

Differentiation Rules

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

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

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

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

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

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

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

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

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

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

$$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$$

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

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

$$\frac{d}{dx} \sec^{-1} x = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx} \csc^{-1} x = \frac{-1}{x\sqrt{x^2-1}}$$

Note: **Remember the Chain Rule! If the variable in the function is not just plain x**

but is u(x), you must multiply the results by $\frac{du}{dx}$.

Product Rule: $(uv)' = uv' + vu'$

Quotient Rule: $\left(\frac{u}{v}\right)' = \frac{vu' - uv'}{v^2}$