



NCERT solutions for class 9 Maths Polynomials Ex 2.2

Q1. Find the value of the polynomial $5x - 4x^2 + 3$ at

(i) $x = 0$

(ii) $x = -1$

(iii) $x = 2$

Ans: (I) Let $f(x) = 5x - 4x^2 + 3$.

We need to substitute 0 in the polynomial

$$f(x) = 5x - 4x^2 + 3 \text{ to get } f(0) = 5(0) - 4(0)^2 + 3$$

$$= 0 - 0 + 3$$

$$= 3$$

Therefore, we conclude that at $x = 0$, the value of the polynomial $5x - 4x^2 + 3$ is 3.

(ii) Let $f(x) = 5x - 4x^2 + 3$.

We need to substitute -1 in the polynomial

$$f(x) = 5x - 4x^2 + 3 \text{ to get.}$$

$$f(-1) = 5(-1) - 4(-1)^2 + 3$$

$$= -5 - 4 + 3$$

$$= -6$$

Therefore, we conclude that at $x = -1$, the value of the polynomial $5x - 4x^2 + 3$ is -6

(iii) Let $f(x) = 5x - 4x^2 + 3$.

We need to substitute 2 in the polynomial

$$f(x) = 5x - 4x^2 + 3 \text{ to get } f(2) = 5(2) - 4(2)^2 + 3$$

$$= 10 - 16 + 3$$

$$= -3$$

Therefore, we conclude that at $x = 2$, the value of the polynomial $5x - 4x^2 + 3$ is -3.

Q2. Find $p(0)$, $p(1)$ and $p(2)$ for each of the following polynomials:

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

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

(iii) $p(x) = x^3$

(iv) $p(x) = (x-1)(x+1)$

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

At $p(0)$:

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

At $p(1)$:

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

At $p(2)$:

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

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

At $p(0)$:

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

At $p(1)$:

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

At $p(2)$:

$$p(2) = 2 + (2) + 2(2)^2 - (2)^3 = 4 + 8 - 8 = 4$$

(iii) $p(x) = (x)^3$

At $p(0)$:

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

At $p(1)$:

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

At $p(2)$:

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

(vi) $p(x) = (x-1)(x+1)$

At $p(0)$:

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

At $p(1)$:

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

At $p(2)$:

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

Q3. Verify whether the following are zeroes of the polynomial, indicated against them.

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

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

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

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

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

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

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

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

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

We need to check whether $p(x) = 3x + 1$ at $x = -\frac{1}{3}$

is equal to zero or not.

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

Therefore, we can conclude that $x = -\frac{1}{3}$ is a zero of the polynomial $p(x) = 3x + 1$.

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

We need to check whether $p(x) = 5x - \pi$ at $x = \frac{4}{5}$ is equal to zero or not.

$$p\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right) - \pi = 4 - \pi$$

Therefore, $x = \frac{4}{5}$ is not a zero of the polynomial $p(x) = 5x - \pi$.

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

We need to check whether $p(x) = x^2 - 1$ at $x = -1, 1$ is equal to zero or not.

At $x = -1$

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

At $x = 1$

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

Therefore, $x = -1, 1$ are the zeros of the polynomial $p(x) = x^2 - 1$.

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

We need to check whether

$p(x) = (x+1)(x-2)$ at $x = -1, 2$ is equal to zero or not.

At $x = -1$

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

At $x = 2$

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

Therefore, $x = -1, 2$ are the zeros of the polynomial $p(x) = (x+1)(x-2)$.

(v) $p(x) = x^2, \quad x = 0$

We need to check whether $p(x) = x^2$ at $x = 0$ is equal to zero or not.

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

Therefore, we can conclude that $x = 0$ is a zero of the polynomial $p(x) = x^2$.

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

We need to check whether $p(x) = lx + m$ at $x = -\frac{m}{l}$ is equal to zero or not.

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

Therefore, $x = -\frac{m}{l}$ is a zero of the polynomial $p(x) = lx + m$.

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

We need to check whether

$p(x) = 3x^2 - 1$ at $x = -\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$ is equal to zero or not.

$$\text{At } x = -\frac{1}{\sqrt{3}}$$

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

$$\text{At } x = \frac{2}{\sqrt{3}}$$

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

Therefore, we can conclude that $x = -\frac{1}{\sqrt{3}}$ is a zero

of the polynomial $p(x) = 3x^2 - 1$ but $x = \frac{2}{\sqrt{3}}$ is not a zero of the polynomial $p(x) = 3x^2 - 1$.

$$\text{(viii)} \quad p(x) = 2x + 1, \quad x = -\frac{1}{2}$$

We need to check whether $p(x) = 2x + 1$ at $x = -\frac{1}{2}$ is equal to zero or not.

$$p\left(-\frac{1}{2}\right) = 2\left(-\frac{1}{2}\right) + 1 = -1 + 1 = 0$$

Therefore, $x = -\frac{1}{2}$ is a zero of the polynomial

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

Q4. Find the zero of the polynomial in each of the following cases:

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

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

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

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

(v) $p(x) = 3x$

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

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

Ans: (i) $p(x) = x + 5$

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers,

we need to find $p(x) = 0$.

On putting $p(x) = x + 5$ equal to 0, we get

$$x + 5 = 0 \Rightarrow x = -5$$

Therefore, we conclude that the zero of the polynomial $p(x) = x + 5$ is -5 .

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

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers,

we need to find $p(x) = 0$.

On putting $p(x) = x - 5$ equal to 0, we get

$$x - 5 = 0 \Rightarrow x = 5$$

Therefore, we conclude that the zero of the polynomial $p(x) = x - 5$ is 5.

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

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers ,
we need to find $p(x) = 0$.

On putting $p(x) = 2x + 5$ equal to 0, we get

$$2x + 5 = 0 \Rightarrow x = \frac{-5}{2}$$

Therefore, we conclude that the zero of the
polynomial $p(x) = 2x + 5$ is $\frac{-5}{2}$.

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

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers ,
we need to find $p(x) = 0$.

On putting $p(x) = 3x - 2$ equal to 0, we get

$$3x - 2 = 0 \Rightarrow x = \frac{2}{3}$$

Therefore, we conclude that the zero of the
polynomial $p(x) = 3x - 2$ is $\frac{2}{3}$.

(v) $p(x) = 3x$

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers ,
we need to find $p(x) = 0$.

On putting $p(x) = 3x$ equal to 0, we get

$$3x = 0 \Rightarrow x = 0$$

Therefore, we conclude that the zero of the
polynomial $p(x) = 3x$ is 0.

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

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers ,
we need to find $p(x) = 0$.

On putting $p(x) = ax$ equal to 0, we get

$$ax = 0 \Rightarrow x = 0$$

Therefore, we conclude that the zero of the polynomial $p(x) = ax, a \neq 0$ is 0.

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

$ax + b$, where $a \neq 0$ and $b \neq 0$, and a and b are real numbers, we need to find $p(x) = 0$.

On putting $p(x) = cx + d$ equal to 0, we get

$$cx + d = 0$$

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

Therefore, we conclude that the zero of the polynomial $p(x) = cx + d, c \neq 0, c, d$ are real

numbers. is $-\frac{d}{c}$.

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