Basic Derivative Formulas

Constant Rule: $\dfrac{d}{dx}[c] = 0$

Power Rule: $\dfrac{d}{dx}[x^n] = nx^{n-1}$

Special Cases of Power Rule:

$$\frac{d}{dx}[x] = 1, \qquad \frac{d}{dx}[\sqrt{x}] = \frac{1}{2\sqrt{x}}, \qquad \frac{d}{dx}\left[\frac{1}{x}\right] = -\frac{1}{x^2}$$

Constant Multiple Rule: $\dfrac{d}{dx}[cf(x)] = cf'(x)$

Sum and Difference Rules: $\dfrac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

Product Rule: $\dfrac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$

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

Chain Rule: $\dfrac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$, or equivalently, $\dfrac{dy}{dx} = \dfrac{dy}{du} \cdot \dfrac{du}{dx}$

Trigonometric Derivatives:

$$\frac{d}{dx}[\sin x] = \cos x \qquad \frac{d}{dx}[\cos x] = -\sin x$$
$$\frac{d}{dx}[\tan x] = \sec^2 x \qquad \frac{d}{dx}[\cot x] = -\csc^2 x$$
$$\frac{d}{dx}[\sec x] = \sec x \tan x \qquad \frac{d}{dx}[\csc x] = -\csc x \cot x$$

Exponential and Logarithmic Derivatives:

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

Inverse Function Derivative: $\dfrac{d}{dx}[f^{-1}(x)] = \dfrac{1}{f'(f^{-1}(x))}$