Mathematica 11.3 Integration Test Results

Test results for the 93 problems in "2.2 (c+d x)^m (F^(g (e+f x)))^n (a+b (F^(g (e+f x)))^n)^p.m"

Problem 46: Unable to integrate problem.

$$\int \frac{(c+d\,x)^3}{a+b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Optimal (type 4, 192 leaves, 6 steps):

$$\frac{(c+d\,x)^4}{4\,a\,d}-\frac{(c+d\,x)^3\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f\,g\,n\,\text{Log}[F]}-\frac{3\,d\,(c+d\,x)^2\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^2\,g^2\,n^2\,\text{Log}[F]^2}+$$
$$\frac{6\,d^2\,(c+d\,x)\,\text{PolyLog}\left[3,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^3\,g^3\,n^3\,\text{Log}[F]^3}-\frac{6\,d^3\,\text{PolyLog}\left[4,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^4\,g^4\,n^4\,\text{Log}[F]^4}$$

Result (type 8, 27 leaves):

$$\int \frac{(c+d\,x)^3}{a+b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Problem 47: Unable to integrate problem.

$$\int \frac{(c+d\,x)^2}{a+b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Optimal (type 4, 145 leaves, 5 steps):

$$\frac{(c+d\,x)^3}{3\,a\,d}-\frac{(c+d\,x)^2\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f\,g\,n\,\text{Log}[F]}-$$
$$\frac{2\,d\,(c+d\,x)\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^2\,g^2\,n^2\,\text{Log}[F]^2}+\frac{2\,d^2\,\text{PolyLog}\left[3,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^3\,g^3\,n^3\,\text{Log}[F]^3}$$

Result (type 8, 27 leaves):

$$\int \frac{(c+d\,x)^2}{a+b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Problem 48: Attempted integration timed out after 120 seconds.

$$\int \frac{c + d\,x}{a + b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Optimal (type 4, 98 leaves, 4 steps):

$$\frac{(c + d\,x)^2}{2\,a\,d} - \frac{(c + d\,x)\,\text{Log}\left[1 + \frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f\,g\,n\,\text{Log}[F]} - \frac{d\,\text{PolyLog}\left[2, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a\,f^2\,g^2\,n^2\,\text{Log}[F]^2}$$

Result (type 1, 1 leaves):

???

Problem 49: Result more than twice size of optimal antiderivative.

$$\int \frac{1}{a + b\left(F^{g\,(e+f\,x)}\right)^n}\,dx$$

Optimal (type 3, 40 leaves, 5 steps):

$$\frac{x}{a} - \frac{\text{Log}\left[a + b\left(F^{g\,(e+f\,x)}\right)^n\right]}{a\,f\,g\,n\,\text{Log}[F]}$$

Result (type 3, 100 leaves):

$$\frac{x}{a} - \frac{1}{a\,f\,g\,n\,\text{Log}[F]}\text{Log}\left[a + b\,e^{n\left(-f\,g\,x\,\text{Log}[F] + \text{Log}\left[F^{e\,g+f\,g\,x}\right]\right)}\left(F^{e\,g+f\,g\,x}\right)^{n - \frac{n\left(-f\,g\,x\,\text{Log}[F] + \text{Log}\left[F^{e\,g+f\,g\,x}\right]\right)}{\text{Log}\left[F^{e\,g+f\,g\,x}\right]}}\right]$$

Problem 52: Unable to integrate problem.

$$\int \frac{(c + d\,x)^3}{\left(a + b\left(F^{g\,(e+f\,x)}\right)^n\right)^2}\,dx$$

Optimal (type 4, 388 leaves, 13 steps):

$$\frac{(c + d\,x)^4}{4\,a^2\,d} - \frac{(c + d\,x)^3}{a^2\,f\,g\,n\,\text{Log}[F]} + \frac{(c + d\,x)^3}{a\,f\left(a + b\left(F^{g\,(e+f\,x)}\right)^n\right)g\,n\,\text{Log}[F]} + \frac{3\,d\,(c + d\,x)^2\,\text{Log}\left[1 + \frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2} -$$

$$\frac{(c + d\,x)^3\,\text{Log}\left[1 + \frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f\,g\,n\,\text{Log}[F]} + \frac{6\,d^2\,(c + d\,x)\,\text{PolyLog}\left[2, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^3\,g^3\,n^3\,\text{Log}[F]^3} -$$

$$\frac{3\,d\,(c + d\,x)^2\,\text{PolyLog}\left[2, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2} - \frac{6\,d^3\,\text{PolyLog}\left[3, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^4\,g^4\,n^4\,\text{Log}[F]^4} +$$

$$\frac{6\,d^2\,(c + d\,x)\,\text{PolyLog}\left[3, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^3\,g^3\,n^3\,\text{Log}[F]^3} - \frac{6\,d^3\,\text{PolyLog}\left[4, -\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^4\,g^4\,n^4\,\text{Log}[F]^4}$$

Result (type 8, 27 leaves):

$$\int \frac{(c+d\,x)^3}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^2}\,dx$$

Problem 53: Unable to integrate problem.

$$\int \frac{(c+d\,x)^2}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^2}\,dx$$

Optimal (type 4, 294 leaves, 11 steps):

$$\frac{(c+d\,x)^3}{3\,a^2\,d}-\frac{(c+d\,x)^2}{a^2\,f\,g\,n\,\text{Log}[F]}+\frac{(c+d\,x)^2}{a\,f\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)\,g\,n\,\text{Log}[F]}+$$

$$\frac{2\,d\,(c+d\,x)\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2}-\frac{(c+d\,x)^2\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f\,g\,n\,\text{Log}[F]}+\frac{2\,d^2\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^3\,g^3\,n^3\,\text{Log}[F]^3}-$$

$$\frac{2\,d\,(c+d\,x)\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2}+\frac{2\,d^2\,\text{PolyLog}\left[3,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^3\,g^3\,n^3\,\text{Log}[F]^3}$$

Result (type 8, 27 leaves):

$$\int \frac{(c+d\,x)^2}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^2}\,dx$$

Problem 54: Attempted integration timed out after 120 seconds.

$$\int \frac{c+d\,x}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^2}\,dx$$

Optimal (type 4, 191 leaves, 11 steps):

$$\frac{(c+d\,x)^2}{2\,a^2\,d}-\frac{d\,x}{a^2\,f\,g\,n\,\text{Log}[F]}+\frac{c+d\,x}{a\,f\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)\,g\,n\,\text{Log}[F]}+$$

$$\frac{d\,\text{Log}\left[a+b\left(F^{g\,(e+f\,x)}\right)^n\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2}-\frac{(c+d\,x)\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f\,g\,n\,\text{Log}[F]}-\frac{d\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^2\,f^2\,g^2\,n^2\,\text{Log}[F]^2}$$

Result (type 1, 1 leaves):

???

Problem 58: Unable to integrate problem.

$$\int \frac{(c+d\,x)^3}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^3}\,dx$$

Optimal (type 4, 594 leaves, 26 steps):

$$\frac{(c+dx)^4}{4a^3d}+\frac{3d(c+dx)^2}{2a^3f^2g^2n^2\text{Log}[F]^2}-\frac{3d(c+dx)^2}{2a^2f^2\left(a+b\left(F^{g(e+fx)}\right)^n\right)g^2n^2\text{Log}[F]^2}-\frac{3(c+dx)^3}{2a^3fgn\text{Log}[F]}+\frac{(c+dx)^3}{2af\left(a+b\left(F^{g(e+fx)}\right)^n\right)^2gn\text{Log}[F]}+\frac{(c+dx)^3}{a^2f\left(a+b\left(F^{g(e+fx)}\right)^n\right)gn\text{Log}[F]}-\frac{3d^2(c+dx)\text{Log}\left[1+\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^3g^3n^3\text{Log}[F]^3}+\frac{9d(c+dx)^2\text{Log}\left[1+\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{2a^3f^2g^2n^2\text{Log}[F]^2}-\frac{(c+dx)^3\text{Log}\left[1+\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3fgn\text{Log}[F]}-\frac{3d^3\text{PolyLog}\left[2,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^4g^4n^4\text{Log}[F]^4}+\frac{9d^2(c+dx)\text{PolyLog}\left[2,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^3g^3n^3\text{Log}[F]^3}-\frac{3d(c+dx)^2\text{PolyLog}\left[2,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^2g^2n^2\text{Log}[F]^2}-\frac{9d^3\text{PolyLog}\left[3,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^4g^4n^4\text{Log}[F]^4}+\frac{6d^2(c+dx)\text{PolyLog}\left[3,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^3g^3n^3\text{Log}[F]^3}-\frac{6d^3\text{PolyLog}\left[4,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^4g^4n^4\text{Log}[F]^4}$$

Result (type 8, 27 leaves):

$$\int\frac{(c+dx)^3}{\left(a+b\left(F^{g(e+fx)}\right)^n\right)^3}\,dx$$

Problem 59: Unable to integrate problem.

$$\int\frac{(c+dx)^2}{\left(a+b\left(F^{g(e+fx)}\right)^n\right)^3}\,dx$$

Optimal (type 4, 439 leaves, 24 steps):

$$\frac{(c+dx)^3}{3a^3d}+\frac{d^2x}{a^3f^2g^2n^2\text{Log}[F]^2}-\frac{d(c+dx)}{a^2f^2\left(a+b\left(F^{g(e+fx)}\right)^n\right)g^2n^2\text{Log}[F]^2}-\frac{3(c+dx)^2}{2a^3fgn\text{Log}[F]}+\frac{(c+dx)^2}{2af\left(a+b\left(F^{g(e+fx)}\right)^n\right)^2gn\text{Log}[F]}+\frac{(c+dx)^2}{a^2f\left(a+b\left(F^{g(e+fx)}\right)^n\right)gn\text{Log}[F]}-\frac{d^2\text{Log}\left[a+b\left(F^{g(e+fx)}\right)^n\right]}{a^3f^3g^3n^3\text{Log}[F]^3}+\frac{3d(c+dx)\text{Log}\left[1+\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^2g^2n^2\text{Log}[F]^2}-\frac{(c+dx)^2\text{Log}\left[1+\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3fgn\text{Log}[F]}+\frac{3d^2\text{PolyLog}\left[2,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^3g^3n^3\text{Log}[F]^3}-\frac{2d(c+dx)\text{PolyLog}\left[2,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^2g^2n^2\text{Log}[F]^2}+\frac{2d^2\text{PolyLog}\left[3,-\frac{b\left(F^{g(e+fx)}\right)^n}{a}\right]}{a^3f^3g^3n^3\text{Log}[F]^3}$$

Result (type 8, 27 leaves):

$$\int \frac{(c+d\,x)^2}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^3}\,dx$$

Problem 60: Attempted integration timed out after 120 seconds.

$$\int \frac{c+d\,x}{\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^3}\,dx$$

Optimal (type 4, 276 leaves, 17 steps):

$$\frac{(c+d\,x)^2}{2\,a^3\,d}-\frac{d}{2\,a^2\,f^2\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)g^2\,n^2\,\text{Log}[F]^2}-\frac{3\,d\,x}{2\,a^3\,f\,g\,n\,\text{Log}[F]}+$$

$$\frac{c+d\,x}{2\,a\,f\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^2 g\,n\,\text{Log}[F]}+\frac{c+d\,x}{a^2\,f\left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)g\,n\,\text{Log}[F]}+$$

$$\frac{3\,d\,\text{Log}\left[a+b\left(F^{g\,(e+f\,x)}\right)^n\right]}{2\,a^3\,f^2\,g^2\,n^2\,\text{Log}[F]^2}-\frac{(c+d\,x)\,\text{Log}\left[1+\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^3\,f\,g\,n\,\text{Log}[F]}-\frac{d\,\text{PolyLog}\left[2,-\frac{b\left(F^{g\,(e+f\,x)}\right)^n}{a}\right]}{a^3\,f^2\,g^2\,n^2\,\text{Log}[F]^2}$$

Result (type 1, 1 leaves):

???

Problem 70: Unable to integrate problem.

$$\int \left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^3(c+d\,x)^m\,dx$$

Optimal (type 4, 340 leaves, 8 steps):

$$\frac{a^3\,(c+d\,x)^{1+m}}{d\,(1+m)}+\frac{1}{f\,g\,n\,\text{Log}[F]}3^{-1-m}\,b^3\,F^{3\left(e-\frac{c\,f}{d}\right)g\,n-3\,g\,n\,(e+f\,x)}\left(F^{e\,g+f\,g\,x}\right)^{3\,n}(c+d\,x)^m$$

$$\text{Gamma}\left[1+m,-\frac{3\,f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right]\left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m}+\frac{1}{f\,g\,n\,\text{Log}[F]}$$

$$3\times 2^{-1-m}\,a\,b^2\,F^{2\left(e-\frac{c\,f}{d}\right)g\,n-2\,g\,n\,(e+f\,x)}\left(F^{e\,g+f\,g\,x}\right)^{2\,n}(c+d\,x)^m\,\text{Gamma}\left[1+m,-\frac{2\,f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right]$$

$$\left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m}+\frac{1}{f\,g\,n\,\text{Log}[F]}3\,a^2\,b\,F^{\left(e-\frac{c\,f}{d}\right)g\,n-g\,n\,(e+f\,x)}\left(F^{e\,g+f\,g\,x}\right)^n$$

$$(c+d\,x)^m\,\text{Gamma}\left[1+m,-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right]\left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m}$$

Result (type 8, 27 leaves):

$$\int \left(a+b\left(F^{g\,(e+f\,x)}\right)^n\right)^3(c+d\,x)^m\,dx$$

Problem 71: Unable to integrate problem.

$$\int \left(a + b \left(F^{g\,(e+f\,x)}\right)^n\right)^2 (c + d\,x)^m \,dx$$

Optimal (type 4, 228 leaves, 6 steps):

$$\frac{a^2 (c + d\,x)^{1+m}}{d\,(1+m)} + \frac{1}{f\,g\,n\,\text{Log}[F]}$$
$$2^{-1-m}\, b^2\, F^{2\left(e-\frac{c\,f}{d}\right) g\,n - 2\,g\,n\,(e+f\,x)} \left(F^{e\,g+f\,g\,x}\right)^{2\,n} (c + d\,x)^m\, \text{Gamma}\left[1+m, -\frac{2\,f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right]$$
$$\left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m} + \frac{1}{f\,g\,n\,\text{Log}[F]} 2\,a\,b\,F^{\left(e-\frac{c\,f}{d}\right) g\,n - g\,n\,(e+f\,x)} \left(F^{e\,g+f\,g\,x}\right)^n$$
$$(c + d\,x)^m\, \text{Gamma}\left[1+m, -\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right] \left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m}$$

Result (type 8, 27 leaves):

$$\int \left(a + b \left(F^{g\,(e+f\,x)}\right)^n\right)^2 (c + d\,x)^m \,dx$$

Problem 72: Unable to integrate problem.

$$\int \left(a + b \left(F^{g\,(e+f\,x)}\right)^n\right) (c + d\,x)^m \,dx$$

Optimal (type 4, 116 leaves, 4 steps):

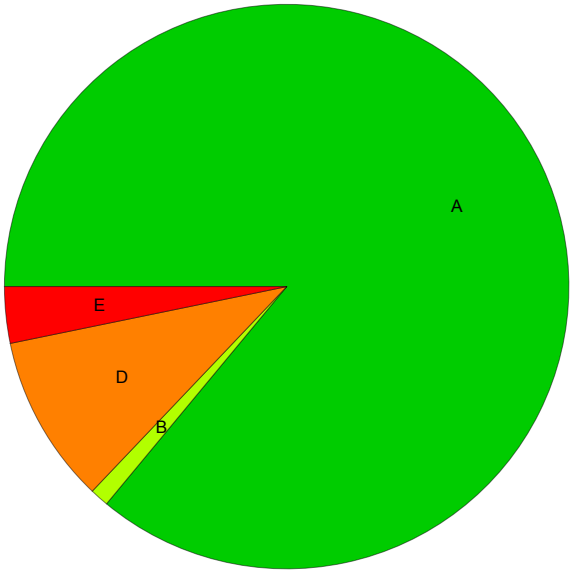
$$\frac{a\,(c + d\,x)^{1+m}}{d\,(1+m)} + \frac{1}{f\,g\,n\,\text{Log}[F]} b\,F^{\left(e-\frac{c\,f}{d}\right) g\,n - g\,n\,(e+f\,x)} \left(F^{e\,g+f\,g\,x}\right)^n$$
$$(c + d\,x)^m\, \text{Gamma}\left[1+m, -\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right] \left(-\frac{f\,g\,n\,(c+d\,x)\,\text{Log}[F]}{d}\right)^{-m}$$

Result (type 8, 25 leaves):

$$\int \left(a + b \left(F^{g\,(e+f\,x)}\right)^n\right) (c + d\,x)^m \,dx$$

Summary of Integration Test Results

93 integration problems



A - 80 optimal antiderivatives

B - 1 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 9 unable to integrate problems

E - 3 integration timeouts