

NCERT Solutions for Class 9 Maths Chapter 2 Polynomials Ex 2.3

Question 1.

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

(i) $x + 1$

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

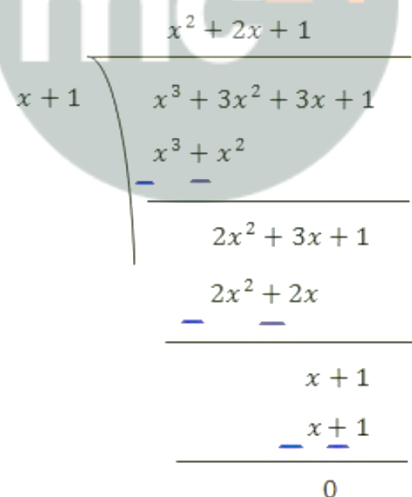
(iii) x

(iv) $x + \pi$

(v) $5 + 2x$

Solution:

(i) By long division method, we have



The image shows a long division problem. On the left, the divisor is $x + 1$. To its right, the dividend is $x^3 + 3x^2 + 3x + 1$. The first step shows $x^2 + 2x + 1$ as the quotient for the first three terms, with a subtraction line below it. The next step shows $x^3 + x^2$ being subtracted from the dividend, leaving a remainder of $2x^2 + 3x + 1$. Then, $2x^2 + 2x$ is subtracted from the remainder, leaving $x + 1$. Finally, $x + 1$ is subtracted from the remainder, leaving 0.

$$\begin{array}{r} x^2 + 2x + 1 \\ x + 1 \overline{) x^3 + 3x^2 + 3x + 1} \\ \underline{x^3 + x^2} \\ 2x^2 + 3x + 1 \\ \underline{2x^2 + 2x} \\ x + 1 \\ \underline{x + 1} \\ 0 \end{array}$$

Therefore, the remainder is 0

(ii) By long division method, we have

$$\begin{array}{r}
 x^2 + \frac{7}{2}x + \frac{19}{4} \\
 \hline
 x - \frac{1}{2} \overline{) \begin{array}{l} x^3 + 3x^2 + 3x + 1 \\ x^3 - \frac{x^2}{2} \\ \hline \frac{7}{2}x^2 + 3x + 1 \\ \frac{7}{2}x^2 - \frac{7}{4}x \\ \hline \frac{19}{4}x + 1 \\ \frac{19}{4}x - \frac{19}{8} \\ \hline \frac{27}{8} \end{array}}
 \end{array}$$

Therefore, the remainder is $\frac{27}{8}$

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(iii)

$$\begin{array}{r}
 x^2 + 3x + 3 \\
 \hline
 x \overline{) \begin{array}{l} x^3 + 3x^2 + 3x + 1 \\ x^3 \\ \hline 3x^2 + 3x + 1 \\ 3x^2 \\ \hline 3x + 1 \\ 3x \\ \hline 1 \end{array}}
 \end{array}$$

Therefore, the remainder is 1

(iv)

$$\begin{array}{r}
 x^2 + (3 - \pi)x + (3 - 3\pi + \pi^2) \\
 \hline
 x + \pi \overline{) \begin{array}{l} x^3 + 3x^2 + 3x + 1 \\ x^3 + \pi x^2 \\ \hline (3 - \pi)x^2 + 3x + 1 \\ (3 - \pi)x^2 + (3 - \pi)\pi x \\ \hline [3 - 3\pi + \pi^2]x + 1 \\ [3 - 3\pi + \pi^2]x + (3 - 3\pi + \pi^2)\pi \\ \hline [1 - 3\pi + 3\pi^2 - \pi^3] \end{array}} \\
 \hline
 \end{array}$$

Therefore, the remainder is $[1 - 3\pi + 3\pi^2 - \pi^3]$

(v)

$$\begin{array}{r}
 \frac{x^2}{2} + \frac{x}{4} + \frac{7}{8} \\
 \hline
 2x + 5 \overline{) \begin{array}{l} x^3 + 3x^2 + 3x + 1 \\ x^3 + \frac{5}{2}x^2 \\ \hline \frac{x^2}{2} + 3x + 1 \\ \frac{x^2}{2} + \frac{5x}{4} \\ \hline \frac{7x}{4} + 1 \\ \frac{7}{4}x + \frac{35}{8} \\ \hline -\frac{27}{8} \end{array}} \\
 \hline
 \end{array}$$

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Question 2.

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

Solution:

By long division method, we have

$$\begin{array}{r}
 x^2 + 6 \\
 x - a \overline{) x^3 - ax^2 + 6x - a} \\
 \underline{x^3 - ax^2} \\
 6x - a \\
 \underline{6x - 6a} \\
 5a
 \end{array}$$

Therefore, remainder obtained is $5a$ when $x^3 - ax^2 + 6x - a$ is divided by $x - a$

Question 3.

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

Solution:

We have to divide $3x^3 + 7x$ by $7 + 3x$

If remainder comes out be 0 then $7 + 3x$ will be a factor of $3x^3 + 7x$

By long division method,

$$\begin{array}{r}
 x^2 - \frac{7}{3}x + \frac{70}{9} \\
 \hline
 3x - 7 \overline{) 3x^3 + 0x^2 + 7x} \\
 \underline{3x^3 + 7x^2} \\
 -7x^2 + 7x \\
 \underline{-7x^2 - \frac{49x}{3}} \\
 \frac{70x}{3} \\
 \underline{\frac{70x}{3} + \frac{490}{9}} \\
 -\frac{490}{9}
 \end{array}$$

As remainder is not zero so $7 + 3x$ is not a factor of $3x^3 + 7x$

