Nishant Jindal

QUADRATIC EQUATION

(1) Graph of Quad Eqn.

(2) Making Per sqr.

(3) SOR/DOR/POR.

(4) If roots of Q Eqn $ax^2+bx+c=0$ are α, β then $ax^2+bx+c = a(x-\alpha)(x-\beta)$ } yadh!!

(5) Cubic Eqn.

$ax^3+bx^2+cx+d=0$ → α, β, γ

$ax^3+bx^2+cx+d = a(x-\alpha)(x-\beta)(x-\gamma)$

$x^3+\boxed{\frac{b}{a}}x^2+\frac{c}{a}x+\frac{d}{a} = x^3-(\alpha+\beta+\gamma)x^2+(\alpha\beta+\beta\gamma+\gamma\alpha)x-\alpha\beta\gamma$

Comparing Coffnt of x^2, x & Constant

SOR → $\alpha+\beta+\gamma = -\frac{b}{a}$

SOPORT2AT → $\alpha\beta+\beta\gamma+\gamma\alpha = \frac{c}{a}$

POR → $\alpha\beta\gamma = -\frac{d}{a}$

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QUADRATIC EQUATION

Q Find coeff^{nt} of x^2 & x in the expansion of $y=(x-1)(x-2)(x-3)$? $\alpha=1, \beta=2, \gamma=3$

$$y = x^3 - (\alpha+\beta+\gamma)x^2 + (\alpha\beta+\beta\gamma+\gamma\alpha)x - \alpha\beta\gamma$$

A) Coeff of $x^2 = \boxed{\alpha+\beta+\gamma} = -(1+2+3) = -6 = \Sigma\alpha$.

B) Coeff of $x = \boxed{\alpha\beta+\beta\gamma+\gamma\alpha} = 1\cdot2+2\cdot3+3\cdot1 = 11 = \Sigma\alpha\beta$

Alt. Method

$$= \frac{(1+2+3)^2-(1^2+2^2+3^2)}{2}$$

$$= \frac{36-(1+4+9)}{2} = \frac{22}{2} = 11$$

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6) Bi Quad Eqn

Eqn of deg 4

$\alpha \quad \beta \quad \delta \quad \gamma$

$$ax^4+bx^3+cx^2+dx+e=0 \rightarrow \alpha, \beta, \gamma, \delta$$

$$ax^4+bx^3+cx^2+dx+e = a(x-\alpha)(x-\beta)(x-\gamma)(x-\delta)$$

$$x^4+\frac{b}{a}x^3+\frac{c}{a}x^2+\frac{d}{a}x+\frac{e}{a} = x^4-(\alpha+\beta+\gamma+\delta)x^3+(\alpha\beta+\beta\gamma+\gamma\delta+\delta\alpha+\alpha\gamma+\beta\delta)x^2-(\alpha\beta\gamma+\beta\gamma\delta+\gamma\delta\alpha+\delta\alpha\beta)x+\alpha\beta\gamma\delta$$

$$x^4+\frac{b}{a}x^3+\frac{c}{a}x^2+\frac{d}{a}x+\frac{e}{a} = x^4-\left(\sum\alpha\right)x^3+\left(\sum\alpha\beta\right)x^2-\left(\sum\alpha\beta\gamma\right)x+\alpha\beta\gamma\delta$$

(1) $\sum\alpha = -\frac{b}{a}$ (2) $\sum\alpha\beta = \frac{c}{a}$ (3) $\sum\alpha\beta\gamma = -\frac{d}{a}$ (4) $\alpha\beta\gamma\delta = \frac{e}{a}$

SOR SOPORT2AT SOPORT3AT POR

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QUADRATIC EQUATION

Q For what value of a & b.

Eqⁿ $x^4 - \boxed{4}x^3 + \boxed{a}x^2 + \boxed{b}x + \boxed{1} = 0$

has 4 Real Roots?

$x^4 - \boxed{(\sum\alpha)}x^3 + (\sum\alpha\beta)x^2 - (\sum\alpha\beta\gamma)x + \alpha\beta\gamma\delta = 0$

$\alpha - \beta$, $\delta - \gamma$

$\sum\alpha = 4 \quad \& \quad \alpha\beta\gamma\delta = 1$

$\alpha + \beta + \gamma + \delta = 4 \quad \& \quad \alpha\cdot\beta\cdot\gamma\delta = 1$

$1 + 1 + 1 + 1 = 4 \qquad 1\times1\times1\times1 = 1$

$\alpha = \beta = \gamma = \delta = 1$

$a = \sum\alpha\beta = \alpha\beta + \beta\gamma + \gamma\delta + \delta\alpha + \alpha\gamma + \delta\beta$

$a = 1\times1 + 1\times1 + 1\times1 + 1\times1 + 1\times1 + 1\times1 = 6$

$b = -\sum\alpha\beta\gamma = -(\alpha\beta\gamma + \beta\gamma\delta + \gamma\delta\alpha + \delta\alpha\beta)$

$= -(1\times1\times1 + 1\times1\times1 + 1\times1\times1 + 1\times1\times1)$

$b = -(1+1+1+1) = -4$

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QUADRATIC EQUATION

Note:- $x^3-(\alpha+\beta+\gamma)x^2+\Sigma\alpha\, x-\alpha\beta\gamma$.

Some Cubic Eqn to Remember.

$(50)^2 = 2500$

$(40)^2 = 1600$

$(45)^2 = 200$

1) $x^3-6x^2+11x-6 = (x-1)(x-2)(x-3)$

Bheja fry

2) $x^3-(1+\cos\theta+\sin\theta)x^2+(\sin\theta\cos\theta+\sin\theta+\cos\theta)x-\sin\theta\cos\theta=0$

$(x-1)(x-\sin\theta)(x-\cos\theta)$

(3) $1\cdot x^3-3x^2+3x-1 = (x-1)^3$

Q If P is Prod of $\boxed{\text{Non Real Roots}}$ of

कभी Miss मत करे

$x^4-4x^3+6x^2-4x = 2016$ then find $\left[\frac{P}{10}\right]$

$x^4-4x^3+6x^2-4x+1 = 2017$

$(x-1)^4 = 2017$

Mistake

$(x-1)^2 = \pm\sqrt{2017}$

Wrong

Non Real Root का Kam

$(x-1)^2 = -\sqrt{2017}$

Iski Jayah $(x-1)^2 = -\sqrt{2017}$

$x^2-2x+\boxed{1+\sqrt{2017}}=0$ POR $= P = 1+\sqrt{2017}$

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

$\left[\frac{P}{10}\right] = \left[\frac{1+\sqrt{(45)^2}}{10}\right] = \left[\frac{46}{10}\right] = [4.6] = 4$

PASCAL Δ.

1

1 1

1 2 1 $\to (a+b)^2 = 1\cdot a^2+2\cdot ab+1\cdot b^2$

1 3 3 1 $\to (a+b)^3 = 1\cdot a^3+3\cdot a^2b+3\cdot ab^2+1\cdot b^3$

1 4 6 4 1 $\to (a+b)^4 = 1\cdot a^4+4\cdot a^3\cdot b+6\cdot a^2b^2+4ab^3+1\cdot b^4$

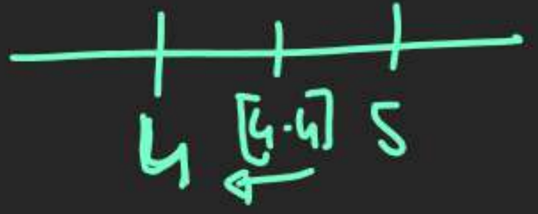
1 5 10 10 5 1

QUADRATIC EQUATION

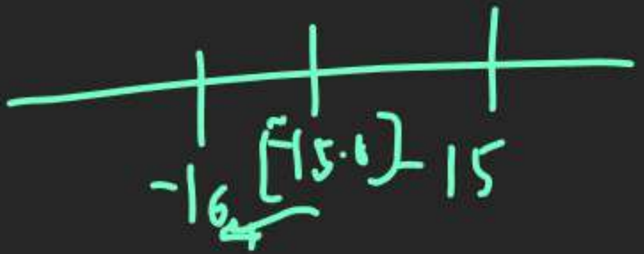
$[f(x)]$ is Greatest Int. fxn.

[ ] takes left side is Integer value for Every Non Integer.

$[4.4] = 4$



$[-15.6] = -16$



Q Roots of $x^4 - 8x^2 - 9 = 0$?

$x^2 = t$

$t^2 - 8t - 9 = 0$

$t^2 - 9t + t - 9 = 0$

$t(t-9) + 1(t-9) = 0$

$(t-9)(t+1) = 0$

$t = 9$ or $t = -1$

$x^2 = 9$ or $x^2 = -1$ → i

$x = \pm\sqrt{9}$ | $x = \pm\sqrt{-1}$

$x = \pm 3$ | $x = \pm i$

$\sqrt{-1}$ is imaginary NO

$= i$ (iota)

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QUADRATIC EQUATION

Q Find x if $3^x + 3^{-x} = \frac{10}{3}$?

$$3^x + \frac{1}{3^x} = \frac{10}{3}$$

let $3^x = t$

$$t + \frac{1}{t} = \frac{10}{3}.$$

$$\frac{t^2+1}{t} = \frac{10}{3}.$$

$$3t^2 + 3 = 10t$$

$$\Rightarrow 3t^2 - 10t + 3 = 0$$

$$\Rightarrow 3t^2 - 9t - t + 3 = 0$$

$$\Rightarrow 3t(t-3) - (t-3) = 0$$

$$(3t-1)(t-3) = 0$$

$t = \frac{1}{3}$ or $t = 3$

$3^x = \frac{1}{3}$ or $3^x = 3^1$

$3^x = 3^{-1}$ $\quad \boxed{x = 1}$

$\boxed{x = -1}$

Q $8\sec^2\theta - 6\sec\theta + 1 = 0$ find No. of Roots?

$$8t^2 - 6t + 1 = 0$$

$$8t^2 - 4t - 2t + 1 = 0$$

$$4t(2t-1) - 1(2t-1) = 0$$

$$(4t-1)(2t-1) = 0$$

$t = \frac{1}{2}$ or $t = \frac{1}{4}.$

$\sec\theta = \frac{1}{2}$ $\quad \sec\theta = \frac{1}{4}.$

$\cos\theta \in [-1,1]$ $\quad \boxed{\cos\theta = 2 \;\; \times}$ $\quad \boxed{\cos\theta = 4 \;\; \times}$

No Roots

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QUADRATIC EQUATION

Q $(5+2\sqrt{6})^{x^2-3}+(5-2\sqrt{6})^{x^2-3}=10$ find Root?

$(5+2\sqrt{6})^{x^2-3}+\left(\frac{1}{5+2\sqrt{6}}\right)^{x^2-3}=10$

$(5+2\sqrt{6})^{x^2-3}+\frac{1}{(5+2\sqrt{6})^{x^2-3}}=10$

$\boxed{2,\ -2,\ \sqrt{2},\ -\sqrt{2}}$

$t+\frac{1}{t}=10$

$\frac{t^2+1}{t}=10 \Rightarrow t^2-10t+1=0$

$t=\frac{10\pm\sqrt{100-4}}{2}=\frac{10\pm4\sqrt{6}}{2}=5\pm2\sqrt{6}$

याद

1) $\sqrt{2}-1=\frac{1}{\sqrt{2}+1}$

2) $2-\sqrt{3}=\frac{1}{2+\sqrt{3}}$

3) $5-2\sqrt{6}=\frac{1}{5+2\sqrt{6}}$

$(\sqrt{2}-1)(\sqrt{2}+1)$

$=(\sqrt{2})^2-(1)^2=2-1=1$

$(\sqrt{2}-1)(\sqrt{2}+1)=1$

$\sqrt{2}-1=\frac{1}{\sqrt{2}+1}$

$(5-2\sqrt{6})(5+2\sqrt{6})=1$

$25-24=1$

$t=5+2\sqrt{6} \Rightarrow (5+2\sqrt{6})^{x^2-3}=(5+2\sqrt{6})^1$

$\Rightarrow x^2-3=1 \Rightarrow x^2=4$

$\boxed{x=2,-2}$ ✓

$t=5-2\sqrt{6}=\frac{1}{5+2\sqrt{6}}$

$(5+2\sqrt{6})^{x^2-3}=(5+2\sqrt{6})^{-1} \Rightarrow x^2-3=-1 \Rightarrow x^2=2 \Rightarrow x=\sqrt{2}$

$=-\sqrt{2}$ ✓