NCERT Solutions for Class 9

Maths

Chapter 2 – Polynomials

Exercise 2.2

1. Find the value of the polynomial $5x - 4x^2 + 3$ at the following values of x.

i. $x = 0$

Ans: Let $p(x) = 5x - 4x^2 + 3$

We will simply put the value of x in the given polynomial.

$\Rightarrow p(0) = 5(0) - 4(0^2) + 3$

$\Rightarrow p(0) = 3$

Hence, the value of the polynomial at $x = 0$ is 3.

ii. $x = -1$

Ans: Let $p(x) = 5x - 4x^2 + 3$

We will simply put the value of x in the given polynomial.

$\Rightarrow p(-1) = 5(-1) - 4\left[(-1)^2\right] + 3$

$\Rightarrow p(-1) = -5 - 4 + 3$

$\Rightarrow p(-1) = -6$

Hence, the value of the polynomial at $x = -1$ is -6.

iii. $x = 2$

Ans: Let $p(x) = 5x - 4x^2 + 3$

We will simply put the value of x in the given polynomial.

$\Rightarrow p(2) = 5(2) - 4(2^2) + 3$

$\Rightarrow p(2) = 10 - 16 + 3$

$\Rightarrow p(2) = -3$

Hence, the value of the polynomial at $x = 2$ is -3.

2. Find $p(0)$, $p(1)$ and $p(2)$ for each of the following polynomials:

i. $p(y) = y^2 - y + 1$

- $p(0) = 0^2 - 0 + 1$.

  So, we get the value of $p(0) = 1$.

- $p(1) = 1^2 - 1 + 1 = 1$

  So, we get the value of $p(1) = 1$.

- $p(2) = 2^2 - 2 + 1$

  $\Rightarrow p(2) = 4 - 2 + 1$

  $\Rightarrow p(2) = 3$

  So, we get the value of $p(2) = 3$.

ii. $p(t) = 2 + t + 2t^2 - t^3$

- $p(0) = 2 + 0 + 2(0^2) - (0^3) = 2$

So, we get the value of $p(0) = 2$.

- $p(1) = 2 + 1 + 2(1^2) - (1^3) = 4$

  So, we get the value of $p(1) = 4$.

- $p(2) = 2 + 2 + 2(2^2) - (2^3)$

  $\Rightarrow p(2) = 4 + 8 - 8$

  $\Rightarrow p(2) = 4$

  So, we get the value of $p(2) = 4$.

iii. $\mathbf{p(x) = x^3}$

- $p(0) = 0^3 = 0$

  So, we get the value of $p(0) = 0$.

- $p(1) = 1^3 = 1$

  So, we get the value of $p(1) = 1$.

- $p(2) = 2^3 = 8$

  So, we get the value of $p(2) = 8$.

iv. $\mathbf{p(x) = (x - 1)(x + 1)}$

- $p(0) = (0 - 1)(0 + 1) = -1$

  So, we get the value of $p(0) = -1$.

- $p(1) = (1 - 1)(1 + 1) = 0$

So, we get the value of $p(1) = 0$.

- $p(2) = (2 - 1)(2 + 1)$

  $\Rightarrow p(2) = (1)(3) = 3$

  So, we get the value of $p(2) = 3$.

3. Verify whether the following are zeroes of the polynomial, indicated against them.

i. $p(x) = 3x + 1$, $x = -\frac{1}{3}$

Ans: We are given $x = -\frac{1}{3}$. If it is the zero of the polynomial $p(x) = 3x + 1$, then $p\left(-\frac{1}{3}\right)$ should be 0.

$$p\left(0\frac{1}{3}\right) = 3\left(0\frac{1}{3}\right) + 1 = -1 + 1 = 0$$

Hence, we can say that $x = -\frac{1}{3}$ is a zero of the given polynomial.

ii. $p(x) = 5x - \pi$, $x = \frac{4}{5}$

Ans: We are given: $x = \frac{4}{5}$. If it is the zero of the polynomial $p(x) = 5x - \pi$, then $p\left(\frac{4}{5}\right)$ should be 0.

$$p\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right) - 3.14 = 4 - 3.14 \neq 0$$

Hence, we can say that $x = \frac{4}{5}$ is not a zero of the given polynomial.

iii. $p(x) = x^2 - 1$, $x = 1, -1$

Ans: We are given: $x = 1$ and $x = -1$.

If they are zeros of polynomial $p(x) = x^2 - 1$, then $p(1)$ and $p(-1)$ should both be 0.

$p(1) = (1)^2 - 1 = 0$

$p(-1) = (-1)^2 - 1 = 0$

Hence, we can say that $x = 1$ and $x = -1$ are zeroes of the given polynomial.

iv. $p(x) = (x+1)(x-2)$, $x = -1, 2$

Ans: We are given: $x = -1$ and $x = 2$.

If they are zeroes of the polynomial $p(x) = (x+1)(x-2)$, then $p(-1)$ and $p(2)$ should be 0.

$p(-1) = (-1+1)(-1-2) = (0)(-3) = 0$

$p(2) = (2+1)(2-2) = (3)(0) = 0$

Hence, we can say that $x = -1$ and $x = 2$ are zeroes of the given polynomial.

v. $p(x) = x^2$, $x = 0$

Ans: We are given $x = 0$.

If it is a zero of the polynomial $p(x) = x^2$, then $p(0)$ should be 0.

$p(0) = (0)^2 = 0$

Hence, we can say that $x = 0$ is a zero of the given polynomial.

vi. $p(x) = lx + m, x = -\frac{m}{l}$

Ans: We are given: $x = -\frac{m}{l}$.

If it is a zero of the polynomial $p(x) = lx + m$, then $p\left(-\frac{m}{l}\right)$ should be 0.

Here, $p\left(-\frac{m}{l}\right) = l\left(-\frac{m}{l}\right) + m = -m + m = 0$

Hence, we can say that $x = -\frac{m}{l}$ is a zero of the given polynomial.

vii. $p(x) = 3x^2-1, x = -\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

Ans: We are given: $x = \frac{-1}{\sqrt{3}}$ and $x = \frac{2}{\sqrt{3}}$.

If they are zeroes of the polynomial $p(x) = 3x^2-1$, then $p\left(\frac{-1}{\sqrt{3}}\right)$ and $p\left(\frac{2}{\sqrt{3}}\right)$ should be 0.

$$p\left(\frac{-1}{\sqrt{3}}\right) = 3\left(\frac{-1}{\sqrt{3}}\right)^2 -1 = 3\left(\frac{1}{3}\right)-1 = 1-1 = 0$$

$$p\left(\frac{2}{\sqrt{3}}\right) = 3\left(\frac{2}{\sqrt{3}}\right)^2 -1 = 3\left(\frac{4}{3}\right)-1 = 4-1 = 3$$

Hence, we can say that $x = \frac{-1}{\sqrt{3}}$ is a zero of the given polynomial.

However, the value of $x = \frac{2}{\sqrt{3}}$ is not a zero of the given polynomial.

viii. p(x) = 2x+1, x = $\frac{1}{2}$

Ans: We are given: $x = \frac{1}{2}$.

If it is a zero of polynomial $p(x) = 2x+1$, then $p\left(\frac{1}{2}\right)$ should be 0

Here, $p\left(\frac{1}{2}\right) = 2\left(\frac{1}{2}\right)+1 = 1+1 = 2$.

So, we get the value $p\left(\frac{1}{2}\right) \neq 0$.

Hence, we can say that $x = \frac{1}{2}$ is not a zero of the given polynomial.

4. Find the zero of the polynomial in each of the following cases:

i. $p(x)$ = x+5

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow x+5 = 0$

$\Rightarrow x = -5$

Therefore, $x = -5$ is a zero of the polynomial.

ii. $p(x)$ = x-5

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow$ x-5 = 0

$\Rightarrow$ x = 5

Therefore, $x = 5$ is a zero of the polynomial.

iii. $p(x)$ = 2x+5

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow$ 2x+5 = 0

$\Rightarrow x = -\frac{5}{2}$

Therefore, $x = -\frac{5}{2}$ is a zero of the given polynomial.

iv. $p(x)$ = 3x-2

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow$ 3x-2 = 0

$\Rightarrow x = \frac{2}{3}$

Therefore, $x = \frac{2}{3}$ is a zero of the given polynomial.

v. $p(x)$ = 3x

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow 3x = 0$

$\Rightarrow x = 0$

Therefore, $x = 0$ is a zero of the given polynomial.

vi. $p(x) = ax, a \neq 0$

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow ax = 0$

It is also given that a is non-zero. This is a required condition because if a is zero, then then the polynomial would not have existed.

$\Rightarrow x = 0$

Therefore, $x = 0$ is a zero of the given polynomial.

vii. $p(x) = cx+d, c \neq 0$, c, d are real numbers.

Ans: If x is zero of the polynomial, then we can say that $p(x) = 0$.

Let $p(x) = 0$

$\Rightarrow cx+d = 0$

It is also given that c is non-zero. This is a required condition because if c is zero, then then the polynomial would not have existed. So, with this only exception, c and d can take any real values.

$\Rightarrow x = -\frac{d}{c}$

Therefore, $x = -\frac{d}{c}$ is a zero of the given polynomial.