



NCERT Solutions For Class 10 Maths Polynomials Exercise 2.3

Q 1. Divide the polynomial $p(x)$ by the polynomial $g(x)$ and find the quotient and remainder in each of the following:

(i) $p(x) = x^3 - 3x^2 + 5x - 3$, $g(x) = x^2 - 2$

(ii) $p(x) = x^4 - 3x^2 + 4x + 5$, $g(x) = x^2 + 1 - x$

(iii) $p(x) = x^4 - 5x + 6$, $g(x) = 2 - x^2$

Answer :

(i) $p(x) = x^3 - 3x^2 + 5x - 3$
 $q(x) = x^2 - 2$

$$\begin{array}{r} x-3 \\ x^2-2 \overline{) x^3-3x^2+5x-3} \\ \underline{x^3 \quad \quad -2x} \\ -3x^2+7x-3 \\ \underline{-3x^2 \quad +6} \\ 7x-9 \end{array}$$

Quotient = $x - 3$

Remainder = $7x - 9$

$$(ii) \quad p(x) = x^4 - 3x^2 + 4x + 5 = x^4 + 0.x^3 - 3x^2 + 4x + 5$$

$$q(x) = x^2 + 1 - x = x^2 - x + 1$$

$$\begin{array}{r}
 x^2 + x - 3 \\
 x^2 - x + 1 \overline{) x^4 + 0.x^3 - 3x^2 + 4x + 5} \\
 \underline{x^4 - x^3 + x^2} \\
 x^3 - 4x^2 + 4x + 5 \\
 \underline{x^3 - x^2 + x} \\
 -3x^2 + 3x + 5 \\
 \underline{-3x^2 + 3x - 3} \\
 8
 \end{array}$$

$$\text{Quotient} = x^2 + x - 3$$

$$\text{Remainder} = 8$$

$$(iii) \quad p(x) = x^4 - 5x + 6 = x^4 + 0.x^2 - 5x + 6$$

$$q(x) = 2 - x^2 = -x^2 + 2$$

$$\begin{array}{r}
 -x^2 - 2 \\
 -x^2 + 2 \overline{) x^4 + 0.x^2 - 5x + 6} \\
 \underline{x^4 - 2x^2} \\
 2x^2 - 5x + 6 \\
 \underline{2x^2 - 4} \\
 -5x + 10
 \end{array}$$

$$\text{Quotient} = -x^2 - 2$$

$$\text{Remainder} = -5x + 10$$

Q 2 . Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in each case:

(i) $2x^3 + x^2 - 5x + 2$; $\frac{1}{2}, 1, -2$

(ii) $x^3 - 4x^2 + 5x - 2$; $2, 1, 1$

Answer :

(i) $p(x) = 2x^3 + x^2 - 5x + 2$.

Zeroes for this polynomial are $\frac{1}{2}, 1, -2$

$$\begin{aligned} p\left(\frac{1}{2}\right) &= 2\left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^2 - 5\left(\frac{1}{2}\right) + 2 \\ &= \frac{1}{4} + \frac{1}{4} - \frac{5}{2} + 2 \\ &= 0 \end{aligned}$$

$$\begin{aligned} p(1) &= 2 \times 1^3 + 1^2 - 5 \times 1 + 2 \\ &= 0 \end{aligned}$$

$$\begin{aligned} p(-2) &= 2(-2)^3 + (-2)^2 - 5(-2) + 2 \\ &= -16 + 4 + 10 + 2 = 0 \end{aligned}$$

Therefore, $\frac{1}{2}$, 1, and - 2 are the zeroes of the given polynomial.

Comparing the given polynomial with $ax^3 + bx^2 + cx + d$, we obtain $a = 2$, $b = 1$, $c = -5$, $d = 2$

We can take $\alpha = \frac{1}{2}$, $\beta = 1$, $\gamma = -2$

$$\alpha + \beta + \gamma = \frac{1}{2} + 1 + (-2) = -\frac{1}{2} = \frac{-b}{a}$$

$$\alpha\beta + \beta\gamma + \alpha\gamma = \frac{1}{2} \times 1 + 1(-2) + \frac{1}{2}(-2) = \frac{-5}{2} = \frac{c}{a}$$

$$\alpha\beta\gamma = \frac{1}{2} \times 1 \times (-2) = \frac{-1}{1} = \frac{-(2)}{2} = \frac{-d}{a}$$

Therefore, the relationship between the zeroes and the coefficients is verified.

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

Zeroes for this polynomial are 2, 1, 1.

$$\begin{aligned} p(2) &= 2^3 - 4(2^2) + 5(2) - 2 \\ &= 8 - 16 + 10 - 2 = 0 \end{aligned}$$

$$\begin{aligned} p(1) &= 1^3 - 4(1)^2 + 5(1) - 2 \\ &= 1 - 4 + 5 - 2 = 0 \end{aligned}$$

Therefore, 2, 1, 1 are the zeroes of the given polynomial.

Comparing the given polynomial with $ax^3 + bx^2 + cx + d$, we obtain $a = 1$, $b = -4$, $c = 5$, $d = -2$.

Verification of the relationship between zeroes and coefficient of the given polynomial

$$\text{Sum of zeroes} = 2 + 1 + 1 = 4 = \frac{-(-4)}{1} = \frac{-b}{a}$$

Multiplication of zeroes taking two at a time = (2)

$$(1) + (1)(1) + (2)(1) = 2 + 1 + 2 = 5 = \frac{(5)}{1} = \frac{c}{a}$$

Multiplication of zeroes = $2 \times 1 \times 1 = 2$

$$= \frac{-(-2)}{1} = \frac{-d}{a}$$

Hence, the relationship between the zeroes and the coefficients is verified.

***** END *****