DERIVATIVE OF A FUNCTION: $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ or $f'(a)=\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$

DIFFERENTIATION RULES:
(Where "**u**" and "**v**" are differentiable functions of x, and "**a**" is a constant.)

$$\frac{d}{dx}au = a \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(u+v) = \frac{du}{dx}+\frac{dv}{dx}$$

$$\frac{d}{dx}u^n = n\,u^{n-1} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}a = 0$$

$$\frac{d}{dx}(uv) = u \bullet \frac{dv}{dx} + v \bullet \frac{du}{dx}$$

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \bullet \frac{du}{dx} - u \bullet \frac{dv}{dx}}{v^2}$$

CHAIN RULE: $\frac{dy}{dx} = \frac{dy}{du} \bullet \frac{du}{dx}$

$$\frac{d}{dx}\sin u = \cos u\,\frac{du}{dx}$$

$$\frac{d}{dx}\cos u = -\sin u\,\frac{du}{dx}$$

$$\frac{d}{dx}\tan u = \sec^2 u\,\frac{du}{dx}$$

$$\frac{d}{dx}\cot u = -\csc^2 u\,\frac{du}{dx}$$

$$\frac{d}{dx}\sec u = \sec u\,\tan u\,\frac{du}{dx}$$

$$\frac{d}{dx}\csc u = -\csc u\,\cot u\,\frac{du}{dx}$$

$$\frac{d}{dx}\ln u = \frac{1}{u}\frac{du}{dx}$$

$$\frac{d}{dx}e^u = e^u\,\frac{du}{dx}$$

$$\frac{d}{dx}a^u = a^u\,\ln a\,\frac{du}{dx}$$

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

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

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

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

$$\frac{d}{dx}\sec^{-1}u = \frac{\frac{du}{dx}}{|u|\sqrt{u^2-1}}$$

$$\frac{d}{dx}\csc^{-1}u = \frac{-\frac{du}{dx}}{|u|\sqrt{u^2-1}}$$