CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 2

Polynomials(Ex. 2.2)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

$$p\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right) - \pi = 4 - \pi \; p(x) = 2x + 1, x = \frac{1}{2}$$

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

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 $p(x)=x^2$.

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

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 $p(x)=lx+m$.

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

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.

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

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

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

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

We need to check $p(x)=2x+1, x=\frac{1}{2}$ whetheris equal to zero or not.

Therefore $p\left(\frac{1}{2}\right)=2\left(\frac{1}{2}\right)+1=2$, As $p\left(\frac{1}{2}\right)\neq 0$, $\frac{1}{2}$

is not the zero of P(x)

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.**

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

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

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

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

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

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

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

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

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

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

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

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

Therefore, we conclude that the zero of the polynomial $p(x) = ax, a \neq 0$ is0.

(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

$cx + d = 0$

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

Therefore, we conclude that the zero of the polynomial $p(x) = cx + d, c \neq 0,\ c, d$ are real numbers. is $-\frac{d}{c}$.