

ASSIGNMENT 1 : QUESTION 11
(A)

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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,

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

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

$$(3)$$

$$(4)$$

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

$$(5) \quad = -1 + k - 8 + k$$

$$(6) \quad = \underline{2k - 9}$$

$$(7)$$

$$(8) \quad f(2) = 2^3 + (2k + 8) \cdot 2 + k$$

$$(9) \quad = 8 + 4k + 16 + k$$

$$(10) \quad = \underline{5k + 24}$$

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

Therefore $k = -2$

Substituting the value of k , we get

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

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

$$(13)$$

Therefore, the remainders are :

$$(14) \quad f(x) \mod (x + 1) = -13$$

$$(15) \quad f(x) \mod (x - 2) = 14$$