

BASIC MATHEMATICS

Binomial theorem

$$(career - love)^2 = career^2 - 2(career \cdot love) + love^2$$

Basic math

$$2^{\infty} = \infty, 2^{-\infty} = 0, e^{\infty} = \infty, e^{-\infty} = 0$$

Trigonometry

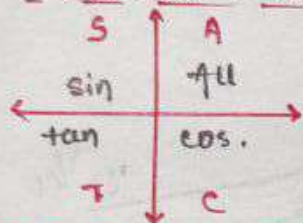
$$180^\circ = \pi \text{ rad}$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

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



$90 \pm \theta \rightarrow \text{change}$

$$\cos(90 + \theta) = -\sin \theta$$

$$\cos(180 - \theta) = -\cos \theta$$

$$\sin 37^\circ = \frac{3}{5}, \sin 53^\circ = \frac{4}{5}$$

$$\cos 37^\circ = \frac{4}{5}, \cos 53^\circ = \frac{3}{5}$$

$$\tan 37^\circ = \frac{3}{4}, \tan 53^\circ = \frac{4}{3}$$

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

Logarithm

$$\log_e^x = 2.303 \log_{10}^x$$

$$\log_{10}^2 = 0.3010$$

$$\log_{10}^3 = 0.47$$

$$\log_a a = 1, \log_e a^n = n \log_e a$$

$$\log_a b = \frac{1}{\log_b a} = \log_e a / \log_e b$$

$$\log_e a^n = \frac{1}{n} \log_e a$$

G.P Series

$$a, ar, ar^2, \dots$$

$a \rightarrow$ 1st term
 $r \rightarrow$ common ratio
 $(a)r^{n-1} =$ nth term

$$\text{Sum} = \frac{a}{1-r}$$

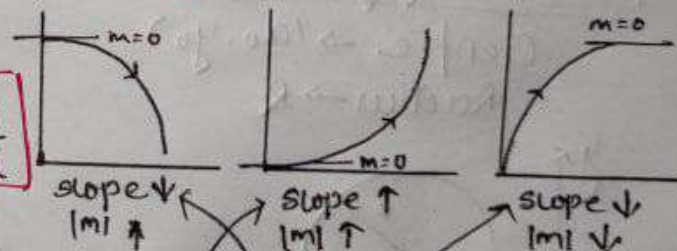
$$\text{nth term} = ar^{(n-1)}$$

A.P Series

$$a, a+d, a+2d, \dots$$

$$\text{Sum} = \left(\frac{\text{1st term} + \text{nth term}}{2} \right) n = \left\{ \frac{a + a + (n-1)d}{2} \right\} n$$

$$\text{nth term} = a + (n-1)d$$



Slope variation

Differential

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

$$\frac{d(\log_e x)}{dx} = \frac{1}{x}$$

$$\frac{d(\sin \theta)}{d\theta} = \cos \theta$$

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

$$\frac{d(\cos \theta)}{d\theta} = -\sin \theta$$

$$y = e^{(x^2)}$$

$$\frac{d(\tan \theta)}{d\theta} = \sec^2 \theta$$

$$\frac{dy}{dx} = e^{(x^2)} \times (2x)$$

$$\frac{d(\sec \theta)}{d\theta} = \sec \theta \tan \theta$$

At maxima

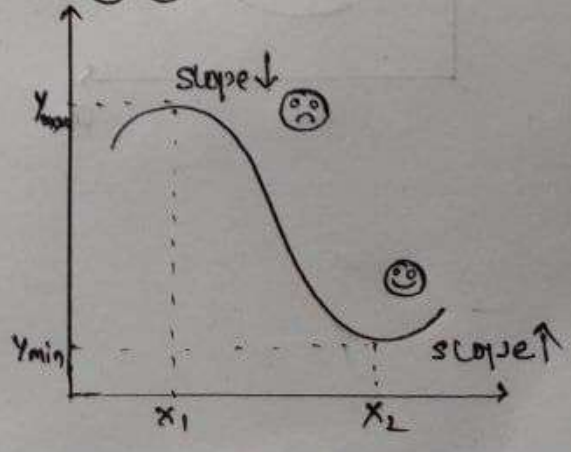
$$\frac{dy}{dx} = 0$$

$$\frac{d^2 y}{dx^2} = -ve$$

At minima

$$\frac{dy}{dx} = 0$$

$$\frac{d^2 y}{dx^2} = +ve$$



Integration

- $\int x^n dx = \frac{x^{n+1}}{n+1} + C$ • $\int \frac{1}{x} dx = \log x$ • $\int e^x dx = e^x$
- $\int \sin \theta d\theta = -\cos \theta + C$ • $\int \cos \theta d\theta = \sin \theta + C$

Outside inside rule

- $\int \sin(2x+5) dx = \frac{-\cos(2x+5)}{2} + C$

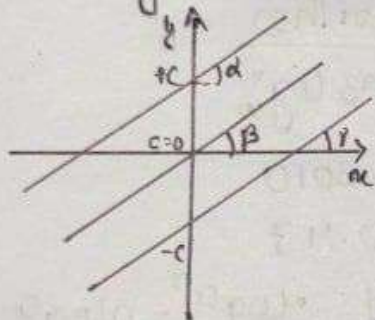
- $\int e^{(3x+1)} dx = \frac{e^{3x+1}}{3} + C$

- $\int (4x+5)^3 dx = \frac{(4x+5)^4}{4 \times 4} + C$

Graph

• straight line

$$y = mx + c$$

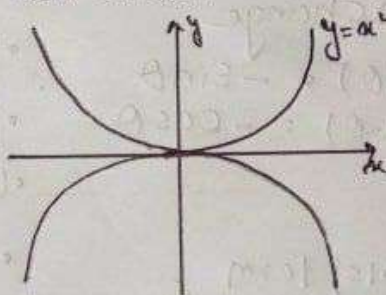


$$m = \text{slope} = \tan \theta = \frac{dy}{dx}$$

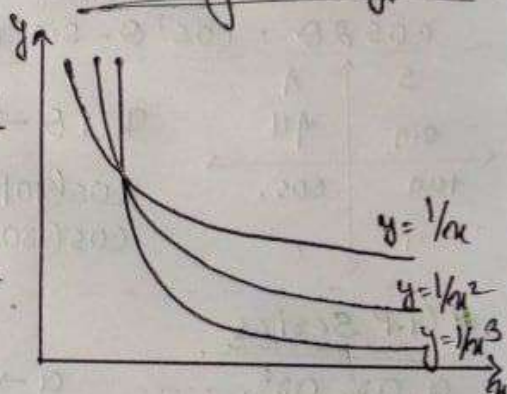
• Parabolas

$$y = x^2$$

non linear variation



• Rectangles & hyperbola



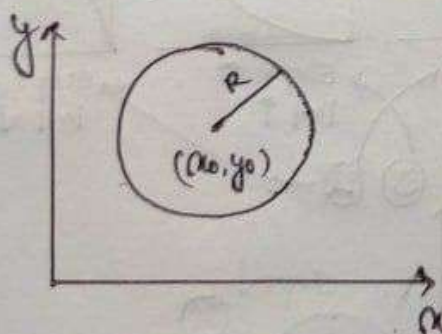
• circle

$$x^2 + y^2 = R^2 \rightarrow \text{centre}$$

$$(x-x_0)^2 + (y-y_0)^2 = R^2$$

Centre $\rightarrow (x_0, y_0)$

Radius $\rightarrow R$



• Ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

