

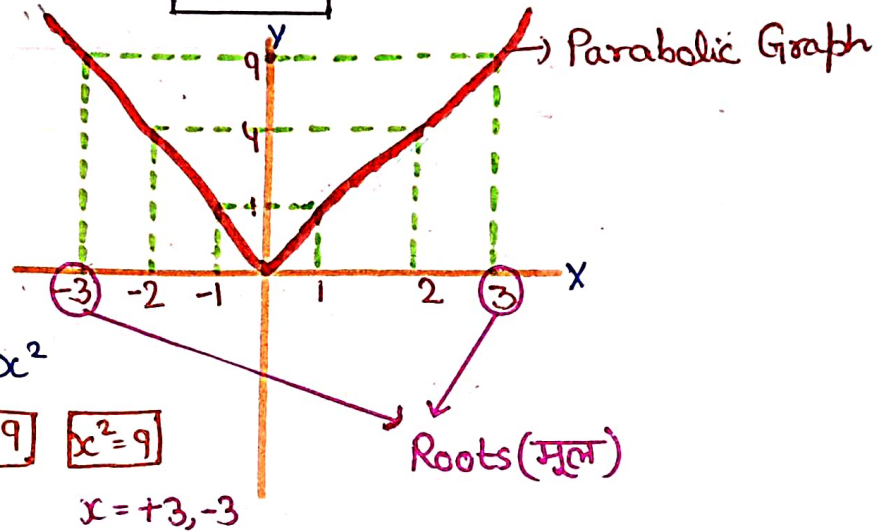
QUADRATIC EQUATION

$$y = ax^2 + bx + c$$

Max Power = 2
 Quadratic Expression
 द्विघात अभिव्यक्ति

$ax^2 + bx + c = 0$
 Quadratic Equation
 द्विघात समीकरण

$$y = x^2$$



Put $y = x^2$
 $y = 9$ $x^2 = 9$
 $x = +3, -3$

$$ax^2 + bx + c = 0$$

Roots $\rightarrow \alpha, \beta$

Factor Method

Sridhar Acharya Rule
 श्रीधर आचार्य नियम

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$\downarrow$
 α

$$\frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$\downarrow$
 β

NATURE OF ROOTS

$$b^2 - 4ac = D \text{ (Discriminant) (विवेचक विविक्तिकर)}$$

$$D > 0$$

मूल (Roots)

Real & Different
(वास्तविक तथा अलग)

α & β are different

Case-1

$$b^2 - 4ac = \text{पूर्ण वर्ग}$$

Roots $\rightarrow$ परिमेय मूल
(Rational Roots)

Case-2

$$b^2 - 4ac = \text{पूर्ण वर्ग नहीं है।}$$

Roots $\rightarrow$ अपरिमेय मूल
(Irrational Roots)

$$D = 0$$

Roots (मूल)

Real & Equal
(वास्तविक तथा बराबर)

$$\alpha = \beta = \frac{-b}{2a}$$

$$D < 0$$

Roots (मूल)

Imaginary
(काल्पनिक)

$$ax^2 + bx + c = 0$$

Roots $\rightarrow \alpha, \beta$

• Sum of Roots (मूलों का योग)

$$\alpha + \beta = \frac{-b}{a} = -\left[\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2} \right]$$

• Product of Roots (मूलों का गुणनफल)

$$\alpha \cdot \beta = \frac{c}{a} = \left[\frac{\text{Constant term}}{\text{Coefficient of } x^2} \right]$$

$$ax^2 + bx + c = 0$$

divide both side by 'a'

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$x^2 - [\text{Sum of Roots}]x + \text{Product of Roots}$$

Ex:- $\alpha + \beta = 6$

$\alpha \times \beta = 8$

eqⁿ = $x^2 - 6x + 8 = 0$

* $\alpha + \beta = -10$

$\alpha \cdot \beta = 16$

$x^2 - (-10)x + 16 = 0$

$x^2 + 10x + 16 = 0$

* $x^2 - 16x + 48 = 0$

$$x = \frac{-(-16) \pm \sqrt{(-16)^2 - 4 \times 1 \times 48}}{2 \times 1}$$

$$\frac{16 \pm \sqrt{256 - 192}}{2}$$

$$\frac{16 \pm \sqrt{64}}{2} = \frac{16 \pm 8}{2}$$

$$\begin{aligned} &\frac{16+8}{2} = \frac{24}{2} = 12 \\ &\frac{16-8}{2} = \frac{8}{2} = 4 \end{aligned}$$

* $x^2 - 16x + 48 = 0$

$x^2 - 12x - 4x + 48 = 0$

$x(x-12) - 4(x-12) = 0$

$(x-12)(x-4) = 0$

$x-12=0 \quad x-4=0$

$x=12$

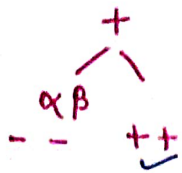
$x=4$

$ax^2 \pm bx \pm c = 0$	Sign of Roots	
$ax^2 + bx + c = 0$	$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$ax^2 - bx + c = 0$	$+$	$+$
$ax^2 + bx - c = 0$	$-$	$+$
$ax^2 - bx - c = 0$	$+$	$-$

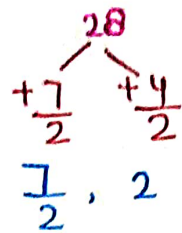
* $x^2 - 16x + 48 = 0$

$\alpha + \beta = 16$

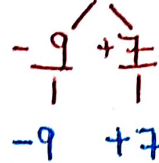
$+12, +4$



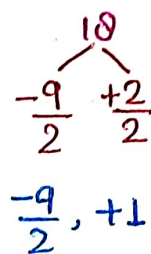
$$* 2x^2 - 11x + 14 = 0$$



$$* x^2 + 2x - 63 = 0$$

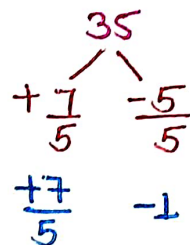


$$* 2x^2 + 7x - 9 = 0$$



$$* 7 - 5x^2 + 2x = 0$$

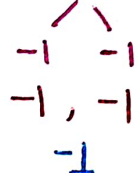
$$5x^2 - 2x - 7 = 0$$



$$* (x-3)(x+5) = -16$$

$$x^2 + 5x - 3x - 15 = -16$$

$$x^2 + 2x + 1 = 0$$



+
Root
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