Polynomial Exercise -2

Question 1:

Find the value of the polynomial $P(x)= 5x-4x^2+3$ at

(i) $x = 0$ (ii) $x = -1$ (iii) $x = 2$

Solution:

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

$P(0)= 0-0+3=3$

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

$P(-1) =-5-4+3=-6$

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

$P(2)= 10-16+3=-3$

Question 2

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

Solution:

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

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

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

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

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

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

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

$= 2 + 1 + 2 - 1 = 4$

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

$= 2 + 2 + 8 - 8 = 4$

(iii) $p(x) = x^3$
$p(0) = (0)^3 = 0$
$p(1) = (1)^3 = 1$
$p(2) = (2)^3 = 8$

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

Question 3

Verify whether the following are zeroes of the polynomial, indicated against them.
(i) $p(x) = 3x + 1, x = -1/3$
3 (ii) $p(x) = 5x - \pi, x = 4/5$
(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) $p(x) = lx + m, x = -m/l$
(vii) $p(x) = 3x^2 - 1, x = -1/\sqrt{3}$ and $2/\sqrt{3}$
(viii) $p(x) = 2x + 1, x = 1/2$

Solution:
(i) $p(x) = 3x + 1, x = -1/3$
$p(-1/3) = 3(-1/3) + 1 = -1 + 1 = 0$
p(-1/3) = 0 which means that -1 /3is zero of the polynomial $p(x) = 3x+1$.
(ii) $p(x) = 5x - \pi$, $x = 4/5$
$p(4/5) = 5(4/5) - \pi = 4 - \pi$
$p(4/5) \neq 0$ which means that 4/5 is not zero of the polynomial $p(x) = 5x - \pi$.

(iii) $p(x) = x^2 - 1, x = 1, -1$
$p(1) = 1^2 - 1 = 1 - 1 = 0$
$p(-1) = (-1)^2 - 1 = 1 - 1 = 0$
Both p(1) and p(−1) are equal to 0. It means that 1 and -1 are zeroes of the polynomial $p(x) = x^2 - 1$.

(iv) $p(x) = (x+1)(x-2), x = -1, 2$
$p(-1) = (-1+1)(-1-2) = 0 \times -3 = 0$
$p(2) = (2+1)(2-2) = 3 \times 0 = 0$
Both p(−1) and p(2) are equal to 0. It means that -1 and 2 are zeroes of the polynomial $p(x) = (x+1)(x-2)$.

(v) $p(x) = x^2, x = 0$
$p(0) = 0^2 = 0$
p(0) = 0 which means that 0 is the zero of the polynomial $p(x) = x^2$.

(vi) $p(x) = lx + m, x = = -m/$
$p(-m/l) = l(-m/l) + m = -m + m = 0$
p(-m/l) = 0 which means that (–m/l) is zero of the polynomial $p(x) = lx + m$

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

$p(-1/\sqrt{3}) = 3(-1/\sqrt{3})^2 - 1 = 3(1/3) - 1 = 1 - 1 = 0$
$p(2/\sqrt{3}) = 3(2/\sqrt{3})^2 - 1 = 3 \times (4/3) - 1 = 4 - 1 = 3$
$p(-1/\sqrt{3}) = 0$ which means that $-1/\sqrt{3}$ is zero of the polynomial $p(x) = 3x^2 - 1$.
$p(2/\sqrt{3}) \neq 0$ which means that $2/\sqrt{3}$ is not zero of the polynomial $p(x) = 3x^2 - 1$.

(viii) $p(x) = 2x + 1$,$x = 1/2$
$p(1/2) = 2 \times (1/2) + 1 = 1 + 1 = 2$
$p(1/2) \neq 0$. It means that 1/2 is not zero of the polynomial $p(x) = 2x + 1$.

4. 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.

Solution:

Zero of a polynomial is that value of the variable at which the value of the polynomial is obtained as 0.
(i) $p(x) = x + 5$
$p(x) = 0$
$x + 5 = 0$
$x = -5$
Therefore, for $x = -5$, the value of the polynomial is 0 and hence, $x = -5$ is a zero of the given polynomial.

(ii) $p(x) = x - 5$
$p(x) = 0$
$x - 5 = 0$
$x = 5$
Therefore, for $x = 5$, the value of the polynomial is0 and hence, $x = 5$ is a zero of the given polynomial.

(iii) $p(x) = 2x + 5$
$p(x) = 0$
$2x + 5 = 0$
$2x = -5$
$x = -5/2$
Therefore, for $x = -5/2$, the value of the polynomial is 0 and hence, $x = -5/2$ is a zero of the given polynomial.
(iv) $p(x) = 3x - 2$
$p(x) = 0$
$3x - 2 = 0$
$x = 2/3$, so $2/3$ is the zero of the polynomial

(v) $p(x) = 3x$
$p(x) = 0$
$3x = 0$
$x = 0$
So $x = 0$ is the zero of the polynomial

(vi) $p(x) = ax$

p(x) = 0
ax = 0
x = 0
Therefore, for x = 0, the value of the polynomial is 0 and hence, x = 0 is a zero of the given polynomial.

(vii) p(x) = cx + d
p(x) = 0
cx+ d = 0
x=-d/c