

Mathematics

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(Chapter – 2) (Polynomials)(Exemplar Problems)

(Class – X)

Exercise 2.4

Question 4:

Find k , so that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$. Also, find all the zeroes of the two polynomials.

Answer 4:

Given that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$, then applying division algorithm,

$$\begin{array}{r} 2x^2 - 3x - (2k + 8) \\ x^2 + 2x + k \overline{) 2x^4 + x^3 - 14x^2 + 5x + 6} \\ \underline{- 2x^4 \pm 4x^3 \pm 2kx^2} \\ -3x^3 - (2k + 14)x^2 + 5x + 6 \\ \underline{+ 3x^3 + 6x^2 \mp 3kx} \\ - (2k + 8)x^2 + (5 + 3k)x + 6 \\ \underline{+ (2k + 8)x^2 \mp (16 + 4k)x \mp (2k^2 + 8k)} \\ (21 + 7k)x + (2k^2 + 8k + 6) \end{array}$$

Since, $(x^2 + 2x + k)$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$.

So, when we apply division algorithm remainder should be zero.

$$\therefore (7k + 21) = 0 \text{ and } (2k^2 + 8k + 6) = 0$$

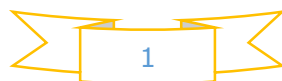
$$\Rightarrow 7k + 21 = 0 \text{ and } 2k^2 + 8k + 6 = 0$$

$$\Rightarrow k = -3 \text{ and } k^2 + 4k + 3 = 0$$

$$\Rightarrow k = -3 \text{ and } k^2 + 3k + k + 3 = 0$$

$$\Rightarrow k = -3 \text{ and } k(k + 3) + 1(k + 3) = 0$$

$$\Rightarrow k = -3 \text{ and } (k + 1)(k + 3) = 0$$



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$$\Rightarrow k = -3 \text{ and } k = -1 \text{ or } -3$$

Here, only $k = -3$ satisfy the required condition.

Thus, the required value of k is -3 .

Now, Dividend = Divisor \times Quotient + Remainder

$$\Rightarrow 2x^4 + x^3 - 14x^2 + 5x + 6 = (x^2 + 2x - 3)(2x^2 - 3x - 2) + 0$$

Using factorization method,

$$(x^2 + 3x - x - 3)(2x^2 - 4x + x - 2)$$

$$= \{x(x + 3) - 1(x + 3)\}\{2x(x - 2) + 1(x - 2)\}$$

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

Hence, the zeroes of $x^2 + 2x - 3$ are $1, -3$ and the zeroes of $2x^2 + x^3 - 14x^2 + 5x + 6$ are $1, -3, 2, -\frac{1}{2}$.

