Derivatives

Definition:

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

- $\frac{d}{dx}\left(u^n\right) = n u^{n-1} \frac{du}{dx}$
- $\frac{d}{dx}\left(uv\right) = uv' + vu'$
- $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{vu' - uv'}{v^2}$
- $\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx}$
- $\frac{d}{dx}\left(f(g(x)\right) = f'\left(g(x)\right)g'\left(x\right)$

- $\frac{d}{dx}\left(\sin u\right) = \cos u \frac{du}{dx}$
- $\frac{d}{dx}\left(\cos u\right) = -\sin u \frac{du}{dx}$
- $\frac{d}{dx}\left(\tan u\right) = \sec^2 u \frac{du}{dx}$
- $\frac{d}{dx}\left(\cot u\right) = -\csc^2 u \frac{du}{dx}$
- $\frac{d}{dx}\left(\sec u\right) = \sec u \ \tan u \frac{du}{dx}$
- $\frac{d}{dx}\left(\csc u\right) = -\csc u \ \cot u \frac{du}{dx}$
- $\frac{d}{dx}\left(\text{Sin}^{-1} u\right) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$
- $\frac{d}{dx}\left(\text{Tan}^{-1} u\right) = \frac{1}{1+u^2} \frac{du}{dx}$
- $\frac{d}{dx}\left(\ln u\right) = \frac{1}{u} \frac{du}{dx}$
- $\frac{d}{dx}\left(e^u\right) = e^u \frac{du}{dx}$