

# Quadratic equation

(द्विघाती समीकरण) *One variable*

*Degree = 2*

Ex  $3x^2 + 2x + 7 = 0$

$$5x^2 - 3x - 10 = 0$$

$$-x^2 + 8x = 0$$

$$3x^2 + 10 = 0$$

# Quadratic polynomial vs quad. equation (Definition):

not equated

powers  $\rightarrow$  non-negative integers

Ex  $3x^2 + 5x - 3$   
 $2x^2 - 7x + 6$

equated

Ex:  $3x^2 + 5x - 3 = 0$

$2x^2 - 7x + 5 = -1$

X  $5x^2 + 3x^{\frac{1}{2}} = 0$

X  $5x^2 + 3x^{\sqrt{2}} - 7 = 0$

X  $3x^2 + 7x^{-1} + 2 = 0$

coaching center

# Graph of quadratic polynomial:

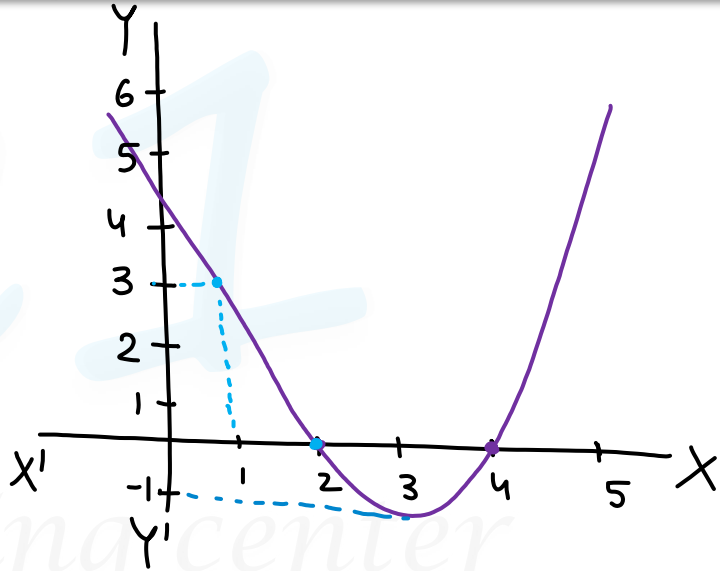
$$2x + 3y = 6 \rightarrow \text{line}$$

$$y = x^2 - 6x + 8$$

$$y = 1 - 6 + 8 = 3 \rightarrow \text{at } x=1$$

$$y = 4 - 12 + 8 = 0 \text{ at } x=2$$

$$y = 9 - 18 + 8 = -1 \text{ at } x=3$$



# Creating equation when roots given:

2, 4

$$x^2 - (S_oR)x + P_oR = 0$$

change Same

$$x^2 - 6x + 8 = 0$$

$$S_oR = \frac{+5}{9} + \frac{5}{3}$$
$$P_oR = \frac{4}{9}$$

Roots	Equation
2,3	$x^2 - 5x + 6 = 0$
5,2	$x^2 - 7x + 10 = 0$
-2,4	$x^2 - 2x - 8 = 0$
-3,-5	$x^2 + 8x + 15 = 0$
-5,0	$x^2 + 5x = 0$
$\frac{1}{3}, \frac{4}{3}$	$x^2 - \frac{5}{3}x + \frac{4}{9} = 0$ $9x^2 - 15x + 4 = 0$

## General form & Sum and product of roots:

$$ax^2 + bx + c = 0, \text{ where } a \neq 0$$

$$\text{Sum of roots} = \frac{-b}{a} = -\frac{\text{Coeff of } x}{\text{Coeff of } x^2}$$

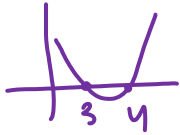
$$\text{Product of roots} = \frac{c}{a} = \frac{\text{Constant}}{\text{Coeff. of } x^2}$$

$$5x^2 - 13x + 2 = 0$$

$$\text{SOR} = \frac{13}{5} \quad \text{POR} = \frac{2}{5}$$

1. Find the zeroes of all the following quadratic expressions:

निम्नलिखित द्विघाती समीकरणों के शून्य बताओ:



a)  $x^2 - 7x + 12$

c)  $a^2 + 10a + 16$

a)  $SoR = \frac{7}{1} = 7$

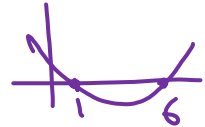
$Por = \frac{12}{1} = 12$   $\begin{matrix} < 4 \\ < 3 \end{matrix}$

c)  $Por = 16$   $\begin{matrix} < -8 \\ < -2 \end{matrix}$   
 $SoR = -10$

b)  $x^2 - 7x + 6$   $\begin{matrix} < 6 \\ < 1 \end{matrix}$

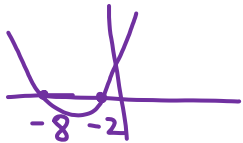
d)  $y^2 + 10y + 21$

b)  $6, 1$



d)  $Por = 21$   $\begin{matrix} < -7 \\ < -3 \end{matrix}$

$SoR = -10$



coaching center



2. Find the roots of all the following quadratic expressions:

निम्नलिखित द्विघाती समीकरणों के मूल बताओ:

a)  $x^2 + x - 12 = 0$

b)  $x^2 - 4x - 21 = 0$

c)  $a^2 - 4a - 5 = 0$

d)  $9y^2 - 18y + 5 = 0$

a) PoR =  $-12 < \begin{matrix} -4 \\ 3 \end{matrix}$   
SoR =  $-1$

b)  $-21 < \begin{matrix} 7 \\ -3 \end{matrix}$

c)  $-5 < \begin{matrix} 5 \\ -1 \end{matrix}$ ,  
4

d)  $\rightarrow$  \*Don't use real PoR & SoR  
PoR =  $45 < \begin{matrix} 15/9 \\ 3/9 \end{matrix}$   
SoR =  $18$  }  $\frac{5}{3}, \frac{1}{3}$

coaching center



3. Find the roots of all the following quadratic expressions:

निम्नलिखित द्विघाती समीकरणों के मूल बताओ: Equations

a)  $2x^2 - 9x + 10 = 0$

b)  $8x^2 - 78x + 169 = 0$

c)  $20a^2 - 117a + 169 = 0$

d)  $3y^2 + 5y - 2 = 0$

a)  $20 \rightarrow \frac{5}{2}, \frac{4}{2}$   
9

b)  $P \& R = 8 \times \cancel{169}^{131} \rightarrow \frac{4 \times 13}{8}, \frac{2 \times 13}{8}$   
 $S \& R = \cancel{78}^6$

c)  $P \& R = 20 \times \cancel{169} \rightarrow \frac{5 \times 13}{20}, \frac{4 \times 13}{20}$   
 $S \& R = \cancel{117}^9$

d)  $-6 < -\frac{6}{3}$   
 $-5 < \frac{1}{3}$



4. Write the following as a product of two factors:

निम्नलिखित को दो गुणखंडों की गुणा के रूप में लिखिए:

$$\text{a) } x^2 - 7x + 12 = (x-3)(x-4)$$

$-4, -3$

$$\text{b) } x^2 - 7x + 6 = (x-6)(x-1)$$

$-6, -1$

$$\text{c) } a^2 + 10a + 16 = (a+8)(a+2)$$

$8, 2$

$$\text{d) } x^2 + x - 12 = (x+4)(x-3)$$

$4, -3$

$$\begin{aligned} \text{e) } 9y^2 - 18y + 5 &= 9y^2 - 15y - 3y + 5 \\ &= 3y(3y-5) - 1(3y-5) \\ &= (3y-5)(3y-1) \end{aligned}$$

$$\begin{aligned} & \left. \begin{aligned} & \frac{x^2 - 4x - 3x + 12}{=} \\ & \frac{x(x-4) - 3(x-4)}{=} \\ & (x-4)(x-3) \end{aligned} \right| \end{aligned}$$