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.

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.

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

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 $\frac{1}{2}$.

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

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.,

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

Therefore, the zeroes of $6x^2 - 3 - 7x$ are $\frac{-1}{3}$ and $\frac{3}{2}$. Sum of zeroes $= \frac{-1}{3} + \frac{3}{2} = \frac{7}{6} = \frac{-(-7)}{6} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2}$ Product of zeroes $= \frac{-1}{3} \times \frac{3}{2} = \frac{-1}{2} = \frac{-3}{6} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(iv)
$$4u^2 + 8u = 4u^2 + 8u + 0$$

= $4u(u+2)$

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.

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

(v) $t^2 - 15$ = $t^2 - 0t - 15$ = $(t - \sqrt{15})(t + \sqrt{15})$

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 $-\sqrt{15}$.

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

(vi) $3x^2 - x - 4$ = (3x - 4)(x + 1)

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

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

Therefore, the zeroes of $3x^2 - x - 4$ are 4/3 and -1.

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

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.

(i) $\frac{1}{4}$, -1 (ii) $\sqrt{2}$, $\frac{1}{3}$ (iii) 0, $\sqrt{5}$ (iv) 1,1 (v) $-\frac{1}{4}$, $\frac{1}{4}$ (vi) 4,1

Answer 2:

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

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

$$\alpha + \beta = \frac{1}{4} = \frac{-b}{a}$$
$$\alpha \beta = -1 = \frac{-4}{4} = \frac{c}{a}$$
If $a = 4$, 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 .

$$\alpha + \beta = \sqrt{2} = \frac{3\sqrt{2}}{3} = \frac{-b}{a}$$
$$\alpha\beta = \frac{1}{3} = \frac{c}{a}$$
If $a = 3$, 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 .

$$\alpha + \beta = 0 = \frac{0}{1} = \frac{-b}{a}$$
$$\alpha \times \beta = \sqrt{5} = \frac{\sqrt{5}}{1} = \frac{c}{a}$$
If $a = 1$, 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 .

$$\alpha + \beta = 1 = \frac{1}{1} = \frac{-b}{a}$$
$$\alpha \times \beta = 1 = \frac{1}{1} = \frac{c}{a}$$
If $a = 1$, 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 .

$$\alpha + \beta = \frac{-1}{4} = \frac{-b}{a}$$
$$\alpha \times \beta = \frac{1}{4} = \frac{c}{a}$$
If $a = 4$, then $b = 1$, $c = 1$

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

(vi) 4, 1

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

$$\alpha + \beta = 4 = \frac{4}{1} = \frac{-b}{a}$$
$$\alpha \times \beta = 1 = \frac{1}{1} = \frac{c}{a}$$
If $a = 1$, then $b = -4$, $c = 1$

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