Mathematica 11.3 Integration Test Results

Test results for the 12 problems in "5.4.2 Exponentials of inverse cotangent.m"

Problem 8: Unable to integrate problem.

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{1/3}} dx$$

Optimal (type 5, 147 leaves, 3 steps):

$$\frac{1}{\left(c + a^2 c x^2\right)^{1/3}} 3 \left(1 + \frac{1}{a^2 x^2}\right)^{1/3} \left(\frac{a - \frac{i}{x}}{a + \frac{i}{x}}\right)^{\frac{1}{6}(2 - 3 i n)} \left(1 - \frac{i}{a x}\right)^{\frac{1}{6}(-2 + 3 i n)}$$

$$\left(1 + \frac{i}{a x}\right)^{\frac{1}{6}(4 - 3 i n)} x \operatorname{Hypergeometric2F1}\left[-\frac{1}{3}, \frac{1}{6}(2 - 3 i n), \frac{2}{3}, \frac{2 i}{\left(a + \frac{i}{x}\right) x}\right]$$

Result (type 8, 25 leaves):

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{1/3}} dx$$

Problem 9: Unable to integrate problem.

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{2/3}} dx$$

Optimal (type 5, 147 leaves, 3 steps):

$$-\frac{1}{\left(c + a^2 c x^2\right)^{2/3}} 3 \left(1 + \frac{1}{a^2 x^2}\right)^{2/3} \left(\frac{a - \frac{i}{x}}{a + \frac{i}{x}}\right)^{\frac{1}{6}(4 - 3 i n)} \left(1 - \frac{i}{a x}\right)^{\frac{1}{6}(-4 + 3 i n)}$$

$$\left(1 + \frac{i}{a x}\right)^{\frac{1}{6}(2 - 3 i n)} x \operatorname{Hypergeometric2F1}\left[\frac{1}{3}, \frac{1}{6}(4 - 3 i n), \frac{4}{3}, \frac{2 i}{\left(a + \frac{i}{x}\right) x}\right]$$

Result (type 8, 25 leaves):

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{2/3}} dx$$

Problem 10: Unable to integrate problem.

$$\int \frac{e^{n\,\text{ArcCot}[a\,x]}}{\left(c + a^2\,c\,x^2\right)^{4/3}}\,dx$$

Optimal (type 5, 207 leaves, 4 steps):

$$-\frac{3\,e^{n\,\text{ArcCot}[a\,x]}\,\left(3\,n - 2\,a\,x\right)}{a\,c\,\left(4 + 9\,n^2\right)\,\left(c + a^2\,c\,x^2\right)^{1/3}} - \left(6\left(1 + \frac{1}{a^2\,x^2}\right)^{1/3}\left(\frac{a - \frac{i}{x}}{a + \frac{i}{x}}\right)^{\frac{1}{6}(2-3\,i\,n)}\left(1 - \frac{i}{a\,x}\right)^{\frac{1}{6}(-2+3\,i\,n)}\left(1 + \frac{i}{a\,x}\right)^{\frac{1}{6}(4-3\,i\,n)} x\right.$$

$$\left.\text{Hypergeometric2F1}\left[-\frac{1}{3}, \frac{1}{6}\left(2 - 3\,i\,n\right), \frac{2}{3}, \frac{2\,i}{\left(a + \frac{i}{x}\right)\,x}\right]\right) \Big/ \left(c\,\left(4 + 9\,n^2\right)\,\left(c + a^2\,c\,x^2\right)^{1/3}\right)$$

Result (type 8, 25 leaves):

$$\int \frac{e^{n\,\text{ArcCot}[a\,x]}}{\left(c + a^2\,c\,x^2\right)^{4/3}}\,dx$$

Problem 11: Unable to integrate problem.

$$\int \frac{e^{n\,\text{ArcCot}[a\,x]}}{\left(c + a^2\,c\,x^2\right)^{5/3}}\,dx$$

Optimal (type 5, 207 leaves, 4 steps):

$$-\frac{3\,e^{n\,\text{ArcCot}[a\,x]}\,\left(3\,n - 4\,a\,x\right)}{a\,c\,\left(16 + 9\,n^2\right)\,\left(c + a^2\,c\,x^2\right)^{2/3}} - \left(12\left(1 + \frac{1}{a^2\,x^2}\right)^{2/3}\left(\frac{a - \frac{i}{x}}{a + \frac{i}{x}}\right)^{\frac{1}{6}(4-3\,i\,n)}\left(1 - \frac{i}{a\,x}\right)^{\frac{1}{6}(-4+3\,i\,n)}\left(1 + \frac{i}{a\,x}\right)^{\frac{1}{6}(2-3\,i\,n)} x\right.$$

$$\left.\text{Hypergeometric2F1}\left[\frac{1}{3}, \frac{1}{6}\left(4 - 3\,i\,n\right), \frac{4}{3}, \frac{2\,i}{\left(a + \frac{i}{x}\right)\,x}\right]\right) \Big/ \left(c\,\left(16 + 9\,n^2\right)\,\left(c + a^2\,c\,x^2\right)^{2/3}\right)$$

Result (type 8, 25 leaves):

$$\int \frac{e^{n\,\text{ArcCot}[a\,x]}}{\left(c + a^2\,c\,x^2\right)^{5/3}}\,dx$$

Problem 12: Unable to integrate problem.

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{7/3}} dx$$

Optimal (type 5, 272 leaves, 5 steps):

$$-\frac{3 e^{n \operatorname{ArcCot}[a x]} \left(3 n - 8 a x\right)}{a c \left(64 + 9 n^2\right) \left(c + a^2 c x^2\right)^{4/3}} - \frac{120 e^{n \operatorname{ArcCot}[a x]} \left(3 n - 2 a x\right)}{a c^2 \left(4 + 9 n^2\right) \left(64 + 9 n^2\right) \left(c + a^2 c x^2\right)^{1/3}} -$$

$$\left(240 \left(1 + \frac{1}{a^2 x^2}\right)^{1/3} \left(\frac{a - \frac{i}{x}}{a + \frac{i}{x}}\right)^{\frac{1}{6}(2 - 3 i n)} \left(1 - \frac{i}{a x}\right)^{\frac{1}{6}(-2 + 3 i n)} \left(1 + \frac{i}{a x}\right)^{\frac{1}{6}(4 - 3 i n)} x \operatorname{Hypergeometric2F1}\left[\right.\right.$$

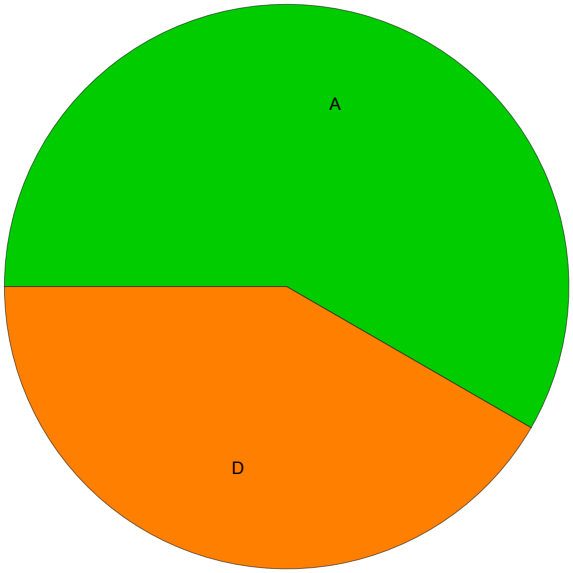
$$\left.\left.-\frac{1}{3}, \frac{1}{6}\left(2 - 3 i n\right), \frac{2}{3}, \frac{2 i}{\left(a + \frac{i}{x}\right) x}\right]\right) \Big/ \left(c^2 \left(4 + 9 n^2\right) \left(64 + 9 n^2\right) \left(c + a^2 c x^2\right)^{1/3}\right)$$

Result (type 8, 25 leaves):

$$\int \frac{e^{n \operatorname{ArcCot}[a x]}}{\left(c + a^2 c x^2\right)^{7/3}} dx$$

Summary of Integration Test Results

12 integration problems



A - 7 optimal antiderivatives

B - 0 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 5 unable to integrate problems

E - 0 integration timeouts