```
> restart;
```

```
> int(x^n, x);
```

$$\frac{x^{(n+1)}}{n+1}$$

```
> A := diff(x^n, x);
```

$$A := \frac{x^n\ n}{x}$$

```
> A;
```

$$\frac{x^n\ n}{x}$$

```
> simplify(A);
```

$$x^{(n-1)}\ n$$

```
> F := 1/(2*x^2-4*x-8);
```

$$F := \frac{1}{2\ x^2 - 4\ x - 8}$$

```
> PF := convert(F, parfrac, sqrt(5));
```

$$PF := -\frac{\sqrt{5}}{20\ (x - 1 + \sqrt{5})} + \frac{\sqrt{5}}{20\ (x - 1 - \sqrt{5})}$$

```
> P := 1/F;
```

$$P := 2\ x^2 - 4\ x - 8$$

```
> solve(P = 0, x);
```

$$1 + \sqrt{5},\ 1 - \sqrt{5}$$

```
> f := int(PF, x);
  lnabs:=x->ln(abs(x));
  fabs:=subs(ln=lnabs,ftmp);
```

$$f := -\frac{1}{20}\sqrt{5}\ \ln(x - 1 + \sqrt{5}) + \frac{1}{20}\sqrt{5}\ \ln(x - 1 - \sqrt{5})$$

$$lnabs := x \rightarrow \ln(\ |x|\ )$$

$$fabs := -\frac{1}{20}\sqrt{5}\ lnabs(x - 1 + \sqrt{5}) + \frac{1}{20}\sqrt{5}\ lnabs(x - 1 - \sqrt{5})$$

```
> g := int(F, x);
```

$$g := -\frac{1}{10}\sqrt{5}\ \operatorname{arctanh}\left(\frac{1}{10}\ (2\ x - 2)\ \sqrt{5}\right)$$

```
> f;
```

$$-\frac{1}{20}\sqrt{5}\,\ln(x-1+\sqrt{5})+\frac{1}{20}\sqrt{5}\,\ln(x-1-\sqrt{5})$$

```
> g;
```

$$-\frac{1}{10}\sqrt{5}\,\operatorname{arctanh}\left(\frac{1}{10}(2\,x-2)\sqrt{5}\right)$$

```
> Q := simplify(diff(f, x));
```

$$Q := \frac{1}{2\,(x-1+\sqrt{5})\,(x-1-\sqrt{5})}$$

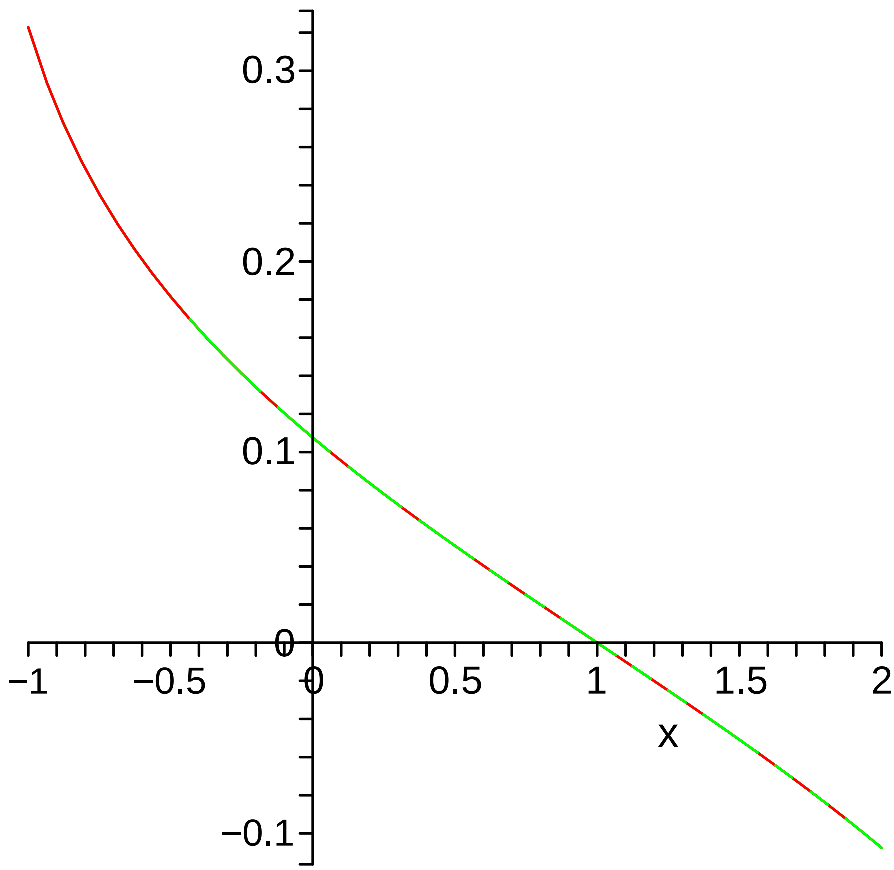
```
> simplify(diff(g, x));
```

$$\frac{1}{2\,(x^2-2\,x-4)}$$

```
> 1/expand(1/Q, x);
```

$$\frac{1}{2\,x^2-4\,x-8}$$

```
> plot([fabs,g], x = -1 .. 2);
```




```
> F1 := 1/((x-1)*(x-2)*(x-3)^2);
```

$$F1 := \frac{1}{(x-1)\,(x-2)\,(x-3)^2}$$

```
> int(F1, x);
```

$$-\frac{1}{2\,(x-3)} - \frac{3}{4}\ln(x-3) + \ln(x-2) - \frac{1}{4}\ln(x-1)$$

```
> convert(F1, parfrac);
```

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

```
> int(x^3*exp(x), x);
```

$$(-6 + 6\,x - 3\,x^2 + x^3)\,\mathbf{e}^x$$

```
> p := (a+b*x+c*x^2+d*x^3)*exp(x);
```

$$p := (a + b\,x + c\,x^2 + d\,x^3)\,\mathbf{e}^x$$

```
> eq1 := diff(p, x) = x^3*exp(x);
```

$$eq1 := (b + 2\,c\,x + 3\,d\,x^2)\,\mathrm{e}^x + (a + b\,x + c\,x^2 + d\,x^3)\,\mathrm{e}^x = x^3\,\mathrm{e}^x$$

```
> Y1 := collect(simplify(eq1/exp(x)), x);
```

$$Y1 := d\,x^3 + (3\,d + c)\,x^2 + (2\,c + b)\,x + b + a = x^3$$

```
> e1 := subs(x = 0, lhs(Y1)) = subs(x = 0, rhs(Y1));
  e2 := coeff(lhs(Y1), x) = coeff(rhs(Y1), x);
  e3 := coeff(lhs(Y1), x^2) = coeff(rhs(Y1), x^2);
  e4 := coeff(lhs(Y1), x^3) = coeff(rhs(Y1), x^3);
```

$$e1 := b + a = 0$$

$$e2 := 2\,c + b = 0$$

$$e3 := 3\,d + c = 0$$

$$e4 := d = 1$$

```
> h := solve({e1, e2, e3, e4}, {a, b, c, d});
```

$$h := \{c = -3, b = 6, a = -6, d = 1\}$$

```
> subs(h, p);
```

$$(-6 + 6\,x - 3\,x^2 + x^3)\,\mathrm{e}^x$$

```
> h1 := arctan(x);
```

$$h1 := \arctan(x)$$

```
> series(h1, x, 10);
```

$$x - \frac{1}{3}\,x^3 + \frac{1}{5}\,x^5 - \frac{1}{7}\,x^7 + \frac{1}{9}\,x^9 + O(x^{10})$$

```
> t4 := series(3*tan(4*x), x);
```

$$t4 := 12\,x + 64\,x^3 + \frac{2048}{5}\,x^5 + O(x^6)$$

```
> t12 := series(12*tan(x), x);
```

$$t12 := 12\,x + 4\,x^3 + \frac{8}{5}\,x^5 + O(x^6)$$

```
> s4 := series(3*sin(4*x), x);
```

$$s4 := 12\,x - 32\,x^3 + \frac{128}{5}\,x^5 + O(x^6)$$

```
> s12 := series(12*sin(x), x);
```

$$s12 := 12\,x - 2\,x^3 + \frac{1}{10}\,x^5 + O(x^6)$$

```
> subs(x = 0, simplify(convert(t4-t12, polynom)/convert(s4-s12, polynom)));
```

$$-2$$

```
> limit((3*tan(4*x)-12*tan(x))/(3*sin(4*x)-12*sin(x)), x = 0);
```

$$-2$$

```
> num := 3*tan(4*x)-12*tan(x);
  den := 3*sin(4*x)-12*sin(x);
```

$$num := 3\tan(4x) - 12\tan(x)$$

$$den := 3\sin(4x) - 12\sin(x)$$

```
> dnum := diff(num, x$3);
  dend := diff(den, x$3);
```

$$dnum := 24\left(4 + 4\tan(4x)^2\right)^2 + 192\tan(4x)^2\left(4 + 4\tan(4x)^2\right) - 24\left(1 + \tan(x)^2\right)^2 - 48\tan(x)^2\left(1 + \tan(x)^2\right)$$

$$dend := -192\cos(4x) + 12\cos(x)$$

```
> p := simplify(subs(x = 0, dnum)); q := simplify(subs(x = 0, dend));
```

$$p := 360 + 1440\tan(0)^2 + 1080\tan(0)^4$$

$$q := -180$$

```
> p/q;
```

$$-2$$

```
> int(x^2*exp(x^2), x);
```

$$\frac{1}{2}x\,\mathbf{e}^{(x^2)} + \frac{1}{4}I\sqrt{\pi}\,\mathrm{erf}(I\,x)$$

```
> 2*(int(exp(-t^2), t = 0 .. x))/sqrt(Pi);
```

$$\mathrm{erf}(x)$$

```
>
```