

## Rubi 4.16.1.4 Integration Test Results

on the problems in the test-suite directory "7 Inverse hyperbolic functions"

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

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Test results for the 663 problems in "7.1.4 (f x)^m (d+e x^2)^p (a+b arcsinh(c x))^n.m"

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Test results for the 371 problems in "7.1.5 Inverse hyperbolic sine functions.m"

Problem 369: Unable to integrate problem.

$$\int \frac{x}{\text{ArcSinh}[\text{Sinh}[x]]} dx$$

Optimal (type 3, 27 leaves, ? steps):

$$\text{ArcSinh}[\text{Sinh}[x]] + \text{Log}[\text{ArcSinh}[\text{Sinh}[x]]] \left( -\text{ArcSinh}[\text{Sinh}[x]] + x \sqrt{\text{Cosh}[x]^2 \text{Sech}[x]} \right)$$

Result (type 8, 9 leaves, 0 steps):

$$\text{CannotIntegrate}\left[\frac{x}{\text{ArcSinh}[\text{Sinh}[x]]}, x\right]$$

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Test results for the 166 problems in "7.2.2 (d x)^m (a+b arccosh(c x))^n.m"

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Test results for the 569 problems in "7.2.4 (f x)^m (d+e x^2)^p (a+b arccosh(c x))^n.m"

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Test results for the 296 problems in "7.2.5 Inverse hyperbolic cosine functions.m"

Problem 61: Unable to integrate problem.

$$\int \frac{(d - c^2 x^2)^{3/2} (a + b \operatorname{ArcCosh}[c x])}{f + g x} dx$$

Optimal (type 4, 1270 leaves, ? steps):

$$\begin{aligned}
& - \frac{a d (c f - g) (c f + g) \sqrt{d - c^2 d x^2}}{g^3} + \frac{b c d (c f - g) (c f + g) x \sqrt{d - c^2 d x^2}}{g^3 \sqrt{-1 + c x} \sqrt{1 + c x}} - \frac{b c^2 d (c f - g) x^2 \sqrt{d - c^2 d x^2}}{4 g^2 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{a d (2 + 3 c x - 2 c^2 x^2) \sqrt{d - c^2 d x^2}}{6 g} + \frac{b c d x (-12 - 9 c x + 4 c^2 x^2) \sqrt{d - c^2 d x^2}}{36 g \sqrt{-1 + c x} \sqrt{1 + c x}} - \frac{b d (c f - g) (c f + g) \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x]}{g^3} - \\
& \frac{a d \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x]}{2 g \sqrt{-1 + c x} \sqrt{1 + c x}} + \frac{b d (2 + 3 c x - 2 c^2 x^2) \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x]}{6 g} - \frac{b d \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x]^2}{4 g \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{c d (c f - g) x \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])}{2 g^2} - \frac{d (c f - g) \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{4 b g^2 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{c d (c f - g) (c f + g) x \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b g^3 \sqrt{-1 + c x} \sqrt{1 + c x}} + \frac{d (c f - g)^2 (c f + g)^2 \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b c g^4 \sqrt{-1 + c x} \sqrt{1 + c x} (f + g x)} + \\
& \frac{d (c f - g) (c f + g) (1 - c^2 x^2) \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b c g^2 \sqrt{-1 + c x} \sqrt{1 + c x} (f + g x)} - \frac{2 a d (c f - g)^{3/2} (c f + g)^{3/2} \sqrt{d - c^2 d x^2} \operatorname{ArcTanh}\left[\frac{\sqrt{c f + g} \sqrt{1 + c x}}{\sqrt{c f - g} \sqrt{-1 + c x}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} - \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x] \operatorname{Log}\left[1 + \frac{e^{\operatorname{ArcCosh}[c x]} g}{c f - \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x] \operatorname{Log}\left[1 + \frac{e^{\operatorname{ArcCosh}[c x]} g}{c f + \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} - \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{PolyLog}\left[2, -\frac{e^{\operatorname{ArcCosh}[c x]} g}{c f - \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} + \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{PolyLog}\left[2, -\frac{e^{\operatorname{ArcCosh}[c x]} g}{c f + \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}}
\end{aligned}$$

Result (type 8, 1150 leaves, 28 steps):

$$\begin{aligned}
& \frac{b c d (c f - g) (c f + g) x \sqrt{d - c^2 d x^2}}{g^3 \sqrt{-1 + c x} \sqrt{1 + c x}} - \frac{b c^2 d (c f - g) x^2 \sqrt{d - c^2 d x^2}}{4 g^2 \sqrt{-1 + c x} \sqrt{1 + c x}} - \frac{a d (c f - g) (c f + g) (1 - c^2 x^2) \sqrt{d - c^2 d x^2}}{g^3 (1 - c x) (1 + c x)} - \\
& \frac{b d (c f - g) (c f + g) \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x]}{g^3} + \frac{c d (c f - g) x \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])}{2 g^2} - \\
& \frac{d (c f - g) \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{4 b g^2 \sqrt{-1 + c x} \sqrt{1 + c x}} + \frac{c d (c f - g) (c f + g) x \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b g^3 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{d (c f - g)^2 (c f + g)^2 \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b c g^4 \sqrt{-1 + c x} \sqrt{1 + c x} (f + g x)} + \frac{d (c f - g) (c f + g) (1 - c^2 x^2) \sqrt{d - c^2 d x^2} (a + b \operatorname{ArcCosh}[c x])^2}{2 b c g^2 \sqrt{-1 + c x} \sqrt{1 + c x} (f + g x)} + \\
& \frac{a d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{-1 + c^2 x^2} \sqrt{d - c^2 d x^2} \operatorname{ArcTanh}\left[\frac{g + c^2 f x}{\sqrt{c^2 f^2 - g^2} \sqrt{-1 + c^2 x^2}}\right]}{g^4 (1 - c x) (1 + c x)} - \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x] \operatorname{Log}\left[1 + \frac{e^{\operatorname{ArcCosh}[c x]} g}{c f - \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{ArcCosh}[c x] \operatorname{Log}\left[1 + \frac{e^{\operatorname{ArcCosh}[c x]} g}{c f + \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} - \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{PolyLog}\left[2, -\frac{e^{\operatorname{ArcCosh}[c x]} g}{c f - \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} + \\
& \frac{b d (c f - g) (c f + g) \sqrt{c^2 f^2 - g^2} \sqrt{d - c^2 d x^2} \operatorname{PolyLog}\left[2, -\frac{e^{\operatorname{ArcCosh}[c x]} g}{c f + \sqrt{c^2 f^2 - g^2}}\right]}{g^4 \sqrt{-1 + c x} \sqrt{1 + c x}} - \\
& \frac{c d \sqrt{d - c^2 d x^2} \operatorname{Unintegrateable}\left[(-1 + c x)^{3/2} \sqrt{1 + c x} (a + b \operatorname{ArcCosh}[c x]), x\right]}{g \sqrt{-1 + c x} \sqrt{1 + c x}}
\end{aligned}$$

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Test results for the 243 problems in "7.3.2 (d x)^m (a+b arctanh(c x^n))^p.m"

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Test results for the 49 problems in "7.3.3 (d+e x)^m (a+b arctanh(c x^n))^p.m"

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Test results for the 538 problems in "7.3.4 u (a+b arctanh(c x))^p.m"

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Test results for the 62 problems in "7.3.5  $u (a+b \operatorname{arctanh}(c+d x))^p.m$ "

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Test results for the 1378 problems in "7.3.6 Exponentials of inverse hyperbolic tangent functions.m"

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Test results for the 361 problems in "7.3.7 Inverse hyperbolic tangent functions.m"

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Test results for the 300 problems in "7.4.1 Inverse hyperbolic cotangent functions.m"

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Test results for the 935 problems in "7.4.2 Exponentials of inverse hyperbolic cotangent functions.m"

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Test results for the 190 problems in "7.5.1  $u (a+b \operatorname{arcsech}(c x))^n.m$ "

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Test results for the 100 problems in "7.5.2 Inverse hyperbolic secant functions.m"

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Test results for the 178 problems in "7.6.1  $u (a+b \operatorname{arccsch}(c x))^n.m$ "

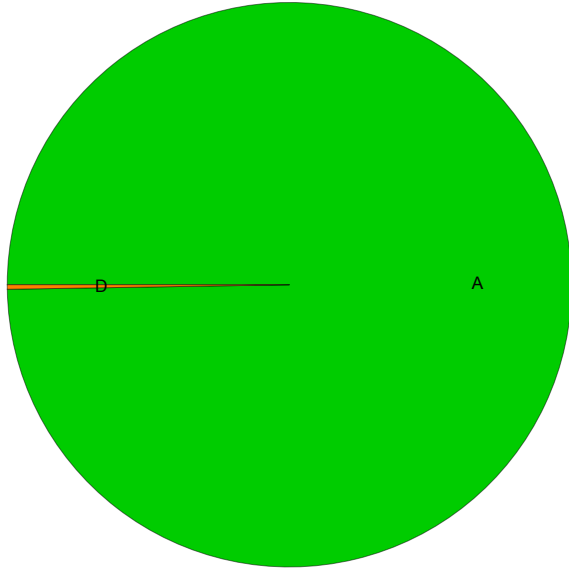
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Test results for the 71 problems in "7.6.2 Inverse hyperbolic cosecant functions.m"

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## Summary of Integration Test Results

6650 integration problems



A - 6633 optimal antiderivatives

B - 0 valid but suboptimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 17 unable to integrate problems

E - 0 integration timeouts

F - 0 invalid antiderivatives