

$$\cos \theta + \sin \theta \cdot \cos 2\theta$$

Trigo 360% Qs + 20% Qs

40% self + 20% 20% Rest 40%

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

$\cos 2\theta$  is used

$$1) \cos^2 \alpha + \cos^2 (\alpha + \beta) - 2 \cos \alpha \cdot \cos \beta \cdot \cos (\alpha + \beta) =$$

$$\cos^2 \alpha + \cos (\alpha + \beta) \{ \cos (\alpha + \beta) - 2 \cos \alpha \cos \beta \}$$

$$+ \cos (\alpha + \beta) \{ \cos \alpha \cos \beta - \sin \alpha \cdot \sin \beta - 2 \cos \alpha \cos \beta \}$$

$$- \cos (\alpha + \beta) \{ + \cos \alpha \cos \beta + \sin \alpha \sin \beta \}$$

$$\cos^2 \alpha - \cos (\alpha + \beta) \cos (\alpha - \beta)$$

$$\cos^2 \alpha - (\cos^2 \alpha - \sin^2 \beta) = \sin^2 \beta$$

$$(2) 2 \sin^2 \beta + 4 \cos (\alpha + \beta) \sin \alpha \sin \beta + 2 \cos^2 (\alpha + \beta) - 1$$

$$2 \sin^2 \beta + 4 \cos (\alpha + \beta) \sin \alpha \sin \beta + 2 \cos^2 (\alpha + \beta) - 1$$

$$2 \sin^2 \beta + 2 \cos (\alpha + \beta) (2 \sin \alpha \sin \beta + \cos (\alpha + \beta)) - 1$$

$$2 \sin^2 \beta + 2 \cos (\alpha + \beta) (2 \sin \alpha \sin \beta + \cos \alpha \cos \beta - \sin \alpha \sin \beta)$$

$$2 \sin^2 \beta + 2 \cos (\alpha + \beta) (\cos \alpha \cos \beta + \sin \alpha \sin \beta) - 1$$

$$2 \sin^2 \beta + 2 \cos (\alpha + \beta) \cos (\alpha - \beta) - 1$$

$$2 \sin^2 \beta + 2 (\cos^2 \alpha - \sin^2 \beta) - 1$$

$$2 \cos^2 \alpha - 1 = \cos 2\alpha = \text{L.H.S.}$$

Beautiful Qs

$$Q \quad \tan \alpha + 2 \tan 2\alpha + 4 \tan 4\alpha + 8 \cot 8\alpha =$$

In this Q we will learn a New concept

$$\boxed{\tan \theta = \cot \theta - 2 \cot 2\theta} \quad \text{RHS } \cot \theta - 2 \cot 2\theta$$

$$\tan 2\theta = \cot 2\theta - 2 \cot 4\theta$$

$$\tan 4\theta = \cot 4\theta - 2 \cot 8\theta$$

$$= \frac{1}{\tan \theta} - \frac{2}{\tan 2\theta}$$

$$= \frac{1}{\tan \theta} - \frac{2 \times (1 - \tan^2 \theta)}{2 \tan \theta}$$

$$= \frac{1}{\tan \theta} - \frac{1 - \tan^2 \theta}{\tan \theta}$$

$$= \frac{1 - (1 - \tan^2 \theta)}{\tan \theta} = \frac{\tan^2 \theta}{\tan \theta} = \tan \theta$$

$$\begin{aligned} & \tan \alpha + 2(\tan 2\alpha) + 4(\tan 4\alpha) + 8 \cot 8\alpha \\ & (\cot \alpha - 2 \cot 2\alpha) + 2(\cot 2\alpha - 2 \cot 4\alpha) + 4(\cot 4\alpha - 2 \cot 8\alpha) \\ & \quad + 8 \cot 8\alpha \\ & = \cot \alpha \end{aligned}$$

$$\boxed{\tan \theta = \cot \theta - 2 \cot 2\theta}$$

Q4 (A) copy

(B)  $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$

$\tan 9^\circ + \cot 9^\circ - (\tan 27^\circ + \cot 27^\circ)$

Copy me h!!

(C) copy me hai

Q5 copy me hai

Q6  $m \tan(\theta - 30^\circ) = n \tan(\theta + 120^\circ)$

$$\frac{m}{n} = \frac{\tan(\theta + 120^\circ)}{\tan(\theta - 30^\circ)} = \frac{\sin(\theta + 120^\circ)}{\sin(\theta + 120^\circ)} \cdot \frac{\cos(\theta - 30^\circ)}{\cos(\theta - 30^\circ)}$$

$\tan 2\theta = \frac{m+n}{2(m-n)}$

$$\frac{m+n}{m-n} = \frac{\sin A \cdot \cos B + \cos A \cdot \sin B}{\sin A \cos B - \cos A \cdot \sin B} = \frac{\sin(A+B)}{\sin(A-B)} = \frac{\sin(\theta + 120^\circ + \theta - 30^\circ)}{\sin(\theta + 120^\circ - \theta + 30^\circ)} = \frac{\sin(90^\circ + 2\theta)}{\sin(150^\circ)} = 2 \cot 2\theta$$

Q7  $\boxed{\cos(\alpha + \beta) = \frac{4}{5} \text{ \& \; } \sin(\alpha - \beta) = \frac{5}{13}}$

$\sin(\alpha + \beta) = \frac{3}{5} \quad \cos(\alpha - \beta) = \frac{12}{13}$

$\tan(\alpha + \beta) = \frac{3}{4} \quad \tan(\alpha - \beta) = \frac{5}{12}$  copy

$\tan(2\alpha) = \tan(\alpha + \beta) + \tan(\alpha - \beta) = \frac{\tan(\alpha + \beta) + \tan(\alpha - \beta)}{1 - \tan(\alpha + \beta)\tan(\alpha - \beta)}$

$$\begin{aligned} Q8 \quad & \sin 25^\circ \cdot \sin(60-25^\circ) \cdot \sin(60+25^\circ) \\ &= \frac{\sin 3 \times 25^\circ}{4} = \frac{\sin 75^\circ}{4} = \frac{\cos(15^\circ)}{4} \end{aligned}$$

$$= \frac{\sqrt{3}+1}{8\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{(\sqrt{3}+1)\sqrt{2}}{16}$$

$$= \frac{\sqrt{6}+\sqrt{2}}{16} = \frac{\sqrt{a}+\sqrt{b}}{c}$$

$$a=6, b=2, c=16$$

$$a^2+b^2+c^2 = (a+b+c)^2 - 2(ab+bc+ca) \quad a+b+c=24$$

$$\frac{(\tan A + \tan B + \tan C)^2}{(\tan A + \tan B + \tan C)} - 2 \left( \frac{\tan A \tan B + \tan B \tan C + \tan C \tan A}{\tan A \cdot \tan B \cdot \tan C} \right)$$

$$(\tan A + \tan B + \tan C) - 2(\cot C + \cot A + \cot B)$$

$$Q9 \quad LHS = \frac{\cos 27^\circ}{\cos 9^\circ} \times \frac{\cos 81^\circ}{\cos 27^\circ} = \frac{\sin 9^\circ}{\cos 9^\circ} = \tan 9^\circ$$

$$Q10 \quad A+B+C=\pi \quad \tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$$

$$LHS = \sum \frac{\tan A}{\tan B \tan C}$$

$$= \frac{\tan A}{\tan B \tan C} + \frac{\tan B}{\tan A \tan C} + \frac{\tan C}{\tan A \tan B}$$

$$= \frac{\tan^2 A + \tan^2 B + \tan^2 C}{\tan A \cdot \tan B \cdot \tan C}$$

$$= \frac{(\tan A + \tan B + \tan C)^2 - 2(\tan A \tan B + \tan B \tan C + \tan C \tan A)}{(\tan A + \tan B + \tan C)}$$

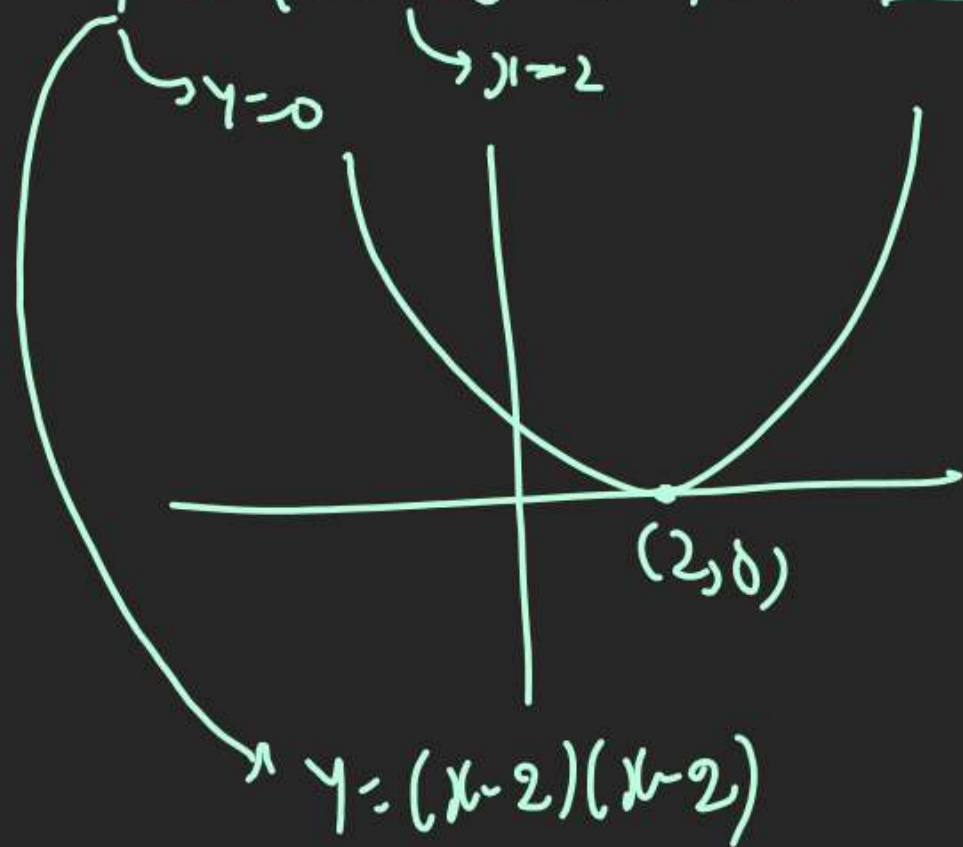
$$\rightarrow \sum \tan A - 2 \sum \cot A \quad \text{RHS}$$

# Quadratic Eqn

$$y = x^2 - 4x + 4 \text{ 's graph}$$

$$= (x-2)^2 - 2^2 + 4$$

$$y = (x-2)^2 \rightarrow y = x^2$$



$$D = (-4)^2 - 4 \times 1 \times 4$$

$$= 16 - 16 = 0$$

$$1) D = 0$$

graph x Axis

to chipakto

Bnta hai

2) It touches  
x Axis twice at

$$x = 2$$

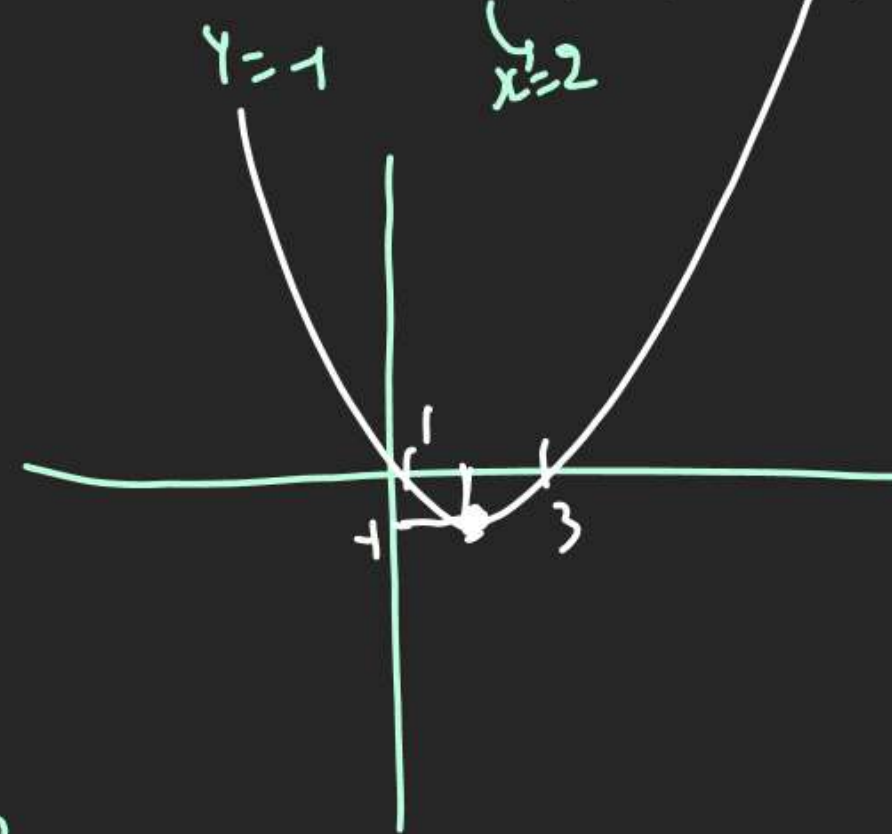
(3)  $x = 2, x = 2$  are roots

$$Q \quad y = x^2 - 4x + 3 = (x-1)(x-3)$$

$$= (x-2)^2 - 2^2 + 3$$

$$y = (x-2)^2 - 1$$

$$y + 1 = (x-2)^2 \Rightarrow y = x^2$$



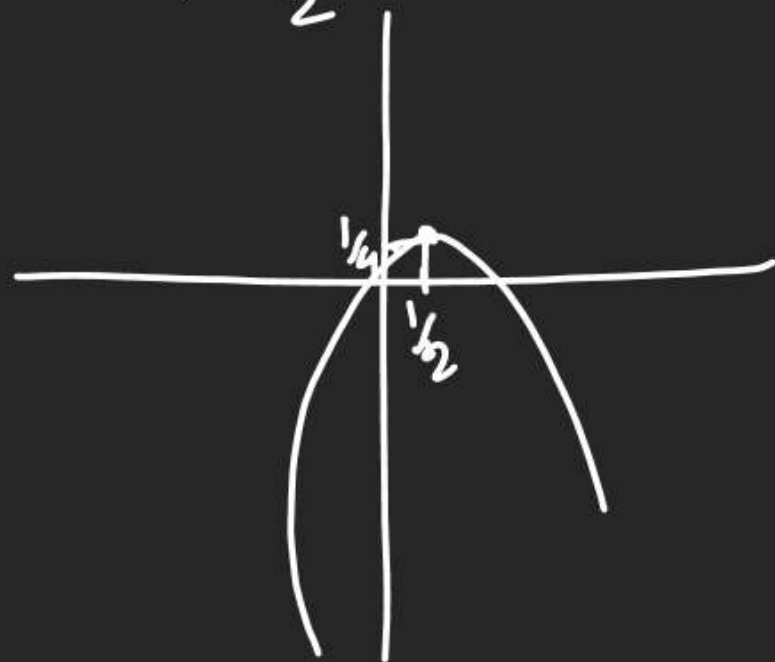
$$Y = x - x^2 \text{ graph.}$$

$$= - (x^2 - \boxed{1})^{\frac{1}{2}}$$

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

$$Y = - (x - \frac{1}{2})^2 + \frac{1}{4}$$

$$Y - \frac{1}{4} = - (x - \frac{1}{2})^2 \rightarrow Y = -x^2$$



$$Y = x^2 - 4x + 4$$



$$Y = -x^2 - 4x + 3$$

L.C. = +ve



Upward Parabola

$$Y = x - x^2$$



Leading coeff =

$x^2$  का गुणांक की coeff

When L.C. = -ve  
then graph is  
downward  
Parabola.

## Conclusion.

1)  $[a]x^2 + bx + c = 0$  is Quad Eq<sup>n</sup>.

But  $y = [a]x^2 + bx + c$  is Quad. f<sup>n</sup>.

2)  $[a]x^3 + bx^2 + cx + d = 0$  is Cubic Eq<sup>n</sup>.

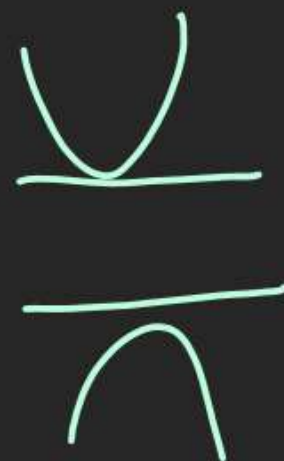
But  $y = [a]x^3 + bx^2 + cx + d$  is Cubic f<sup>n</sup>.

3) Leading coeff = (coeff of highest deg)

4)  $y = ax^2 + bx + c$ 's graph is Parabola

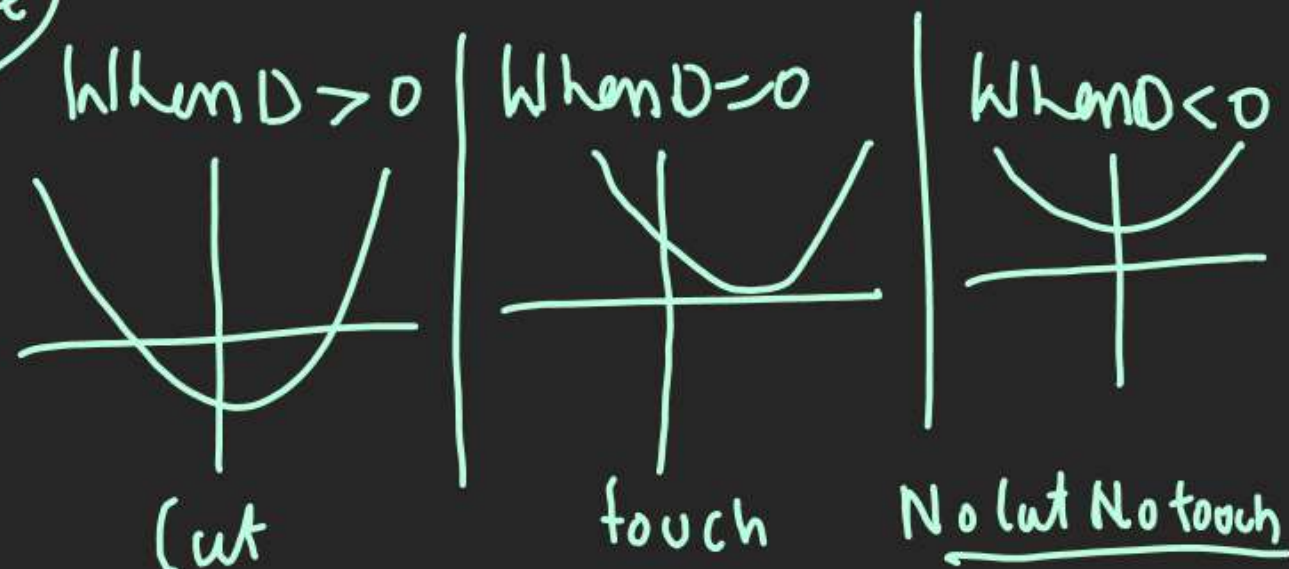
if  $a = +ve$  then Upward Parabola

if  $a = -ve$  ————— downward



(5) Graph (plotting) X Axis  
for Quad Eq<sup>n</sup>.

$a = +ve$



(6) Quad Eq<sup>n</sup>, Cubic Eq<sup>n</sup>, Biquad Eq<sup>n</sup>  
they all Part of Polynomial Eq<sup>n</sup>

अधिक terms.  
Polynomial fxn.

$$y = \boxed{x}, y = \boxed{3x^2}, y = \boxed{\frac{x^3}{9}}$$

1 term = monomial.

$$y = x - 5, y = 3x^2 + 8, y = \frac{x^2}{9} + 1$$

2-2 term = Binomial

$$y = \underline{a}x^2 + \underline{b}x + \underline{c}, y = \underline{x^3} - 3\underline{x} + \underline{4}$$

3 term = trinomial

1)  $y = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0$  is polynomial fxn of n deg.

$$Q y = \sqrt{5} x^3 + 2x - 7 \quad \checkmark \text{ Polynomial.}$$

$$y = \frac{2}{7} x^2 - 6\sqrt{3} x + 7 \quad \checkmark \text{ Poly.}$$

$$y = 3x^2 - 6x^{-1} + 5 \quad \otimes$$

$$y = 3x^3 + \frac{2}{x^{1/3}} + 4x \quad \otimes \text{ Poly.}$$

12 lectures.

$$2) f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0 \text{ Poly fxn. (पॉलीनॉमियल)}$$

A)  $n = \text{finite deg}$ B)  $n \in \mathbb{N}$ C)  $a_n = \text{L.C.}$ 

$$f(x) = a \rightarrow \text{Constant fxn}$$

$$f(x) = ax + b \rightarrow \text{Linear fxn.}$$

$$f(x) = ax^2 + bx + c \rightarrow \text{Quadratic fxn}$$

$$f(x) = ax^3 + bx^2 + cx + d \rightarrow \text{Cubic}$$

$$f(x) = ax^4 + bx^3 + cx^2 + dx + e \rightarrow \text{Biquad.}$$

Poly fxnTheory of eq<sup>n</sup>

(3) Zeros of Polynomial  $\rightarrow$  These Eq<sup>n</sup> are Roots Vese Poly fxn are Zeros

Zeros are values of  $x$  where answer of fxn becomes Zero

$$f(x) = x^2 - 3x + 2 \rightarrow \left. \begin{array}{l} f(1) = 1^2 - 3 \times 1 + 2 = 0 \\ f(2) = 2^2 - 3 \times 2 + 2 = 0 \end{array} \right\} \therefore x=1, 2 \text{ are Zeros of } f(x) = x^2 - 3x + 2$$

#### (4) Fundamental Theorem of Algebra.

$N$  deg Poly fxn has max<sup>m</sup>  $N$  Zeros.

Bhavarth:  $\Rightarrow$  Quad fxn can have max<sup>m</sup> 2 Zeros  
 (cubic fxn ——— max<sup>m</sup> 3 Zeros)

(5)\* If  $\alpha, \beta$  are Zeros of Q quad fxn

then Q fxn will be  $\rightarrow a(x-\alpha)(x-\beta)$

(6)\* If  $\alpha, \beta, \gamma$  are Zeros of cubic fxn

then cubic fxn  $\Rightarrow a(x-\alpha)(x-\beta)(x-\gamma)$

Ex:  $\rightarrow$  If 2, 3 are Zeros of Q fxn

then Q fxn =  $[a](x-2)(x-3)$

Ex:- If  $f(x) = (x-2)^2(x-3)$  then Zeros?

$f(x) = (x-2)(x-2)(x-3)$  is cubic  
 3 Zeros  $\rightarrow x = 2, 2, 3$

lekin Distinct Zeros  $\rightarrow x = 2, 3$

Where 2 is Repeated Zero

(2)  $f(x) = (x-2)(x-3)^2$  then Zeros

3 Zeros  $\rightarrow 2, 3, 3$

Distinct Zero  $\rightarrow \boxed{2, 3}$

Where 3 is Repeated Zero

Q  $f(x) = (x-2)^2$  is a fn then Zeros:

$$= (x-2)(x-2)$$

2 Zeros  $= 2, 2$

Where 2 is Repeated Zero.