Differential Formulas

$$\frac{d}{dx}(\log_e x) = \frac{1}{x}, x > 0$$

$$\frac{d}{dx}(\log_a x) = \frac{1}{x}(\log_a e) = \frac{1}{x \log_e a}$$

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x, x \neq (2n+1)\frac{\pi}{2}, n \in I$$

$$\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x, x \neq n\pi, n \in I$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x, x \neq (2n+1)\frac{\pi}{2}, n \in I$$

$$\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x, x \neq n\pi, n \in I$$

$$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}, -1 < x < 1$$

$$\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1-x^2}}, -1 < x < 1$$

$$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$$

$$\frac{d}{dx}(\cot^{-1} x) = -\frac{1}{1+x^2}$$

$$\frac{d}{dx}(\sec^{-1} x) = \frac{1}{|x|\sqrt{x^2-1}}, |x| > 1$$

$$\frac{d}{dx}(\operatorname{cosec}^{-1} x) = -\frac{1}{|x|\sqrt{x^2-1}}, |x| > 1$$

$$\frac{d}{dx}(\sinh x) = \cosh x$$

$$\frac{d}{dx}(\cosh x) = \sinh x$$

$$\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$$

$$\frac{d}{dx}(sin\ x) = cos\ x$$
$$\frac{d}{dx}(cos\ x) = -sin\ x$$
$$\frac{d}{dx}(tan\ x) = sec^2 x$$
$$\frac{d}{dx}(cot\ x = -cosec^2 x$$
$$\frac{d}{dx}(sec\ x) = sec\ x\ tan\ x$$
$$\frac{d}{dx}(cosec\ x) = -cosec\ x\ cot\ x$$
$$\frac{d}{dx}(sinh\ x) = cosh\ x$$
$$\frac{d}{dx}(cosh\ x) = sinh\ x$$
$$\frac{d}{dx}(tanh\ x) = sech^2 x$$
$$\frac{d}{dx}(coth\ x) = -cosech^2 x$$
$$\frac{d}{dx}(sech\ x) = -sech\ x\ tanh\ x$$
$$\frac{d}{dx}(cosech\ x) = -cosech\ x\ coth\ x$$

- $\frac{d}{dx}x^n = nx^{n-1}$
- $\frac{d}{dx}(fg) = fg' + gf'$
- $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{gf' - fg'}{g^2}$
- $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$
- $\frac{d}{dx}(\sin\ x) = \cos\ x$
- $\frac{d}{dx}(\cos\ x) = -\sin\ x$
- $\frac{d}{dx}(\tan\ x) = \sec^2\ x$
- $\frac{d}{dx}(\cot\ x) = -\csc^2\ x$
- $\frac{d}{dx}(\sec\ x) = \sec\ x \tan\ x$
- $\frac{d}{dx}(\csc\ x) = -\csc\ x \cot\ x$
- $\frac{d}{dx}(e^x) = e^x$
- $\frac{d}{dx}(a^x) = a^x \ln\ a$
- $\frac{d}{dx}\ln\ x = \frac{1}{x}$
- $\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$