

Derivative Rules

Given functions f, g ,

$$\frac{d}{dx}(f(x) \pm g(x)) = \frac{d}{dx}f(x) \pm \frac{d}{dx}g(x),$$

$$\frac{d}{dx}(f(x) \cdot g(x)) = \frac{d}{dx}(f(x)) \cdot g(x) + f(x) \cdot \frac{d}{dx}g(x),$$

and

$$\frac{d}{dx}f(g(x)) = \frac{d}{du}f(u) \cdot \frac{d}{dx}g(x) \quad \text{where } u = g(x)$$

Derivative Formulae

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

$$\frac{d}{dx}e^x = e^x, \quad \frac{d}{dx}a^x = a^x \ln(a),$$

$$\frac{d}{dx}\ln(x) = 1/x, \quad \frac{d}{dx}\log_a(x) = \frac{1}{x \ln(a)},$$

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

$$\frac{d}{dx}\tan(x) = \sec^2(x), \quad \frac{d}{dx}\cot(x) = -\csc^2(x),$$

$$\frac{d}{dx}\sec(x) = \sec(x)\tan(x), \quad \frac{d}{dx}\csc(x) = -\csc(x)\cot(x),$$

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

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

$$\frac{d}{dx}\sec^{-1}(x) = \frac{1}{x\sqrt{x^2-1}}, \quad \frac{d}{dx}\csc^{-1}(x) = -\frac{1}{x\sqrt{x^2-1}}.$$