) + E^(13*x)*(-16384*x^27 + 163840*x^26*Log[2] - 65536*x^25*Log[2]^2 - 163840*x^24*Log[2]^3 + 65536*x^23*Log[2]^4 + 16384*x^22*Log[2]^5 + 8192*x^21*Log[2]^6 + 4096*x^20*Log[2]^7 + 2048*x^19*Log[2]^8 + 1024*x^18*Log[2]^9 + 512*x^17*Log[2]^10 + 256*x^16*Log[2]^11 + 128*x^15*Log[2]^12 + 48*x^14*Log[2]^13 + 16*x^13*Log[2]^14 + 4*x^12*Log[2]^15 + Log[2]^16) + E^(14*x)*(-32768*x^29 + 327680*x^28*Log[2] - 131072*x^27*Log[2]^2 - 327680*x^26*Log[2]^3 + 131072*x^25*Log[2]^4 + 32768*x^24*Log[2]^5 + 16384*x^23*Log[2]^6 + 8192*x^22*Log[2]^7 + 4096*x^21*Log[2]^8 + 2048*x^20*Log[2]^9 + 1024*x^19*Log[2]^10 + 512*x^18*Log[2]^11 + 256*x^17*Log[2]^12 + 128*x^16*Log[2]^13 + 48*x^15*Log[2]^14 + 16*x^14*Log[2]^15 + 4*x^13*Log[2]^16 + Log[2]^17) + E^(15*x)*(-65536*x^31 + 655360*x^30*Log[2] - 262144*x^29*Log[2]^2 - 655360*x^28*Log[2]^3 + 262144*x^27*Log[2]^4 + 65536*x^26*Log[2]^5 + 32768*x^25*Log[2]^6 + 16384*x^24*Log[2]^7 + 8192*x^23*Log[2]^8 + 4096*x^22*Log[2]^9 + 2048*x^21*Log[2]^10 + 1024*x^20*Log[2]^11 + 512*x^19*Log[2]^12 + 256*x^18*Log[2]^13 + 128*x^17*Log[2]^14 + 48*x^16*Log[2]^15 + 16*x^15*Log[2]^16 + 4*x^14*Log[2]^17 + Log[2]^18) + E^(16*x)*(-131072*x^33 + 1310720*x^32*Log[2] - 524288*x^31*Log[2]^2 - 1310720*x^30*Log[2]^3 + 524288*x^29*Log[2]^4 + 131072*x^28*Log[2]^5 + 65536*x^27*Log[2]^6 + 32768*x^26*Log[2]^7 + 16384*x^25*Log[2]^8 + 8192*x^24*Log[2]^9 + 4096*x^23*Log[2]^10 + 2048*x^22*Log[2]^11 + 1024*x^21*Log[2]^12 + 512*x^20*Log[2]^13 + 256*x^19*Log[2]^14 + 128*x^18*Log[2]^15 + 48*x^17*Log[2]^16 + 16*x^16*Log[2]^17 + 4*x^15*Log[2]^18 + Log[2]^19) + E^(17*x)*(-262144*x^35 + 2621440*x^34*Log[2] - 1048576*x^33*Log[2]^2 - 2621440*x^32*Log[2]^3 + 1048576*x^31*Log[2]^4 + 262144*x^30*Log[2]^5 + 131072*x^29*Log[2]^6 + 65536*x^28*Log[2]^7 + 32768*x^27*Log[2]^8 + 16384*x^26*Log[2]^9 + 8192*x^25*Log[2]^10 + 4096*x^24*Log[2]^11 + 2048*x^23*Log[2]^12 + 1024*x^22*Log[2]^13 + 512*x^21*Log[2]^14 + 256*x^20*Log[2]^15 + 128*x^19*Log[2]^16 + 48*x^18*Log[2]^17 + 16*x^17*Log[2]^18 + 4*x^16*Log[2]^19 + Log[2]^20) + E^(18*x)*(-524288*x^37 + 5242880*x^36*Log[2] - 2097152*x^35*Log[2]^2 - 5242880*x^34*Log[2]^3 + 2097152*x^33*Log[2]^4 + 524288*x^32*Log[2]^5 + 262144*x^31*Log[2]^6 + 131072*x^30*Log[2]^7 + 65536*x^29*Log[2]^8 + 32768*x^28*Log[2]^9 + 16384*x^27*Log[2]^10 + 8192*x^26*Log[2]^11 + 4096*x^25*Log[2]^12 + 2048*x^24*Log[2]^13 + 1024*x^23*Log[2]^14 + 512*x^22*Log[2]^15 + 256*x^21*Log[2]^16 + 128*x^20*Log[2]^17 + 48*x^19*Log[2]^18 + 16*x^18*Log[2]^19 + 4*x^17*Log[2]^20 + Log[2]^21) + E^(19*x)*(-1048576*x^39 + 10485760*x^38*Log[2] - 4194304*x^37*Log[2]^2 - 10485760*x^36*Log[2]^3 + 4194304*x^35*Log[2]^4 + 1048576*x^34*Log[2]^5 + 524288*x^33*Log[2]^6 + 262144*x^32*Log[2]^7 + 131072*x^31*Log[2]^8 + 65536*x^30*Log[2]^9 + 32768*x^29*Log[2]^10 + 16384*x^28*Log[2]^11 + 8192*x^27*Log[2]^12 + 4096*x^26*Log[2]^13 + 2048*x^25*Log[2]^14 + 1024*x^24*Log[2]^15 + 512*x^23*Log[2]^16 + 256*x^22*Log[2]^17 + 128*x^21*Log[2]^18 + 48*x^20*Log[2]^19 + 16*x^19*Log[2]^20 + 4*x^18*Log[2]^21 + Log[2]^22) + E^(20*x)*(-2097152*x^41 + 20971520*x^40*Log[2] - 8388608*x^39*Log[2]^2 - 20971520*x^38*Log[2]^3 + 8388608*x^37*Log[2]^4 + 2097152*x^36*Log[2]^5 + 1048576*x^35*Log[2]^6 + 524288*x^34*Log[2]^7 + 262144*x^33*Log[2]^8 + 131072*x^32*Log[2]^9 + 65536*x^31*Log[2]^10 + 32768*x^30*Log[2]^11 + 16384*x^29*Log[2]^12 + 8192*x^28*Log[2]^13 + 4096*x^27*Log[2]^14 + 2048*x^26*Log[2]^15 + 1024*x^25*Log[2]^16 + 512*x^24*Log[2]^17 + 256*x^23*Log[2]^18 + 128*x^22*Log[2]^19 + 48*x^21*Log[2]^20 + 16*x^20*Log[2]^21 + 4*x^19*Log[2]^22 + Log[2]^23) + E^(21*x)*(-4194304*x^43 + 41943040*x^42*Log[2] - 17592960*x^41*Log[2]^2 - 41943040*x^40*Log[2]^3 + 17592960*x^39*Log[2]^4 + 4194304*x^38*Log[2]^5 + 2097152*x^37*Log[2]^6 + 1048576*x^36*Log[2]^7 + 524288*x^35*Log[2]^8 + 262144*x^34*Log[2]^9 + 131072*x^33*Log[2]^10 + 65536*x^32*Log[2]^11 + 32768*x^31*Log[2]^12 + 16384*x^30*Log[2]^13 + 8192*x^29*Log[2]^14 + 4096*x^28*Log[2]^15 + 2048*x^27*Log[2]^16 + 1024*x^26*Log[2]^17 + 512*x^25*Log[2]^18 + 256*x^24*Log[2]^19 + 128*x^23*Log[2]^20 + 48*x^22*Log[2]^21 + 16*x^21*Log[2]^22 + 4*x^20*Log[2]^23 + Log[2]^24) + E^(22*x)*(-8388608*x^45 + 83886080*x^44*Log[2] - 34754400*x^43*Log[2]^2 - 83886080*x^42*Log[2]^3 + 34754400*x^41*Log[2]^4 + 8388608*x^40*Log[2]^5 + 4194304*x^39*Log[2]^6 + 2097152*x^38*Log[2]^7 + 1048576*x^37*Log[2]^8 + 524288*x^36*Log[2]^9 + 262144*x^35*Log[2]^10 + 131072*x^34*Log[2]^11 + 65536*x^33*Log[2]^12 + 32768*x^32*Log[2]^13 + 16384*x^31*Log[2]^14 + 8192*x^30*Log[2]^15 + 4096*x^29*Log[2]^16 + 2048*x^28*Log[2]^17 + 1024*x^27*Log[2]^18 + 512*x^26*Log[2]^19 + 256*x^25*Log[2]^20 + 128*x^24*Log[2]^21 + 48*x^23*Log[2]^22 + 16*x^22*Log[2]^23 + 4*x^21*Log[2]^24 + Log[2]^25) + E^(23*x)*(-17592960*x^47 + 175929600*x^46*Log[2] - 71961600*x^45*Log[2]^2 - 175929600*x^44*Log[2]^3 + 71961600*x^43*Log[2]^4 + 1759296*x^42*Log[2]^5 + 8388608*x^41*Log[2]^6 + 4194304*x^40*Log[2]^7 + 2097152*x^39*Log[2]^8 + 1048576*x^38*Log[2]^9 + 524288*x^37*Log[2]^10 + 262144*x^36*Log[2]^11 + 131072*x^35*Log[2]^12 + 65536*x^34*Log[2]^13 + 32768*x^33*Log[2]^14 + 16384*x^32*Log[2]^15 + 8192*x^31*Log[2]^16 + 4096*x^30*Log[2]^17 + 2048*x^29*Log[2]^18 + 1024*x^28*Log[2]^19 + 512*x^27*Log[2]^20 + 256*x^26*Log[2]^21 + 128*x^25*Log[2]^22 + 48*x^24*Log[2]^23 + 16*x^23*Log[2]^24 + 4*x^22*Log[2]^25 + Log[2]^26) + E^(24*x)*(-34754400*x^49 + 347544000*x^48*Log[2] - 143777600*x^47*Log[2]^2 - 347544000*x^46*Log[2]^3 + 143777600*x^45*Log[2]^4 + 3475440*x^44*Log[2]^5 + 1759296*x^43*Log[2]^6 + 8388608*x^42*Log[2]^7 + 4194304*x^41*Log[2]^8 + 2097152*x^40*Log[2]^9 + 1048576*x^39*Log[2]^10 + 524288*x^38*Log[2]^11 + 262144*x^37*Log[2]^12 + 131072*x^36*Log[2]^13 + 65536*x^35*Log[2]^14 + 32768*x^34*Log[2]^15 + 16384*x^33*Log[2]^16 + 8192*x^32*Log[2]^17 + 4096*x^31*Log[2]^18 + 2048*x^30*Log[2]^19 + 1024*x^29*Log[2]^20 + 512*x^28*Log[2]^21 + 256*x^27*Log[2]^22 + 128*x^26*Log[2]^23 + 48*x^25*Log[2]^24 + 16*x^24*Log[2]^25 + 4*x^23*Log[2]^26 + Log[2]^27) + E^(25*x)*(-71961600*x^51 + 719616000*x^50*Log[2] - 307846400*x^49*Log[2]^2 - 719616000*x^48*Log[2]^3 + 307846400*x^47*Log[2]^4 + 719616*x^46*Log[2]^5 + 347544*x^45*Log[2]^6 + 1759296*x^44*Log[2]^7 + 8388608*x^43*Log[2]^8 + 4194304*x^42*Log[2]^9 + 2097152*x^41*Log[2]^10 + 1048576*x^40*Log[2]^11 + 524288*x^39*Log[2]^12 + 262144*x^38*Log[2]^13 + 131072*x^37*Log[2]^14 + 65536*x^36*Log[2]^15 + 32768*x^35*Log[2]^16 + 16384*x^34*Log[2]^17 + 8192*x^33*Log[2]^18 + 4096*x^32*Log[2]^19 + 2048*x^31*Log[2]^20 + 1024*x^30*Log[2]^21 + 512*x^29*Log[2]^22 + 256*x^28*Log[2]^23 + 128*x^27*Log[2]^24 + 48*x^26*Log[2]^25 + 16*x^25*Log[2]^26 + 4*x^24*Log[2]^27 + Log[2]^28) + E^(26*x)*(-143777600*x^53 + 1437776000*x^52*Log[2] - 618590400*x^51*Log[2]^2 - 1437776000*x^50*Log[2]^3 + 618590400*x^49*Log[2]^4 + 1437776*x^48*Log[2]^5 + 719616*x^47*Log[2]^6 + 347544*x^46*Log[2]^7 + 1759296*x^45*Log[2]^8 + 8388608*x^44*Log[2]^9 + 4194304*x^43*Log[2]^10 + 2097152*x^42*Log[2]^11 + 1048576*x^41*Log[2]^12 + 524288*x^40*Log[2]^13 + 262144*x^39*Log[2]^14 + 131072*x^38*Log[2]^15 + 65536*x^37*Log[2]^16 + 32768*x^36*Log[2]^17 + 16384*x^35*Log[2]^18 + 8192*x^34*Log[2]^19 + 4096*x^33*Log[2]^20 + 2048*x^32*Log[2]^21 + 1024*x^31*Log[2]^22 + 512*x^30*Log[2]^23 + 256*x^29*Log[2]^24 + 128*x^28*Log[2]^25 + 48*x^27*Log[2]^26 + 16*x^26*Log[2]^27 + 4*x^25*Log[2]^28 + Log[2]^29) + E^(27*x)*(-307846400*x^55 + 3078464000*x^54*Log[2] - 1539232000*x^53*Log[2]^2 - 3078464000*x^52*Log[2]^3 + 1539232000*x^51*Log[2]^4 + 307846*x^50*Log[2]^5 + 153923*x^49*Log[2]^6 + 719616*x^48*Log[2]^7 + 347544*x^47*Log[2]^8 + 1759296*x^46*Log[2]^9 + 8388608*x^45*Log[2]^10 + 4194304*x^44*Log[2]^11 + 2097152*x^43*Log[2]^12 + 1048576*x^42*Log[2]^13 + 524288*x^41*Log[2]^14 + 262144*x^40*Log[2]^15 + 131072*x^39*Log[2]^16 + 65536*x^38*Log[2]^17 + 32768*x^37*Log[2]^18 + 16384*x^36*Log[2]^19 + 8192*x^35*Log[2]^20 + 4096*x^34*Log[2]^21 + 2048*x^33*Log[2]^22 + 1024*x^32*Log[2]^23 + 512*x^31*Log[2]^24 + 256*x^30*Log[2]^25 + 128*x^29*Log[2]^26 + 48*x^28*Log[2]^27 + 16*x^27*Log[2]^28 + 4*x^26*Log[2]^29 + Log[2]^30) + E^(28*x)*(-618590400*x^57 + 6185904000*x^56*Log[2] - 3092952000*x^55*Log[2]^2 - 6185904000*x^54*Log[2]^3 + 3092952000*x^53*Log[2]^4 + 61859*x^52*Log[2]^5 + 30929*x^51*Log[2]^6 + 153923*x^50*Log[2]^7 + 719616*x^49*Log[2]^8 + 347544*x^48*Log[2]^9 + 1759296*x^47*Log[2]^10 + 8388608*x^46*Log[2]^11 + 4194304*x^45*Log[2]^12 + 2097152*x^44*Log[2]^13 + 1048576*x^43*Log[2]^14 + 524288*x^42*Log[2]^15 + 262144*x^41*Log[2]^16 + 131072*x^40*Log[2]^17 + 65536*x^39*Log[2]^18 + 32768*x^38*Log[2]^19 + 16384*x^37*Log[2]^20 + 8192*x^36*Log[2]^21 + 4096*x^35*Log[2]^22 + 2048*x^34*Log[2]^23 + 1024*x^33*Log[2]^24 + 512*x^32*Log[2]^25 + 256*x^31*Log[2]^26 + 128*x^30*Log[2]^27 + 48*x^29*Log[2]^28 + 16*x^28*Log[2]^29 + 4*x^27*Log[2]^30 + Log[2]^31) + E^(29*x)*(-1539232000*x^59 + 15392320000*x^58*Log[2] - 7696160000*x^57*Log[2]^2 - 15392320000*x^56*Log[2]^3 + 7696160000*x^55*Log[2]^4 + 15392*x^54*Log[2]^5 + 76961*x^53*Log[2]^6 + 38491*x^52*Log[2]^7 + 153923*x^51*Log[2]^8 + 719616*x^50*Log[2]^9 + 347544*x^49*Log[2]^10 + 1759296*x^48*Log[2]^11 + 8388608*x^47*Log[2]^12 + 4194304*x^46*Log[2]^13 + 2097152*x^45*Log[2]^14 + 1048576*x^44*Log[2]^15 + 524288*x^43*Log[2]^16 + 262144*x^42*Log[2]^17 + 131072*x^41*Log[2]^18 + 65536*x^40*Log[2]^19 + 32768*x^39*Log[2]^20 + 16384*x^38*Log[2]^21 + 8192*x^37*Log[2]^22 + 4096*x^36*Log[2]^23 + 2048*x^35*Log[2]^24 + 1024*x^34*Log[2]^25 + 512*x^33*Log[2]^26 + 256*x^32*Log[2]^27 + 128*x^31*Log[2]^28 + 48*x^30*Log[2]^29 + 16*x^29*Log[2]^30 + 4*x^28*Log[2]^31 + Log[2]^32) + E^(30*x)*(-384910000*x^61 + 3849100000*x^60*Log[2] - 2000000000*x^59*Log[2]^2 - 3849100000*x^58*Log[2]^3 + 2000000000*x^57*Log[2]^4 + 38491*x^56*Log[2]^5 + 20000*x^55*Log[2]^6 + 10000*x^54*Log[2]^7 + 38491*x^53*Log[2]^8 + 153923*x^52*Log[2]^9 + 719616*x^51*Log[2]^10 + 347544*x^50*Log[2]^11 + 1759296*x^49*Log[2]^12 + 8388608*x^48*Log[2]^13 + 4194304*x^47*Log[2]^14 + 2097152*x^46*Log[2]^15 + 1048576*x^45*Log[2]^16 + 524288*x^44*Log[2]^17 + 262144*x^43*Log[2]^18 + 131072*x^42*Log[2]^19 + 65536*x^41*Log[2]^20 + 32768*x^40*Log[2]^21 + 16384*x^39*Log[2]^22 + 8192*x^38*Log[2]^23 + 4096*x^37*Log[2]^24 + 2048*x^36*Log[2]^25 + 1024*x^35*Log[2]^26 + 512*x^34*Log[2]^27 + 256*x^33*Log[2]^28 + 128*x^32*Log[2]^29 + 48*x^31*Log[2]^30 + 16*x^30*Log[2]^31 + 4*x^29*Log[2]^32 + Log[2]^33) + E^(31*x)*(-1000000000*x^63 + 10000000000*x^62*Log[2] - 5000000000*x^61*Log[2]^2 - 10000000000*x^60*Log[2]^3 + 5000000000*x^59*Log[2]^4 + 100000*x^58*Log[2]^5 + 50000*x^57*Log[2]^6 + 25000*x^56*Log[2]^7 + 10000*x^55*Log[2]^8 + 38491*x^54*Log[2]^9 + 153923*x^53*Log[2]^10 + 719616*x^52*Log[2]^11 + 347544*x^51*Log[2]^12 + 1759296*x^50*Log[2]^13 + 8388608*x^49*Log[2]^14 + 4194304*x^48*Log[2]^15 + 2097152*x^47*Log[2]^16 + 1048576*x^46*Log[2]^17 + 524288*x^45*Log[2]^18 + 262144*x^44*Log[2]^19 + 131072*x^43*Log[2]^20 + 65536*x^42*Log[2]^21 + 32768*x^41*Log[2]^22 + 16384*x^40*Log[2]^23 + 8192*x^39*Log[2]^24 + 4096*x^38*Log[2]^25 + 2048*x^37*Log[2]^26 + 1024*x^36*Log[2]^27 + 512*x^35*Log[2]^28 + 256*x^34*Log[2]^29 + 128*x^33*Log[2]^30 + 48*x^32*Log[2]^31 + 16*x^31*Log[2]^32 + 4*x^30*Log[2]^33 + Log[2]^34) + E^(32*x)*(-2500000000*x^65 + 25000000000*x^64*Log[2] - 12500000000*x^63*Log[2]^2 - 25000000000*x^62*Log[2]^3 + 12500000000*x^61*Log[2]^4 + 25000*x^60*Log[2]^5 + 12500*x^59*Log[2]^6 + 6250*x^58*Log[2]^7 + 2500*x^57*Log[2]^8 + 38491*x^56*Log[2]^9 + 153923*x^55*Log[2]^10 + 719616*x^54*Log[2]^11 + 347544*x^53*Log[2]^12 + 1759296*x^52*Log[2]^13 + 8388608*x^51*Log[2]^14 + 4194304*x^50*Log[2]^15 + 2097152*x^49*Log[2]^16 + 1048576*x^48*Log[2]^17 + 524288*x^47*Log[2]^18 + 262144*x^46*Log[2]^19 + 131072*x^45*Log[2]^20 + 65536*x^44*Log[2]^21 + 32768*x^43*Log[2]^22 + 16384*x^42*Log[2]^23 + 8192*x^41*Log[2]^24 + 4096*x^40*Log[2]^25 + 2048*x^39*Log[2]^26 + 1024*x^38*Log[2]^27 + 512*x^37*Log[2]^28 + 256*x^36*Log[2]^29 + 128*x^35*Log[2]^30 + 48*x^34*Log[2]^31 + 16*x^33*Log[2]^32 + 4*x^32*Log[2]^33 + Log[2]^34) + E^(33*x)*(-6250000000*x^67 + 62500000000*x^66*Log[2] - 31250000000*x^65*Log[2]^2 - 62500000000*x^64*Log[2]^3 + 31250000000*x^63*Log[2]^4 + 6250*x^62*Log[2]^5 + 3125*x^61*Log[2]^6 + 15625*x^60*Log[2]^7 + 6250*x^59*Log[2]^8 + 38491*x^58*Log[2]^9 + 153923*x^57*Log[2]^10 + 719616*x^56*Log[2]^11 + 347544*x^55*Log[2]^12 + 1759296*x^54*Log[2]^13 + 8388608*x^53*Log[2]^