

Mathematica 11.3 Integration Test Results

Test results for the 156 problems in "7.1.2 (d x)^m (a+b arcsinh(c x))^n.m"

Problem 40: Result unnecessarily involves imaginary or complex numbers.

$$\int \frac{\text{ArcSinh}[a x]^4}{x^3} dx$$

Optimal (type 4, 108 leaves, 8 steps):

$$-2 a^2 \text{ArcSinh}[a x]^3 - \frac{2 a \sqrt{1+a^2 x^2} \text{ArcSinh}[a x]^3}{x} - \frac{\text{ArcSinh}[a x]^4}{2 x^2} + 6 a^2 \text{ArcSinh}[a x]^2 \text{Log}[1 - e^{2 \text{ArcSinh}[a x]}] + 6 a^2 \text{ArcSinh}[a x] \text{PolyLog}[2, e^{2 \text{ArcSinh}[a x]}] - 3 a^2 \text{PolyLog}[3, e^{2 \text{ArcSinh}[a x]}]$$

Result (type 4, 113 leaves):

$$-\frac{\text{ArcSinh}[a x]^4}{2 x^2} + \frac{1}{4} a^2 \left(i \pi^3 - 8 \text{ArcSinh}[a x]^3 - \frac{8 \sqrt{1+a^2 x^2} \text{ArcSinh}[a x]^3}{a x} + 24 \text{ArcSinh}[a x]^2 \text{Log}[1 - e^{2 \text{ArcSinh}[a x]}] + 24 \text{ArcSinh}[a x] \text{PolyLog}[2, e^{2 \text{ArcSinh}[a x]}] - 12 \text{PolyLog}[3, e^{2 \text{ArcSinh}[a x]}] \right)$$

Problem 119: Unable to integrate problem.

$$\int x^m \text{ArcSinh}[a x]^2 dx$$

Optimal (type 5, 137 leaves, 2 steps):

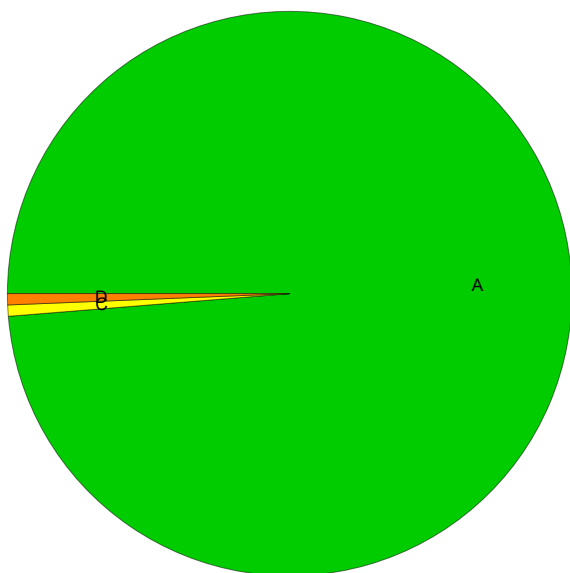
$$\frac{x^{1+m} \text{ArcSinh}[a x]^2}{1+m} - \frac{2 a x^{2+m} \text{ArcSinh}[a x] \text{Hypergeometric2F1}\left[\frac{1}{2}, \frac{2+m}{2}, \frac{4+m}{2}, -a^2 x^2\right]}{2+3 m+m^2} + \left(2 a^2 x^{3+m} \text{HypergeometricPFQ}\left[\left\{1, \frac{3}{2} + \frac{m}{2}, \frac{3}{2} + \frac{m}{2}\right\}, \left\{2 + \frac{m}{2}, \frac{5}{2} + \frac{m}{2}\right\}, -a^2 x^2\right]\right) / (6+11 m+6 m^2+m^3)$$

Result (type 9, 133 leaves):

$$\frac{1}{4(1+m)} x^{1+m} \left(4 \operatorname{ArcSinh}[a x] \left(\operatorname{ArcSinh}[a x] - \frac{2 a x \sqrt{1+a^2 x^2} \operatorname{Hypergeometric2F1}\left[1, \frac{3+m}{2}, \frac{4+m}{2}, -a^2 x^2\right]}{2+m} \right) + 2^{-m} a^2 \sqrt{\pi} x^2 \operatorname{Gamma}[2+m] \operatorname{HypergeometricPFQRegularized}\left[\left\{1, \frac{3+m}{2}, \frac{3+m}{2}\right\}, \left\{\frac{4+m}{2}, \frac{5+m}{2}\right\}, -a^2 x^2\right] \right)$$

Summary of Integration Test Results

156 integration problems



- A - 154 optimal antiderivatives
- B - 0 more than twice size of optimal antiderivatives
- C - 1 unnecessarily complex antiderivatives
- D - 1 unable to integrate problems
- E - 0 integration timeouts