

Exercise 2.2

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1. Find the value of the polynomial $(x)=5x-4x^2+3$ **(i) $x = 0$** **(ii) $x = -1$** **(iii) $x = 2$** **Solution:**

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

(iii) When $x = 0$

$$\begin{aligned} f(0) &= 5(0) - 4(0)^2 + 3 \\ &= 3 \end{aligned}$$

(ii) When $x = -1$

$$\begin{aligned} f(x) &= 5x - 4x^2 + 3 \\ f(-1) &= 5(-1) - 4(-1)^2 + 3 \\ &= -5 - 4 + 3 \\ &= -6 \end{aligned}$$

(iii) When $x = 2$

$$\begin{aligned} f(x) &= 5x - 4x^2 + 3 \\ f(2) &= 5(2) - 4(2)^2 + 3 \\ &= 10 - 16 + 3 \\ &= -3 \end{aligned}$$

2. Find $p(0)$, $p(1)$ and $p(2)$ for each of the following polynomials:**(i) $p(y) = y^2 - y + 1$** **Solution:**

$$\begin{aligned} p(y) &= y^2 - y + 1 \\ \therefore p(0) &= (0)^2 - (0) + 1 = 1 \\ p(1) &= (1)^2 - (1) + 1 = 1 \\ p(2) &= (2)^2 - (2) + 1 = 3 \end{aligned}$$

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

$$\begin{aligned} p(t) &= 2 + t + 2t^2 - t^3 \\ \therefore p(0) &= 2 + 0 + 2(0)^2 - (0)^3 = 2 \\ p(1) &= 2 + 1 + 2(1)^2 - (1)^3 = 2 + 1 + 2 - 1 = 4 \\ p(2) &= 2 + 2 + 2(2)^2 - (2)^3 = 2 + 2 + 8 - 8 = 4 \end{aligned}$$

(iii) $p(x) = x^3$ **Solution:**

$$\begin{aligned} p(x) &= x^3 \\ \therefore p(0) &= (0)^3 = 0 \end{aligned}$$

$$p(1) = (1)^3 = 1$$
$$p(2) = (2)^3 = 8$$

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

Solution:

$$p(x) = (x-1)(x+1)$$
$$\therefore p(0) = (0-1)(0+1) = (-1)(1) = -1$$
$$p(1) = (1-1)(1+1) = 0(2) = 0$$
$$p(2) = (2-1)(2+1) = 1(3) = 3$$

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

(i) $p(x)=3x+1$, $x=-1/3$

Solution:

$$\text{For, } x = -1/3, p(x) = 3x+1$$
$$\therefore p(-1/3) = 3(-1/3)+1 = -1+1 = 0$$
$$\therefore -1/3 \text{ is a zero of } p(x).$$

(ii) $p(x)=5x-\pi$, $x = 4/5$

Solution:

$$\text{For, } x = 4/5, p(x) = 5x-\pi$$
$$\therefore p(4/5) = 5(4/5)-\pi = 4-\pi$$
$$\therefore 4/5 \text{ is not a zero of } p(x).$$

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

Solution:

$$\text{For, } x = 1, -1;$$
$$p(x) = x^2-1$$
$$\therefore p(1)=1^2-1=1-1 = 0$$
$$p(-1)=(-1)^2-1 = 1-1 = 0$$
$$\therefore 1, -1 \text{ are zeros of } p(x).$$

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

Solution:

$$\text{For, } x = -1, 2;$$
$$p(x) = (x+1)(x-2)$$
$$\therefore p(-1) = (-1+1)(-1-2)$$
$$= (0)(-3) = 0$$
$$p(2) = (2+1)(2-2) = (3)(0) = 0$$
$$\therefore -1, 2 \text{ are zeros of } p(x).$$

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

Solution:

$$\text{For, } x = 0 p(x) = x^2$$
$$p(0) = 0^2 = 0$$
$$\therefore 0 \text{ is a zero of } p(x).$$

(vi) $p(x) = lx+m$, $x = -m/l$

Solution:

For, $x = -m/l$; $p(x) = lx+m$

$\therefore p(-m/l) = l(-m/l)+m = -m+m = 0$

$\therefore -m/l$ is a zero of $p(x)$.

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

Solution:

For, $x = -1/\sqrt{3}$, $2/\sqrt{3}$; $p(x) = 3x^2-1$

$\therefore p(-1/\sqrt{3}) = 3(-1/\sqrt{3})^2-1 = 3(1/3)-1 = 1-1 = 0$

$\therefore p(2/\sqrt{3}) = 3(2/\sqrt{3})^2-1 = 3(4/3)-1 = 4-1=3 \neq 0$

$\therefore -1/\sqrt{3}$ is a zero of $p(x)$ but $2/\sqrt{3}$ is not a zero of $p(x)$.

(viii) $p(x) = 2x+1$, $x = 1/2$

Solution:

For, $x = 1/2$ $p(x) = 2x+1$

$\therefore p(1/2) = 2(1/2)+1 = 1+1 = 2 \neq 0$

$\therefore 1/2$ is not a zero of $p(x)$.

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

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

Solution:

$p(x) = x+5$

$\Rightarrow x+5 = 0$

$\Rightarrow x = -5$

$\therefore -5$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

$p(x) = x-5$

$\Rightarrow x-5 = 0$

$\Rightarrow x = 5$

$\therefore 5$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

$p(x) = 2x+5$

$\Rightarrow 2x+5 = 0$

$\Rightarrow 2x = -5$

$\Rightarrow x = -5/2$

$\therefore x = -5/2$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

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

$$\Rightarrow 3x - 2 = 0$$

$$\Rightarrow 3x = 2$$

$$\Rightarrow x = 2/3$$

$\therefore x = 2/3$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

$$p(x) = 3x$$

$$\Rightarrow 3x = 0$$

$$\Rightarrow x = 0$$

$\therefore 0$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

$$p(x) = ax$$

$$\Rightarrow ax = 0$$

$$\Rightarrow x = 0$$

$\therefore x = 0$ is a zero polynomial of the polynomial $p(x)$.

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

Solution:

$$p(x) = cx + d$$

$$\Rightarrow cx + d = 0$$

$$\Rightarrow x = -d/c$$

$\therefore x = -d/c$ is a zero polynomial of the polynomial $p(x)$.