

Mathematics

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

(Class – X)

Exercise 2.4

Question 2:

If the zeroes of the cubic polynomial $x^3 - 6x^2 + 3x + 10$ are of the form a , $a + b$ and $a + 2b$ for some real numbers a and b , find the values of a and b as well as the zeroes of the given polynomial.

Answer 2:

$$\text{Let } f(x) = x^3 - 6x^2 + 3x + 10$$

Given that, a , $a + b$ and $a + 2b$ are the zeroes of $f(x)$. Then,

$$\text{Sum of the zeroes} = -\frac{(\text{Coefficient of } x^2)}{(\text{coefficient of } x^3)}$$

$$\Rightarrow a + (a + b) + (a + 2b) = -\frac{(-6)}{1}$$

$$\Rightarrow 3a + 3b = 6$$

$$\Rightarrow a + b = 2$$

$$\text{Sum of product of zeroes taking two at a time} = \left(\frac{\text{coefficient of } x}{\text{coefficient of } x^3}\right)$$

$$\Rightarrow a(a + b) + (a + b)(a + 2b) + a(a + 2b) = \frac{3}{1}$$

$$\Rightarrow a(a + b) + (a + b)\{(a + b) + b\} + a\{(a + b) + b\} = 3$$

$$\Rightarrow 2a + 2(2 + b) + a(2 + b) = 3 \quad [\text{Since } a + b = 2]$$

$$\Rightarrow 2a + 2(2 + 2 - a) + a(2 + 2 - a) = 3 \quad [\text{Since } b = 2 - a]$$

$$\Rightarrow 2a + 8 - 2a + 4a - a^2 = 3$$

$$\Rightarrow a^2 + 8 = 3 - 4a$$

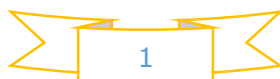
$$\Rightarrow a^2 - 4a - 5 = 0$$

Using factorization method,

$$a^2 - 5a + a - 5 = 0$$

$$\Rightarrow a(a - 5) + 1(a - 5) = 0$$

$$\Rightarrow (a - 5)(a + 1) = 0$$



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$$\Rightarrow a = -1 \text{ or } a = 5$$

When $a = -1$, then $b = 3$

When $a = 5$, then $b = -3$

\therefore required zeroes of $f(x)$ are when $a = -1$ and $b = 3$

Then, $a, (a + b), (a + 2b) = -1, (-1 + 3), (-1 + 6) = -1, 2, 5$

When $a = 5$ and $b = -3$, then

$a, (a + b), (a + 2b) = 5, (5 - 3), (5 - 6) = 5, 2, -1.$

Hence, the required values of a and b are -1 and 3 or 5 and -3 and the zeroes are $-1, 2$ and 5 .

