ASSIGNMENT 1 : QUESTION 11 (A)

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Question :

Using the Remainder theorem find the remainders obtained when $x^3 + (kx + 8)x + k$ is divided by $x + 1$ and $x - 2$.

Hence find k if the sum of the two remainders is 1.

Given:

- $f(x) = x^3 + (kx + 8)x + k$
- Sum of remainders of $f(x)$ after dividing by $(x + 1)$ and $(x - 2)$ is 1

Find:

- Remainders of $f(x)$ after dividing by $(x + 1)$ and $(x - 2)$
- The value of k

Solution :

By the remainder theorem,
The remainder after dividing a polynomial $p(x)$ by $(x - r)$ is equal to $p(r)$.

Therefore,

(1) $\quad f(x) \mod (x + 1) = f(-1)$

(2) $\quad f(x) \mod (x - 2) = f(2)$

(3)
$$f(-1) = (-1)^3 + (k(-1) + 8) * (-1) + k$$

(4) $\quad = -1 + k - 8 + k$

(5) $\quad = \underline{2k - 9}$

$$f(2) = 2^3 + (2k + 8) \cdot 2 + k \qquad = 8 + 4k + 16 + k =$$

Given that $(2k - 9) + (5k + 24) = 1$
Rearranging, we get $7k = -14$

Therefore

(10) $\quad \underline{k = -2}$

Substituting the value of k, we get

(11) $\quad 2k - 9 = -13$

(12) $\quad 5k + 24 = 14$

Therefore, the remainders are :

(13) $\quad f(x) \mod (x + 1) = -13$

(14) $\quad f(x) \mod (x - 2) = 14$