CALCULUS 12 ~ FORMULA SHEET ~

Pythagorean:

$$\sin^2 A + \cos^2 A = 1$$
$$1 + \tan^2 A = \sec^2 A$$
$$1 + \cot^2 A = \csc^2 A$$

Addition/Subtraction:

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$
$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$
$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$
$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Double Angle:

$$\sin 2A = 2 \sin A \cos A$$
$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1$$
$$= 1 - 2\sin^2 A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

Symmetry:

$$\sin(-A) = -\sin A$$
$$\cos(-A) = \cos A$$

Derivatives:

$$(\sin x)' = \cos x$$
$$(\cos x)' = -\sin x$$
$$(\tan x)' = \sec^2 x$$
$$(\cot x)' = -\csc^2 x$$
$$(\sec x)' = \sec x \tan x$$
$$(\csc x)' = -\csc x \cot x$$

Reciprocal & Quotient:

$$\sec A = \frac{1}{\cos A}$$

$$\csc A = \frac{1}{\sin A}$$

$$\cot A = \frac{1}{\tan A}$$

$$\tan A = \frac{\sin A}{\cos A}$$

$$\cot A = \frac{\cos A}{\sin A}$$

Definition of Derivative:

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

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Limits:

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

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

$$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x}=e$$

$$\lim_{x\to 0}(1+x)^{\frac{1}{x}}=e$$

Miscellaneous:

$$s=\int_a^b\sqrt{1+\left(f'(x)\right)^2}\,dx$$

$$f(x)\sim f(a)+f'(a)(x-a)$$

$$x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}\;;\;n=1,2,3,...$$

Surface Area and Volume

	Surface Area	Volume
Sphere	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Cylinder	$2\pi r^2+2\pi rh$	$\pi r^2 h$
Cone	$\pi rs+\pi r^2$	$\frac{1}{3}\pi r^2 h$
Pyramid	$1\ rec+4\ tri$	$\frac{lwh}{3}$

Limits:

$$\int\tan x\,dx=-\ln\left|\cos x\right|+c$$

$$\int\cot x\,dx=\ln\left|\sin x\right|+c$$

$$\int\sec x\,dx=\ln\left|\sec x+\tan x\right|+c$$

$$\int\csc x\,dx=-\ln\left|\csc x+\cot x\right|+c$$

$$\int\frac{du}{\sqrt{a^2-u^2}}=\sin^{-1}\left(\frac{u}{a}\right)+c$$

Further Derivatives:

$$\left(\sin^{-1}(x)\right)'=\frac{1}{\sqrt{1-x^2}}$$

$$\left(\cos^{-1}(x)\right)'=\frac{-1}{\sqrt{1-x^2}}$$

$$\left(\tan^{-1}(x)\right)'=\frac{1}{1+x^2}$$

$$\left(\log_a^{-1}x\right)'=\frac{1}{(\ln a)}\bullet\frac{1}{x}=\frac{1}{(\ln a)x}$$