

> diff(sin(a*x), x);

$$\cos(ax) a$$

> y:=diff(arctan(x+1)/exp(sin(x)), x, x, x);

$$y := 2 \frac{(2x+2)^2}{(1+(x+1)^2)^3 e^{\sin(x)}} + 3 \frac{(2x+2)\cos(x)}{(1+(x+1)^2)^2 e^{\sin(x)}} - 2 \frac{1}{(1+(x+1)^2)^2 e^{\sin(x)}} + 3 \frac{\cos(x)^2}{(1+(x+1)^2) e^{\sin(x)}} + 3 \frac{\sin(x)}{(1+(x+1)^2) e^{\sin(x)}} - \frac{\arctan(x+1)\cos(x)^3}{e^{\sin(x)}} - 3 \frac{\arctan(x+1)\cos(x)\sin(x)}{e^{\sin(x)}} + \frac{\arctan(x+1)\cos(x)}{e^{\sin(x)}}$$

> diff(x*exp(sin(x)*ln(x)), x\$3);

$$3 \left(-\sin(x) \ln(x) + 2 \frac{\cos(x)}{x} - \frac{\sin(x)}{x^2} \right) e^{(\sin(x) \ln(x))} + 3 \left(\cos(x) \ln(x) + \frac{\sin(x)}{x} \right)^2 e^{(\sin(x) \ln(x))} + x \left(-\cos(x) \ln(x) - 3 \frac{\sin(x)}{x} - 3 \frac{\cos(x)}{x^2} + 2 \frac{\sin(x)}{x^3} \right) e^{(\sin(x) \ln(x))} + 3 x \left(-\sin(x) \ln(x) + 2 \frac{\cos(x)}{x} - \frac{\sin(x)}{x^2} \right) \left(\cos(x) \ln(x) + \frac{\sin(x)}{x} \right) e^{(\sin(x) \ln(x))}$$

$$+ x \left(\cos(x) \ln(x) + \frac{\sin(x)}{x} \right)^3 e^{(\sin(x) \ln(x))}$$

> subs (x=0, y) ;

$$\frac{1}{2} \frac{1}{e^{\sin(0)}} + \frac{3 \cos(0)}{2 e^{\sin(0)}} + \frac{3 \cos(0)^2}{2 e^{\sin(0)}} + \frac{3 \sin(0)}{2 e^{\sin(0)}} - \frac{\arctan(1) \cos(0)^3}{e^{\sin(0)}} \\ - 3 \frac{\arctan(1) \cos(0) \sin(0)}{e^{\sin(0)}} + \frac{\arctan(1) \cos(0)}{e^{\sin(0)}}$$

> simplify (%);

$$\frac{7}{2}$$

> simplify (subs (x=0, diff (arctan (x) /exp (sin (x)) , x\$2))) ;

$$-2$$

> y := -log (1+x^2) -2*arctan (x+1) +x;

$$y := -\ln(1+x^2) - 2 \arctan(x+1) + x$$

> y1:=diff (y, x) ;

$$y1 := -2 \frac{x}{1+x^2} - 2 \frac{1}{1+(x+1)^2} + 1$$

> factor (y1) ;

$$\frac{x(x-2)(x+1)^2}{(1+x^2)(2+x^2+2x)}$$

> solve (y1=0, x) ;

$$0, 2, -1, -1$$

> y2:=diff (y, x\$2) ;

$$y2 := -2 \frac{1}{1+x^2} + 4 \frac{x^2}{(1+x^2)^2} + 2 \frac{2x+2}{(1+(x+1)^2)^2}$$

> factor(y2);

$$2 \frac{(x+1)(x^5 + 5x^4 + 4x^3 + 4x^2 - 4x - 2)}{(1+x^2)^2 (2+x^2+2x)^2}$$

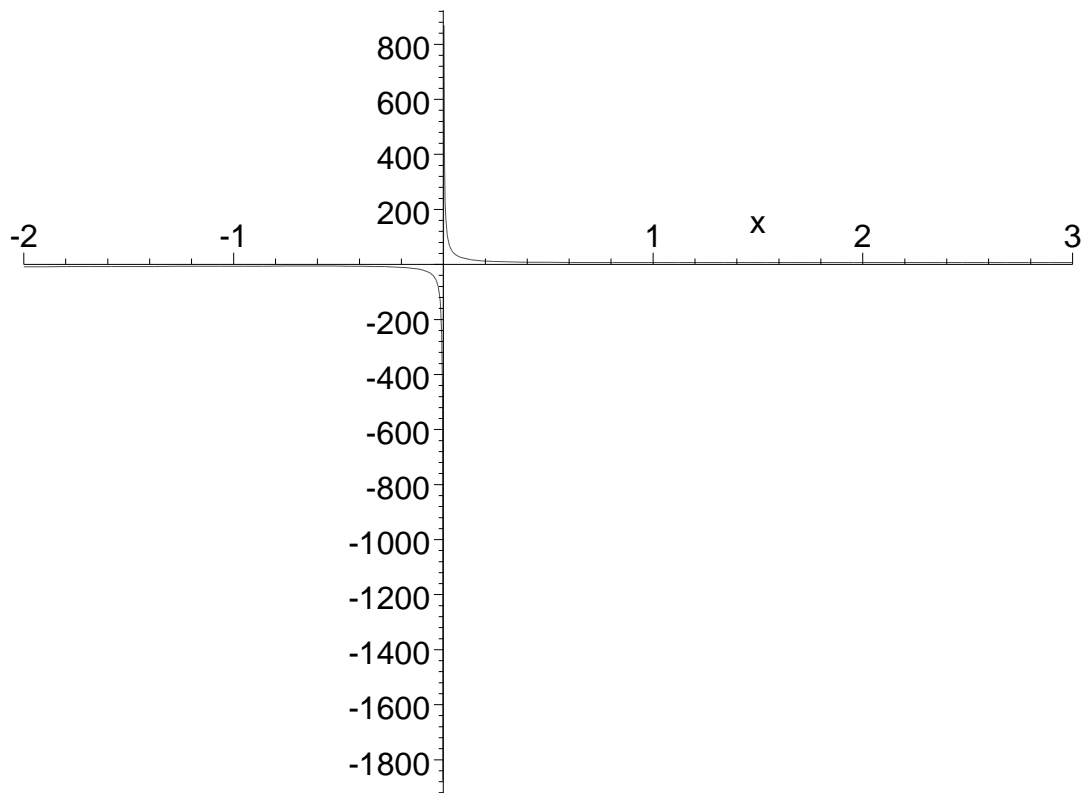
> numer(%);

$$2(x+1)(x^5 + 5x^4 + 4x^3 + 4x^2 - 4x - 2)$$

> fsolve(%=0, x);

$$-4.333435475, -1., -0.3840476529, 0.7063192971$$

> plot(y, x=-2..3);



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> maximize(y, x, -2..3);
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∞

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>
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> y := -log(1+x^2) + 6*arctan(x) + 2/x;
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$$y := -\ln(1 + x^2) + 6 \arctan(x) + 2 \frac{1}{x}$$

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> factor(diff(y, x));
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$$-2 \frac{(x-1)(x^2-x-1)}{(1+x^2)x^2}$$

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> s := solve(%=0, x);
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$$s := 1, \frac{1}{2} + \frac{1}{2}\sqrt{5}, \frac{1}{2} - \frac{1}{2}\sqrt{5}$$

> evalf(%);

1., 1.618033989, -.6180339890

> subs(x=s[1], y);

$-\ln(2) + 6 \arctan(1) + 2$

> evalf(%);

6.019241800

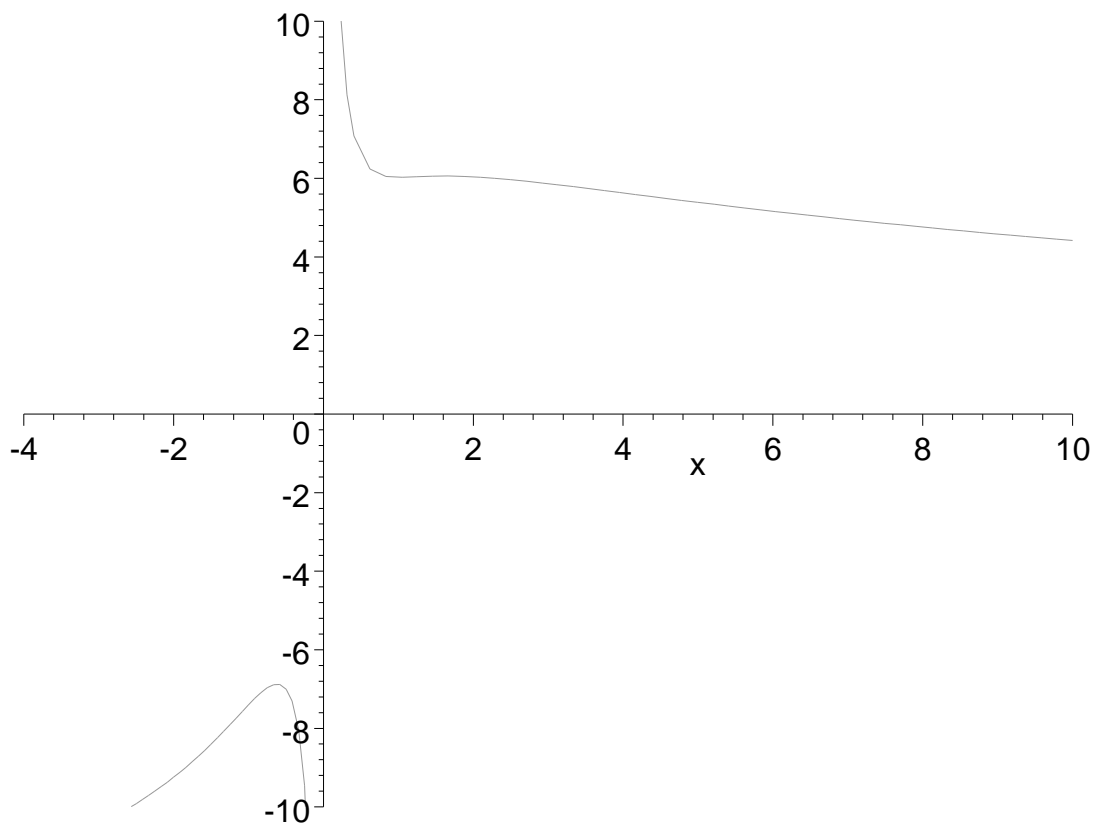
> subs(x=s[2], y);

$$-\ln\left(1 + \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^2\right) + 6 \arctan\left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right) + 2 \frac{1}{\frac{1}{2} + \frac{1}{2}\sqrt{5}}$$

> evalf(%);

6.053469003

> plot(y, x=-4..10, -10..10, discontinuity=true);



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> maximize(y, x, 1..10);
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$$\frac{1}{4} \left(-\ln\left(\frac{5}{2} + \frac{1}{2}\sqrt{5}\right) - \ln\left(\frac{5}{2} + \frac{1}{2}\sqrt{5}\right)\sqrt{5} + 6 \arctan\left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right) \right. \\ \left. + 6 \arctan\left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)\sqrt{5} + 4 \right) (-1 + \sqrt{5})$$

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> minimize(y, x, 1..10);
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$$-\ln(101) + 6 \arctan(10) + \frac{1}{5}$$

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> subs(x=10, y);
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$$-\ln(101) + 6 \arctan(10) + \frac{1}{5}$$

> f:=x->x*sin(x);

$$f := x \rightarrow x \sin(x)$$

> f(5);

$$5 \sin(5)$$

> f(f(x));

$$x \sin(x) \sin(x \sin(x))$$

> f1:=x->diff(f(x),x);

$$f1 := x \rightarrow \text{diff}(f(x), x)$$

> f1(x);

$$\sin(x) + x \cos(x)$$

> f1(1);

Error, (in f1) wrong number (or type) of parameters in function diff

> diff(4*3,3);

Error, wrong number (or type) of parameters in function diff

> f1:=unapply(diff(f(x),x),x);

$$f1 := x \rightarrow \sin(x) + x \cos(x)$$

> f1(3);

$$\sin(3) + 3 \cos(3)$$

> y;

$$-\ln(1+x^2) + 6 \arctan(x) + 2 \frac{1}{x}$$

> F:=unapply(y,x);

$$F := x \rightarrow -\ln(x^2 + 1) + 6 \arctan(x) + 2 \frac{1}{x}$$

> F (t) ;

$$-\ln(t^2 + 1) + 6 \arctan(t) + 2 \frac{1}{t}$$

> D (F) ;

$$x \rightarrow -2 \frac{x}{x^2 + 1} + 6 \frac{1}{x^2 + 1} - 2 \frac{1}{x^2}$$

> D (F) (u) ;

$$-2 \frac{u}{u^2 + 1} + 6 \frac{1}{u^2 + 1} - 2 \frac{1}{u^2}$$

> diff (F (u) , u) ;

$$-2 \frac{u}{u^2 + 1} + 6 \frac{1}{u^2 + 1} - 2 \frac{1}{u^2}$$

> D (sin) ;

cos

> q:=x->x^2;

$$q := x \rightarrow x^2$$

> (q@@2) (x) ;

x^4

> q (q (x)) ;

x^4

> (D@@3) (sin) ;

-cos


```

> (cos@q) (x) ;
                                cos(x^2)
> (q@cos) (x) ;
                                cos(x)^2
>
> int (1/x, x) ;
                                ln(x)
> int (1/x, x=-1..-1/2) ;
                                -ln(2)
> int (exp (1/arctan (x) ) , x=0..1) ;
                                
$$\int_0^1 e^{\left(\frac{1}{\arctan(x)}\right)} dx$$

> evalf (Int (exp (1/cos (x) ) , x=0..1) ) ;
                                3.508459775
> int (sqrt (1-sqrt (t) ) , t) ;
                                
$$-\frac{-\frac{8}{15}\sqrt{\pi} - \frac{4}{15}\sqrt{\pi}(-1 + \sqrt{t})(3\sqrt{t} + 2)\sqrt{1 - \sqrt{t}}}{\sqrt{\pi}}$$

> simplify (%) ;
                                
$$\frac{8}{15} - \frac{4}{15}\sqrt{1 - \sqrt{t}}\sqrt{t} - \frac{8}{15}\sqrt{1 - \sqrt{t}} + \frac{4}{5}\sqrt{1 - \sqrt{t}}t$$

> int (2/ (5-3*cos (a*x) ) , x=0..2*Pi/a) ;
                                0
> int (2/ (5-3*cos (a*x) ) , x) ;

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$$\frac{\arctan\left(2 \tan\left(\frac{1}{2} a x\right)\right)}{a}$$

> F := (x, y) -> x^5/y;

$$F := (x, y) \rightarrow \frac{x^5}{y}$$

> y := 'y' ;

y := y

> diff (F (x, y) , x\$3, y) ;

$$-60 \frac{x^2}{y^2}$$

> D[1\$2, 2\$4] (F) (x, y) ;

$$480 \frac{x^3}{y^5}$$

> diff (F (x, y) , x\$2, y\$4) ;

$$480 \frac{x^3}{y^5}$$

> (D@@3) (g@h) ;

$$\begin{aligned} & ((D^{(3)})(g))@h D(h)^3 + 3 ((D^{(2)})(g))@h (D^{(2)})(h) D(h) \\ & + (D(g))@h (D^{(3)})(h) \end{aligned}$$

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