

Mathematics

(Chapter – 2) (Polynomials)

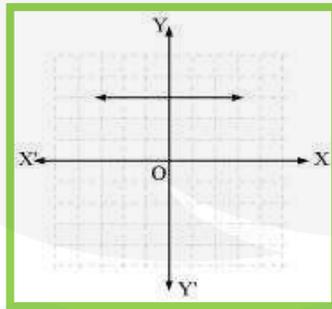
(Class – X)

Exercise 2.1

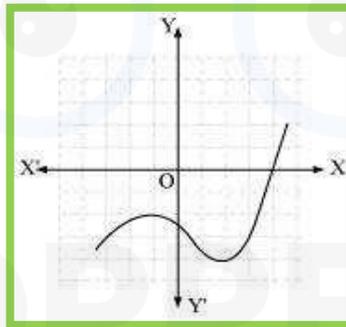
Question 1:

The graphs of $y = p(x)$ are given in following figure, for some polynomials $p(x)$. Find the number of zeroes of $p(x)$, in each case.

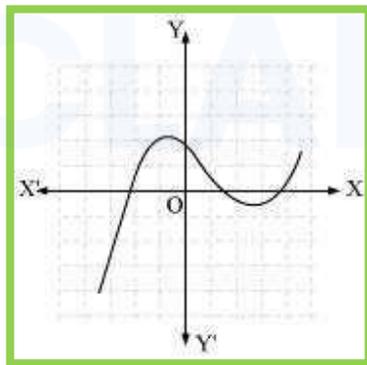
(i)



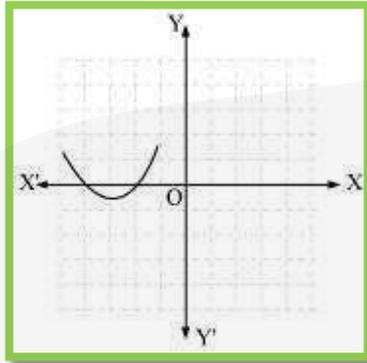
(ii)



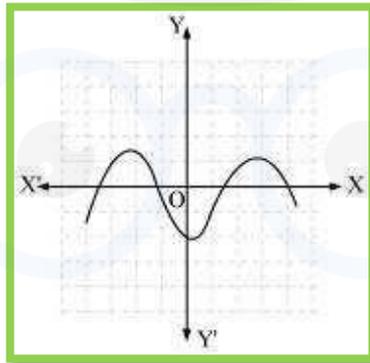
(iii)



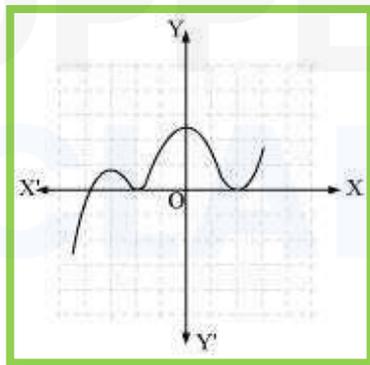
(iv)



(v)



(vi)



Answer 1:

- (i)** The number of zeroes is 0 as the graph does not cut the x -axis at any point.
- (ii)** The number of zeroes is 1 as the graph intersects the x -axis at only 1 point.
- (iii)** The number of zeroes is 3 as the graph intersects the x -axis at 3 points.
- (iv)** The number of zeroes is 2 as the graph intersects the x -axis at 2 points.
- (v)** The number of zeroes is 4 as the graph intersects the x -axis at 4 points.
- (vi)** The number of zeroes is 3 as the graph intersects the x -axis at 3 points.

TOPPERS
CLAN

Mathematics

(Chapter – 2) (Polynomials)

(Class X)

Exercise 2.2

Question 1:

Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients.

(i) $x^2 - 2x - 8$

(ii) $4s^2 - 4s + 1$

(iii) $6x^2 - 3 - 7x$

(iv) $4u^2 + 8u$

(v) $t^2 - 15$

(vi) $3x^2 - x - 4$

Answer 1:

(i) $x^2 - 2x - 8 = (x - 4)(x + 2)$

The value of $x^2 - 2x - 8$ is zero when $x - 4 = 0$ or $x + 2 = 0$, i.e., when $x = 4$ or $x = -2$

Therefore, the zeroes of $x^2 - 2x - 8$ are 4 and -2 .

$$\text{Sum of zeroes} = 4 - 2 = 2 = \frac{-(-2)}{1} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$$

$$\text{Product of zeroes} = 4 \times (-2) = -8 = \frac{(-8)}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

(ii) $4s^2 - 4s + 1 = (2s - 1)^2$

The value of $4s^2 - 4s + 1$ is zero when $2s - 1 = 0$, i.e., $s = \frac{1}{2}$. Therefore,

the zeroes of $4s^2 - 4s + 1$ are $\frac{1}{2}$ and $\frac{1}{2}$.

$$\text{Sum of zeroes} = \frac{1}{2} + \frac{1}{2} = 1 = \frac{-(-4)}{4} = \frac{-(\text{Coefficient of } s)}{(\text{Coefficient of } s^2)}$$

$$\text{Product of zeroes} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} = \frac{\text{Constant term}}{\text{Coefficient of } s^2}$$

(iii) $6x^2 - 3 - 7x = 6x^2 - 7x - 3 = (3x + 1)(2x - 3)$

The value of $6x^2 - 3 - 7x$ is zero when $3x + 1 = 0$ or $2x - 3 = 0$, i.e.,

$$x = \frac{-1}{3} \text{ or } x = \frac{3}{2}$$

Therefore, the zeroes of $6x^2 - 3 - 7x$ are $\frac{-1}{3}$ and $\frac{3}{2}$.

$$\text{Sum of zeroes} = \frac{-1}{3} + \frac{3}{2} = \frac{7}{6} = \frac{-(-7)}{6} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$$

$$\text{Product of zeroes} = \frac{-1}{3} \times \frac{3}{2} = \frac{-1}{2} = \frac{-3}{6} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

$$\begin{aligned} \text{(iv) } 4u^2 + 8u &= 4u^2 + 8u + 0 \\ &= 4u(u + 2) \end{aligned}$$

The value of $4u^2 + 8u$ is zero when $4u = 0$ or $u + 2 = 0$, i.e.,
 $u = 0$ or $u = -2$

Therefore, the zeroes of $4u^2 + 8u$ are 0 and -2 .

$$\text{Sum of zeroes} = 0 + (-2) = -2 = \frac{-(8)}{4} = \frac{-(\text{Coefficient of } u)}{\text{Coefficient of } u^2}$$

$$\text{Product of zeroes} = 0 \times (-2) = 0 = \frac{0}{4} = \frac{\text{Constant term}}{\text{Coefficient of } u^2}$$

$$\begin{aligned} \text{(v) } t^2 - 15 \\ &= t^2 - 0t - 15 \\ &= (t - \sqrt{15})(t + \sqrt{15}) \end{aligned}$$

The value of $t^2 - 15$ is zero when $t - \sqrt{15} = 0$ or $t + \sqrt{15} = 0$, i.e., when
 $t = \sqrt{15}$ or $t = -\sqrt{15}$

Therefore, the zeroes of $t^2 - 15$ are $\sqrt{15}$ and $-\sqrt{15}$.

$$\text{Sum of zeroes} = \sqrt{15} + (-\sqrt{15}) = 0 = \frac{-0}{1} = \frac{-(\text{Coefficient of } t)}{(\text{Coefficient of } t^2)}$$

$$\text{Product of zeroes} = (\sqrt{15})(-\sqrt{15}) = -15 = \frac{-15}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

$$\begin{aligned} \text{(vi)} \quad 3x^2 - x - 4 \\ = (3x - 4)(x + 1) \end{aligned}$$

The value of $3x^2 - x - 4$ is zero when $3x - 4 = 0$ or $x + 1 = 0$, i.e.,

$$\text{when } x = \frac{4}{3} \text{ or } x = -1$$

Therefore, the zeroes of $3x^2 - x - 4$ are $\frac{4}{3}$ and -1 .

$$\text{Sum of zeroes} = \frac{4}{3} + (-1) = \frac{1}{3} = \frac{-(-1)}{3} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$$

$$\text{Product of zeroes} = \frac{4}{3}(-1) = \frac{-4}{3} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

Question 2:

Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively.

$$\text{(i)} \quad \frac{1}{4}, -1$$

$$\text{(ii)} \quad \sqrt{2}, \frac{1}{3}$$

$$\text{(iii)} \quad 0, \sqrt{5}$$

$$\text{(iv)} \quad 1, 1$$

$$\text{(v)} \quad -\frac{1}{4}, \frac{1}{4}$$

$$\text{(vi)} \quad 4, 1$$

Answer 2:

$$\text{(i)} \quad \frac{1}{4}, -1$$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = \frac{1}{4} = \frac{-b}{a}$$

$$\alpha\beta = -1 = \frac{-4}{4} = \frac{c}{a}$$

$$\text{If } a = 4, \text{ then } b = -1, c = -4$$

Therefore, the quadratic polynomial is $4x^2 - x - 4$.

(ii) $\sqrt{2}, \frac{1}{3}$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = \sqrt{2} = \frac{3\sqrt{2}}{3} = \frac{-b}{a}$$

$$\alpha\beta = \frac{1}{3} = \frac{c}{a}$$

$$\text{If } a = 3, \text{ then } b = -3\sqrt{2}, c = 1$$

Therefore, the quadratic polynomial is $3x^2 - 3\sqrt{2}x + 1$.

(iii) $0, \sqrt{5}$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = 0 = \frac{0}{1} = \frac{-b}{a}$$

$$\alpha \times \beta = \sqrt{5} = \frac{\sqrt{5}}{1} = \frac{c}{a}$$

$$\text{If } a = 1, \text{ then } b = 0, c = \sqrt{5}$$

Therefore, the quadratic polynomial is $x^2 + \sqrt{5}$.

(iv) $1, 1$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = 1 = \frac{1}{1} = \frac{-b}{a}$$

$$\alpha \times \beta = 1 = \frac{1}{1} = \frac{c}{a}$$

$$\text{If } a = 1, \text{ then } b = -1, c = 1$$

Therefore, the quadratic polynomial is $x^2 - x + 1$.

$$(v) \quad -\frac{1}{4}, \frac{1}{4}$$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = \frac{-1}{4} = \frac{-b}{a}$$

$$\alpha \times \beta = \frac{1}{4} = \frac{c}{a}$$

$$\text{If } a = 4, \text{ then } b = 1, c = 1$$

Therefore, the quadratic polynomial is $4x^2 + x + 1$.

$$(vi) \quad 4, 1$$

Let the polynomial be $ax^2 + bx + c$ and its zeroes be α and β .

$$\alpha + \beta = 4 = \frac{4}{1} = \frac{-b}{a}$$

$$\alpha \times \beta = 1 = \frac{1}{1} = \frac{c}{a}$$

$$\text{If } a = 1, \text{ then } b = -4, c = 1$$

Therefore, the quadratic polynomial is $x^2 - 4x + 1$.