Mathematica 11.3 Integration Test Results

Test results for the 16 problems in "6.5.1 (c+d x)^m (a+b sech)^n.m"

Problem 3: Result more than twice size of optimal antiderivative.

$$\int (c + d x) \operatorname{Sech}[a + b x] \, dx$$

Optimal (type 4, 61 leaves, 5 steps):

$$\frac{2 (c + d x) \operatorname{ArcTan}\left[e^{a+b x}\right]}{b} - \frac{i d \operatorname{PolyLog}\left[2, -i e^{a+b x}\right]}{b^2} + \frac{i d \operatorname{PolyLog}\left[2, i e^{a+b x}\right]}{b^2}$$

Result (type 4, 132 leaves):

$$\frac{1}{2 b^2} \left(4 b c \operatorname{ArcTan}\left[\operatorname{Tanh}\left[\frac{1}{2} (a + b x)\right]\right] - d (-2 i a + \pi - 2 i b x) \left(\operatorname{Log}\left[1 - i e^{a+b x}\right] - \operatorname{Log}\left[1 + i e^{a+b x}\right]\right) + d (-2 i a + \pi) \operatorname{Log}\left[\operatorname{Cot}\left[\frac{1}{4} (2 i a + \pi + 2 i b x)\right]\right] - 2 i d \left(\operatorname{PolyLog}\left[2, -i e^{a+b x}\right] - \operatorname{PolyLog}\left[2, i e^{a+b x}\right]\right)\right)$$

Problem 6: Result unnecessarily involves complex numbers and more than twice size of optimal antiderivative.

$$\int (c + d x)^2 \operatorname{Sech}[a + b x]^2 \, dx$$

Optimal (type 4, 73 leaves, 5 steps):

$$\frac{(c + d x)^2}{b} - \frac{2 d (c + d x) \operatorname{Log}\left[1 + e^{2 (a+b x)}\right]}{b^2} - \frac{d^2 \operatorname{PolyLog}\left[2, -e^{2 (a+b x)}\right]}{b^3} + \frac{(c + d x)^2 \operatorname{Tanh}[a + b x]}{b}$$

Result (type 4, 277 leaves):

$$-\left(\left(2\,c\,d\,\text{Sech}[a]\,\left(\text{Cosh}[a]\,\text{Log}[\text{Cosh}[a]\,\text{Cosh}[b\,x]+\text{Sinh}[a]\,\text{Sinh}[b\,x]]-b\,x\,\text{Sinh}[a]\right)\right)\Big/\left(b^2\,\left(\text{Cosh}[a]^2-\text{Sinh}[a]^2\right)\right)\right)+$$
$$\left(d^2\,\text{Csch}[a]\,\left(-b^2\,e^{-\text{ArcTanh}[\text{Coth}[a]]}\,x^2+\left(i\,\text{Coth}[a]\,\left(-b\,x\,\left(-\pi+2\,i\,\text{ArcTanh}[\text{Coth}[a]]\right)-\pi\,\text{Log}\left[1+e^{2\,b\,x}\right]-2\,\left(i\,b\,x+i\,\text{ArcTanh}[\text{Coth}[a]]\right)\,\text{Log}\left[1-e^{2\,i\,(i\,b\,x+i\,\text{ArcTanh}[\text{Coth}[a]])}\right]+\pi\,\text{Log}[\text{Cosh}[b\,x]]+2\,i\,\text{ArcTanh}[\text{Coth}[a]]\,\text{Log}[i\,\text{Sinh}[b\,x+\text{ArcTanh}[\text{Coth}[a]]]]+i\,\text{PolyLog}\left[2,\,e^{2\,i\,(i\,b\,x+i\,\text{ArcTanh}[\text{Coth}[a]])}\right]\right)\right)\Big/\left(\sqrt{1-\text{Coth}[a]^2}\right)\right)\,\text{Sech}[a]\right)\Big/$$
$$\left(b^3\,\sqrt{\text{Csch}[a]^2\,\left(-\text{Cosh}[a]^2+\text{Sinh}[a]^2\right)}\right)+\frac{1}{b}\text{Sech}[a]\,\text{Sech}[a+b\,x]\left(c^2\,\text{Sinh}[b\,x]+2\,c\,d\,x\,\text{Sinh}[b\,x]+d^2\,x^2\,\text{Sinh}[b\,x]\right)$$

Problem 11: Result more than twice size of optimal antiderivative.

$$\int (c+d\,x)\,\text{Sech}[a+b\,x]^3\,dx$$

Optimal (type 4, 102 leaves, 6 steps):

$$\frac{(c+d\,x)\,\text{ArcTan}\left[e^{a+b\,x}\right]}{b}-\frac{i\,d\,\text{PolyLog}\left[2,\,-i\,e^{a+b\,x}\right]}{2\,b^2}+\frac{i\,d\,\text{PolyLog}\left[2,\,i\,e^{a+b\,x}\right]}{2\,b^2}+\frac{d\,\text{Sech}[a+b\,x]}{2\,b^2}+\frac{(c+d\,x)\,\text{Sech}[a+b\,x]\,\text{Tanh}[a+b\,x]}{2\,b}$$

Result (type 4, 263 leaves):

$$\frac{c\,\text{ArcTan}\left[\text{Tanh}\left[\frac{1}{2}\,(a+b\,x)\right]\right]}{b}-\frac{1}{2\,b^2}d\,\left(\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)\,\left(\text{Log}\left[1-e^{i\,\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)}\right]-\text{Log}\left[1+e^{i\,\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)}\right]\right)-\left(-i\,a+\frac{\pi}{2}\right)\,\text{Log}\left[\text{Tan}\left[\frac{1}{2}\,\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)\right]\right]+i\,\left(\text{PolyLog}\left[2,\,-e^{i\,\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)}\right]-\text{PolyLog}\left[2,\,e^{i\,\left(-i\,a+\frac{\pi}{2}-i\,b\,x\right)}\right]\right)\right)+$$
$$\frac{d\,\text{Sech}[a]\,\text{Sech}[a+b\,x]\,(\text{Cosh}[a]+b\,x\,\text{Sinh}[a])}{2\,b^2}+\frac{d\,x\,\text{Sech}[a]\,\text{Sech}[a+b\,x]^2\,\text{Sinh}[b\,x]}{2\,b}+\frac{c\,\text{Sech}[a+b\,x]\,\text{Tanh}[a+b\,x]}{2\,b}$$

Problem 12: Attempted integration timed out after 120 seconds.

$$\int \frac{\text{Sech}[a+b\,x]^3}{c+d\,x}\,dx$$

Optimal (type 8, 19 leaves, 0 steps):

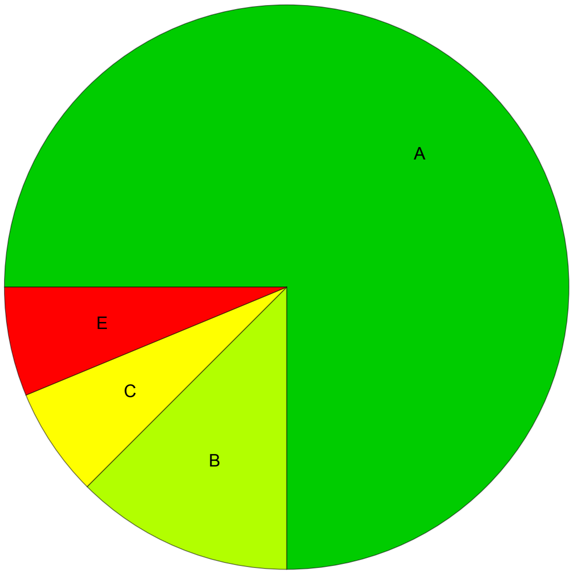
$$\text{Int}\left[\frac{\text{Sech}[a+b\,x]^3}{c+d\,x},\,x\right]$$

Result (type 1, 1 leaves) :

???

Summary of Integration Test Results

16 integration problems



A - 12 optimal antiderivatives

B - 2 more than twice size of optimal antiderivatives

C - 1 unnecessarily complex antiderivatives

D - 0 unable to integrate problems

E - 1 integration timeouts