DERIVATIVES

function	derivative
x^n	nx^{n-1}
e^x	e^x
$a^x (a > 0)$	$a^x \ell n a$
$\ell n x$	$\frac{1}{x}$
$\log_a x$	$\frac{1}{x \ell n a}$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cot x$
$\sec x$	$\sec x \tan x$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sin^{-1} x$	$\frac{1}{\sqrt{1-x^2}}$
$\cos^{-1} x$	$-\frac{1}{\sqrt{1-x^2}}$
$\tan^{-1} x$	$\frac{1}{1+x^2}$
$\sinh x$	$\cosh x$
$\cosh x$	$\sinh x$
$\tanh x$	$\operatorname{sech}^2 x$
$\operatorname{cosech} x$	$-\operatorname{cosech} x \coth x$
$\operatorname{sech} x$	$-\operatorname{sech} x \tanh x$
$\coth x$	$-\operatorname{cosech}^2 x$
$\sinh^{-1} x$	$\frac{1}{\sqrt{1+x^2}}$
$\cosh^{-1} x (x > 1)$	$\frac{1}{\sqrt{x^2-1}}$
$\tanh^{-1} x (\lvert x \rvert < 1)$	$\frac{1}{1-x^2}$
$\coth^{-1} x (\lvert x \rvert > 1)$	$-\frac{1}{x^2-1}$

Product Rule

$$\frac{d}{dx}(u(x)\ v(x)) = u(x)\frac{dv}{dx} + v(x)\frac{du}{dx}$$

Quotient Rule

$$\frac{d}{dx}\left(\frac{u(x)}{v(x)}\right) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

Chain Rule

$$\frac{d}{dx}\left(f(g(x))\right) = f'(g(x)) \times g'(x)$$

Leibnitz's theorem

$$\frac{d^n}{dx^n}(f.g) = f^{(n)}.g + nf^{(n-1)}.g^{(1)} + \frac{n(n-1)}{2!}f^{(n-2)}.g^{(2)} + ... + \binom{n}{r}f^{(n-r)}.g^{(r)} + ... + f.g^{(n)}$$