```
syms y x t a b c d
```

Basic Derentiation

```
D(4*x^7)
```

ans = $28\,x^6$

```
D(-3*x^12)
```

ans = $-36\,x^{11}$

```
D(3*x^8+2*x+1)
```

ans = $24\,x^7+2$

```
D(1/2*(x^4+7))
```

ans = $2\,x^3$

```
diff(pi^3)
```

```
ans =

     []
```

```
D(sqrt(2)*x+1/sqrt(2))
```

ans = $\sqrt{2}$

```
D(-1/3*(x^7+2*x-9))
```

ans =

$$-\frac{7\,x^6}{3}-\frac{2}{3}$$

```
D((x^2+1)/5)
```

ans =

$$\frac{2\,x}{5}$$

```
D(x^(-3)+x^(-7))
```

ans =

$$-\frac{3\,x^4+7}{x^8}$$

```
D(sqrt(x)+1/x)
```

ans =

$$\frac{1}{2\ \sqrt{x}}-\frac{1}{x^2}$$

```
D(-3*x^(-8)+2*sqrt(x))
```

ans =

$$\frac{1}{\sqrt{x}}+\frac{24}{x^9}$$

```
D(7*x^(-6)-5*sqrt(x))
```

ans =

$$-\frac{5}{2\ \sqrt{x}}-\frac{42}{x^7}$$

```
D(x^exp(1)+1/x^sqrt(10))
```

ans =

$$\frac{3060513257434037\,x^{1934613350591413/1125899906842624}}{1125899906842624}-\frac{\sqrt{10}}{x^{\sqrt{10}+1}}$$

```
D((8/x)^(1/3))
```

ans =

$$-\frac{2\left(\frac{1}{x}\right)^{4/3}}{3}$$

```
D(a*x^3+b*x^2+c*x+d)
```

ans = $3\,a\,x^2+2\,b\,x+c$

```
D(1/a*(x^2+1/b*x+c))
```

ans =

$$\frac{2\,x+\frac{1}{b}}{a}$$

```
D(5*x^2-3*x+1)
```

ans = $10\,x-3$

```
D((x^(3/2)+2)/x)
```

ans =

$$\frac{x^{3/2}-4}{2\,x^2}$$

```
D(t^2-t)
```

ans = $2\,t-1$

```
D((t^2+1)/(3*t))
```

ans =

$$\frac{t^2-1}{3\,t^2}$$

Trigonometric Derivatives

```
D(4*cos(x)+2*sin(x))
```

ans = $2\cos(x)-4\sin(x)$

```
D(5/x^2+sin(x))
```

ans =

$$\cos(x)-\frac{10}{x^3}$$

```
D(-4*x^2*cos(x))
```

ans = $4\,x^2\sin(x)-8\,x\cos(x)$

```
D(2*sin(x)^2)
```

ans = $2\sin(2\,x)$

```
D((5-cos(x))/(5+sin(x)))
```

ans =

$$-\frac{5\,\sqrt{2}\,\cos\left(x+\frac{\pi}{4}\right)-1}{\left(\sin(x)+5\right)^2}$$

```
D(sin(x)/(x^2+sin(x)))
```

ans =

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

```
D(sec(x)-sqrt(2)*tan(x))
```

```
ans =
```

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

```
D(sec(x)*(x^2+1))
```

```
ans =
```

$$\frac{2\,x}{\cos(x)}+\frac{\sin(x)\ (x^2+1)}{\cos(x)^2}$$

```
D(4*csc(x)-cot(x))
```

```
ans =
```

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

```
D(cos(x)-x*csc(x))
```

```
ans =
```

$$-\frac{\sin(x)^3+\sin(x)-x\cos(x)}{\sin(x)^2}$$

```
D(sec(x)*tan(x))
```

```
ans =
```

$$-\frac{\cos(x)^2-2}{\cos(x)^3}$$

```
D(csc(x)*cot(x))
```

```
ans =
```

$$\frac{\sin(x)^2-2}{\sin(x)^3}$$

```
D(cot(x)/(1+csc(x)))
```

```
ans =
```

$$-\frac{1}{\sin(x)+1}$$

```
D(sec(x)/(1+tan(x)))
```

```
ans =
```

$$-\frac{\sqrt{2}\,\cos\left(x+\frac{\pi}{4}\right)}{\sin(2\,x)+1}$$

```
D(sin(x)^2+cos(x)^2)
```

ans = 0

```
D(sec(x)^2-tan(x)^2)
```

ans = 0

```
D(sin(x)*sec(x)/(1+x*tan(x)))
```

ans =

$$\frac{\cos(x)^2}{(\cos(x)+x\sin(x))^2}$$

```
D((x^2+1)*cot(x)/(3-cos(x)*csc(x)))
```

ans =

$$\frac{2\,x\cos(x)^2-3\,x\sin(2\,x)+3\,x^2+3}{8\cos(x)^2+3\sin(2\,x)-9}$$

```
D(D(x*cos(x)))
```

ans = $-2\sin(x)-x\cos(x)$

```
D(D(csc(x)))
```

ans =

$$-\frac{\sin(x)^2-2}{\sin(x)^3}$$

Integration by substitution

```
I(2*x*(x^2+1)^23)
```

ans =

$$\frac{(x^2+1)^{24}}{24}$$

```
I(cos(x)^3*sin(x))
```

ans =

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

```
I(1/sqrt(x)*sin(sqrt(x)))
```

ans = $-2\cos(\sqrt{x})$

```
I(3*x/sqrt(4*x^2+5))
```

ans =

$$\frac{3\sqrt{x^2+\frac{5}{4}}}{2}$$

```
I(sec(4*x+1)^2)
```

ans =

$$\frac{\tan(4\,x+1)}{4}$$

```
I(y*sqrt(1+2*y^2))
```

ans =

$$\frac{\sqrt{2}\ \sqrt{y^2+\frac{1}{2}}\ \left(\frac{2\,y^2}{3}+\frac{1}{3}\right)}{2}$$

```
I(sqrt(sin(pi*t))*cos(pi*t))
```

ans =

$$\frac{2\sin(\pi\,t)^{3/2}}{3\,\pi}$$

```
I((2*x+7)*(x^2+7*x+3)^(4/5))
```

ans =

$$(x^2+7\,x+3)^{4/5}\ \left(\frac{5\,x^2}{9}+\frac{35\,x}{9}+\frac{5}{3}\right)$$

```
I(cot(x)*csc(x)^2)
```

ans =

$$-\frac{\cot(x)^2}{2}$$

```
I((1+sin(t))^9*cos(t))
```

ans =

$$\frac{(\sin(t)+1)^{10}}{10}$$

```
I(cos(2*x))
```

ans =

$$\frac{\sin(2\,x)}{2}$$

```
I(x^2*sqrt(1+x))
```

ans =

$$\frac{2\ (x+1)^{3/2}\ (15\,x^2-12\,x+8)}{105}$$

```
I(csc(sin(x))^2*cos(x))
```

ans =

$$-\frac{2\,\mathrm{i}}{\mathrm{e}^{2\sin(x)\,\mathrm{i}}-1}$$

```
I(sin(x-pi))
```

ans = $\cos(x)$

```
I(5*x^4/((x^5+1)^2))
```

ans =

$$-\frac{1}{x^5+1}$$

```
I(1/x/log(x))
```

ans = $\log(\log(x))$

```
I(exp(-5*x))
```

ans =

$$-\frac{\mathrm{e}^{-5\,x}}{5}$$

```
I(sin(3*t)/(1+cos(3*t)))
```

ans =

$$-\frac{\log(\cos(3\,t)+1)}{3}$$

```
I(exp(x)/(1+exp(x)))
```

ans = $\log\left(e^x+1\right)$

Integration by part

```
I(x*exp(-2*x))
```

ans =

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

```
I(x*exp(3*x))
```

ans =

$$\frac{e^{3x}\,(3x-1)}{9}$$

```
I(x^2*exp(x))
```

ans = $e^x\,(x^2-2x+2)$

```
I(x^2*exp(-2*x))
```

ans =

$$-\frac{e^{-2x}\,(4x^2+4x+2)}{8}$$

```
I(x*sin(3*x))
```

ans =

$$\frac{\sin(3x)}{9}-\frac{x\cos(3x)}{3}$$

```
I(x*cos(2*x))
```

ans =

$$\frac{\cos(2x)}{4}+\frac{x\sin(2x)}{2}$$

```
I(x^2*cos(x))
```

ans = $\sin(x)\,(x^2-2)+2x\cos(x)$

```
I(x^2*sin(x))
```

ans = $2x\sin(x)-\cos(x)\,(x^2-2)$

```
I(x*log(x))
```

ans =

$$\frac{x^2\left(\log(x)-\frac{1}{2}\right)}{2}$$

```
I(sqrt(x)*log(x))
```

ans =

$$\frac{2\,x^{3/2}\left(\log(x)-\frac{2}{3}\right)}{3}$$

```
I(log(x)^2)
```

ans = $x\,\left(\log(x)^2-2\log(x)+2\right)$

```
I(log(x)/sqrt(x))
```

ans = $2\,\sqrt{x}\,\left(\log(x)-2\right)$

```
I(log(3*x-2))
```

ans =

$$\frac{\left(\log(3\,x-2)-1\right)\,\left(3\,x-2\right)}{3}$$

```
I(log(x^2+4))
```

ans =

$$4\,\mathrm{atan}\left(\frac{x}{2}\right)-2\,x+x\log\left(x^2+4\right)$$

```
I(asin(x))
```

ans = $x\,\mathrm{asin}(x)+\sqrt{1-x^2}$

```
I(acos(2*x))
```

ans =

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

```
I(atan(3*x))
```

ans =

$$x\,\mathrm{atan}(3\,x) - \frac{\log\left(x^2+\frac{1}{9}\right)}{6}$$

```
I(x*atan(x))
```

ans =

$$\mathrm{atan}(x)\,\left(\frac{x^2}{2}+\frac{1}{2}\right) - \frac{x}{2}$$

```
I(exp(x)*sin(x))
```

ans =

$$-\frac{\sqrt{2}\;\mathrm{e}^x\cos\left(x+\frac{\pi}{4}\right)}{2}$$

```
I(exp(3*x)*cos(2*x))
```

ans =

$$\frac{\mathrm{e}^{3\,x}\;(3\cos(2\,x)+2\sin(2\,x))}{13}$$

```
function out_=D(in_)
    out_=simplify(diff(in_));
end
function out_=I(in_)
    out_=simplify(int(in_));
end
```