AB Flash Cards

$$\lim_{x\to 0}\frac{\sin x}{x}=1$$

Definition of Derivative

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

Alternate Definition of Derivative
Derivative at a point

$$f'(a)=\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$$

$$\lim_{h\to 0}\frac{\cos h-1}{h}=0$$

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

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

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

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

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

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

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

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

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

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

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

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

$$\lim_{h\to 0}\frac{e^h-1}{h}=1$$

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

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

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

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

Power Rule

$$\frac{d}{dx}\left(x^n\right)=nx^{n-1}$$

Product Rule

$$\frac{d}{dx}(uv)=u'v+uv'$$

Quotient Rule

$$\frac{d}{dx}\left(\frac{u}{v}\right)=\frac{u'v-uv'}{v^2}$$

Chain Rule

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

<u>Mean Value Theorem:</u>

If $f(x)$ is continuous at every point of the closed interval $[a,b]$ and differentiable at every point (a,b) then there is one point c in (a,b) at which

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

Average (Mean Value)

If f is integrable on $[a,b]$, its **average (mean value** on $[a,b]$ is

$$av(f) = \frac{1}{b-a}\int_a^b f(x)dx$$

The Fundamental Theorem of Calculus, Part 1

If f is continuous on $[a,b]$, then the function $F(x) = \int_a^x f(t)dt$ has a derivative at every point x in $[a,b]$, and $\frac{dF}{dx} = \frac{d}{dx}\int_a^x f(t)dt = f(x)$

The Fundamental Theorem of Calculus, Part 2
(Integral Evaluation Theorem)

If f is continuous at every point $[a,b]$, and if F is any antiderivitive of f on $[a,b]$, then

$$\int_a^b f(x)dx = F(b) - F(a)$$

$$\mathbf{cos}^2 x = \frac{\mathbf{cos}\,2x + 1}{2}$$

$$\mathbf{sin}^2 x = \frac{1 - \mathbf{cos}\,2x}{2}$$