

Basic Differentiation Rules

$$\frac{d}{dx}[c] = 0$$

$$\frac{d}{dx}[x] = 1$$

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

$$\frac{d}{dx}[cf(x)] = cf'(x)$$

$$\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$$

$$\frac{d}{dx}[e^x] = e^x$$

$$\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + g'(x)f(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

$$\frac{d}{dx}[f(g(x))] = f'(g(x))\frac{d}{dx}[g(x)]$$

$$\frac{d}{dx}[\ln x] = \frac{1}{x}$$

$$\frac{d}{dx}[a^x] = (\ln a)a^x$$

$$\frac{d}{dx}[\log_a x] = \frac{1}{(\ln a)x}$$

$$\frac{d}{dx}[\sin x] = \cos x$$

$$\frac{d}{dx}[\cos x] = -\sin x$$

$$\frac{d}{dx}[\tan x] = \sec^2 x$$

$$\frac{d}{dx}[\sec x] = \sec x \tan x$$

$$\frac{d}{dx}[\csc x] = -\csc x \cot x$$

$$\frac{d}{dx}[\cot x] = -\csc^2 x$$

$$\frac{d}{dx}[\arcsin x] = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}[\arccos x] = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}[\arctan x] = \frac{1}{1+x^2}$$

$$\frac{d}{dx}[\text{arccot } x] = \frac{-1}{1+x^2}$$

$$\frac{d}{dx}[\text{arcsec } x] = \frac{1}{|x|\sqrt{x^2-1}}$$

$$\frac{d}{dx}[\text{arccsc } x] = \frac{-1}{|x|\sqrt{x^2-1}}$$

You'll also learn the following basic differentiation rules for hyperbolic functions at the end of our course.

$$\frac{d}{dx}[\sinh x] = \cosh x$$

$$\frac{d}{dx}[\cosh x] = \sinh x$$

$$\frac{d}{dx}[\tanh x] = \text{sech}^2 x$$

$$\frac{d}{dx}[\text{sech } x] = -\text{sech } x \tanh x$$

$$\frac{d}{dx}[\text{csch } x] = -\text{csch } x \coth x$$

$$\frac{d}{dx}[\coth x] = -\text{csch}^2 x$$