CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 2

Polynomials(Ex. 2.3)

1. Find the remainder when x^3+3x^2+3x+1 is divided by

(i) $x+1$

(ii) $x-\frac{1}{2}$

(iii) x

(iv) $x+\pi$

(v) $5+2x$

Ans. (i) $x+1$

We need to find the zero of the polynomial $x+1$.

$x+1=0 \qquad \Rightarrow x=-1$

While applying the remainder theorem, we need to put the zero of the polynomial $x+1$ in the polynomial x^3+3x^2+3x+1 , to get

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

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

=-1+3-3+1

=0

Therefore, we conclude that on dividing the polynomial x^3+3x^2+3x+1 by $x+1$, we will get the remainder as 0.

(ii) $x-\frac{1}{2}$

We need to find the zero of the polynomial $x-\frac{1}{2}$.

$x-\frac{1}{2}=0 \qquad \Rightarrow x=\frac{1}{2}$

While applying the remainder theorem, we need to put the zero of the polynomial $x-\frac{1}{2}$ in the polynomial x^3+3x^2+3x+1, to get

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

$p\left(\frac{1}{2}\right)=\left(\frac{1}{2}\right)^3+3\left(\frac{1}{2}\right)^2+3\left(\frac{1}{2}\right)+1$

$=\frac{1}{8}+3\left(\frac{1}{4}\right)+\frac{3}{2}+1$

$=\frac{1+6+12+8}{8}$

$=\frac{27}{8}$

Therefore, we conclude that on dividing the polynomial x^3+3x^2+3x+1 by $x-\frac{1}{2}$, we will get the remainder as $\frac{27}{8}$.

(iii) x

We need to find the zero of the polynomial x.

$x=0$

While applying the remainder theorem, we need to put the zero of the polynomial x in the polynomial x^3+3x^2+3x+1, to get

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

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

=0+0+0+1

=1

Therefore, we conclude that on dividing the polynomial x^3+3x^2+3x+1 by x, we will get the remainder as 1.

(iv) $x+\pi$

We need to find the zero of the polynomial $x+\pi$.

$$x+\pi=0 \qquad \Rightarrow x=-\pi$$

While applying the remainder theorem, we need to put the zero of the polynomial $x+\pi$ in the polynomial x^3+3x^2+3x+1, to get

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

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

$$=-\pi^3+3\pi^2-3\pi+1.$$

Therefore, we conclude that on dividing the polynomial x^3+3x^2+3x+1 by $x+\pi$, we will get the remainder as $-\pi^3+3\pi^2-3\pi+1$.

(v) $5+2x$

We need to find the zero of the polynomial $5+2x$.

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

While applying the remainder theorem, we need to put the zero of the polynomial $5+2x$ in the polynomial x^3+3x^2+3x+1, to get

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

$$p\left(-\frac{5}{2}\right)=\left(-\frac{5}{2}\right)^3+3\left(-\frac{5}{2}\right)^2+3\left(-\frac{5}{2}\right)+1$$

$$=-\frac{125}{8}+3\left(\frac{25}{4}\right)-\frac{15}{2}+1$$

$$=-\frac{125}{8}+\frac{75}{4}-\frac{15}{2}+1$$

$$=\frac{-125+150-60+8}{8}$$

$$=-\frac{27}{4}.$$

Therefore, we conclude that on dividing the polynomial x^3+3x^2+3x+1 by $5+2x$, we will get the remainder as $-\frac{27}{4}$.

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2. Find the remainder when x^3-ax^2+6x-a is divided by $x-a$.

Ans. We need to find the zero of the polynomial $x-a$.

$$x-a=0 \qquad \Rightarrow x=a$$

While applying the remainder theorem, we need to put the zero of the polynomial $x-a$ in the polynomial x^3-ax^2+6x-a, to get

$$p(x)=x^3-ax^2+6x-a$$

$$p(a)=(a)^3-a(a)^2+6(a)-a$$

$= a^3 - a^3 + 6a - a$

= 5a

Therefore, we conclude that on dividing the polynomial $x^3 - ax^2 + 6x - a$ by $x - a$, we will get the remainder as $5a$.

3. Check whether $7 + 3x$ is a factor of $3x^3 + 7x$.

Ans. We know that if the polynomial $7 + 3x$ is a factor of $3x^3 + 7x$, then on dividing the polynomial $3x^3 + 7x$ by $7 + 3x$, we must get the remainder as 0.

We need to find the zero of the polynomial $7 + 3x$.

$$7 + 3x = 0 \qquad \Rightarrow x = -\frac{7}{3}$$

While applying the remainder theorem, we need to put the zero of the polynomial $7 + 3x$ inthe polynomial $3x^3 + 7x$, to get

$$p(x) = 3x^3 + 7x$$

$$= 3\left(-\frac{7}{3}\right)^3 + 7\left(-\frac{7}{3}\right) = 3\left(-\frac{343}{27}\right) - \frac{49}{3}$$

$$= -\frac{343}{9} - \frac{49}{3} = \frac{-343 - 147}{9}$$

$$= \frac{-490}{9}.$$

We conclude that on dividing the polynomial $3x^3 + 7x$ by $7 + 3x$, we will get the remainder as $\frac{-490}{9}$, which is not 0.

Therefore, we conclude that $7 + 3x$ is not a factor of $3x^3 + 7x$.