MATHEMATICS 31 Online
Formula Sheet

TRIGONOMETRY

Function of single angle

$$\sin\theta = \frac{1}{\csc\theta} \qquad \csc\theta = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{1}{\sec\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{1}{\cot\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Derivatives of the Trigonometric Functions

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

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

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

Limits

$$\lim_{\theta\to 0}\sin\theta = 0$$

$$\lim_{\theta\to 0}\cos\theta = 1$$

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

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

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

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

APPLICATIONS OF DERIVATIVES

SOLIDS	SURFACE AREA	VOLUME
Sphere	$SA = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$
Cube	$SA = 6s^2$	$V = s^3$
Rectangular solid with square base	$SA = 2x^2 + 4xy$	$V = x^2 y$
Right-circle cylinder	$SA = 2\pi r^2 + 2\pi rh$	$V = \pi r^2 h$
Right-circle cone	lateral area: $A = \pi rs$ total area: $SA = \pi r^2 + \pi rs$ (s = slant height)	$V = \frac{1}{3}\pi r^2 h$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

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

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

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

INTEGRATION

$$\int \sin kx\, dx = \frac{-\cos kx}{k} + C$$

$$\int \cos kx\, dx = \frac{\sin kx}{k} + C$$

$$\int \sec^2 kx\, dx = \frac{\tan kx}{k} + C$$

$$\int \csc x \cot x\, dx = -\csc x + C$$

$$\int \sec x \tan x\, dx = \sec x + C$$

$$\int \csc^2 x\, dx = -\cot x + C$$

$$\int u\, dv = uv - \int v\, du$$