

Exercise 2.2

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

Solution:

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

(i) When $x = 0$

$$f(0) = 5(0) - 4(0)^2 + 3$$

$$= 3$$

(ii) When $x = -1$

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

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

$$= -5 - 4 + 3$$

$$= -6$$

(iii) When $x = 2$

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

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

$$= 10 - 16 + 3$$

$$= -3$$

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

Solution:

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

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

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

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

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

Solution:

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

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

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

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

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

Solution:

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

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

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

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

(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:

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

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

 $\therefore -1/3$ is a zero of $p(x)$.

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

Solution:

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

$$\therefore p(4/5) = 5(4/5)-\pi = 4-\pi$$

 $\therefore 4/5$ is not a zero of $p(x)$.

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

Solution:

For, $x = 1, -1;$

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

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

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

 $\therefore 1, -1$ are zeros of $p(x)$.

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

Solution:

For, $x = -1, 2$;

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

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

$$= (0)(-3) = 0$$

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

 $\therefore -1, 2$ are zeros of $p(x)$.

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

Solution:

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

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

 $\therefore 0$ 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 $p(x)$.