

Congratulations

ON YOUR CONVOCAATION
CEREMONY

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LELEKUMO TAM MAT102 ASSIGNMENT

IAANUSOLIAA MECHANICAL ENGINEERING

QUESTION

$$1. \text{ If } A = 4i + j - 2k \quad B = 3i - 2j + k \quad C = i - 2k$$

a, $(A - 2B) \times C$

$$\Rightarrow 4i + j - 2k - 2(3i - 2j + k) \times C$$

$$\Rightarrow (4i + j - 2k - 6i + 4j - 2k) \times C$$

$$\Rightarrow -2i + 5j - 4k (i - 2k)$$

$$\Rightarrow i(-2i + 5j - 4k) - 2k(-2i + 5j - 4k)$$

$$\Rightarrow -2i^2 + 5ij - 4ik - 10jk + 8k^2$$

$$\Rightarrow -2i^2 + 5ij - 10jk + 8k^2 //$$

b, $A \times (2C \times 3B)$

$$2(i - 2k) \times 3(3i - 2j + k)$$

$$(2i - 4k)(9i - 6j + 3k)$$

$$2i(9i - 6j + 3k) - 4k(9i - 6j + 3k)$$

$$18i^2 - 12ij + 6ik - 36ik + 24jk - 12k^2$$

$$\rightarrow 18i^2 - 12ij - 30ik + 24jk - 12k^2$$

$$4i + j - 2k (18i^2 - 12ij - 30ik + 24jk - 12k^2)$$

$$\begin{aligned}
 & 4i(18i^2 - 12ij - 30ik + 24jk - 12k^2) + j(18i^2 - 12ij - 30ik + 24jk - 12k^2) \\
 & - 2k(18i^2 - 12ij - 30ik + 24jk - 12k^2) \\
 \Rightarrow & 72i^3 - 48i^2j - 120i^2k + 96ijk - 48ik^2 + 18i^2j - 12ij^2 \\
 & - 30ijk + 24j^2k - 12jk^2 - 36i^2k + 24ijk + 6ik^2 + \\
 & 48jk^2 + 24k^3 \\
 \Rightarrow & 72i^3 - 30i^2j - 156i^2k + 90ijk + 12ik^2 - 12ij^2 + \\
 & 24j^2k - 60jk^2 + 24k^3 //
 \end{aligned}$$

QUESTION 2, $A = pi - 6j - 3k$ $B = 4i + 3j - k$ $C = i - 3j + 2k$

If A, B and C are coplanar,

$$A \cdot (B \times C) = 0$$

$$A \cdot (B \times C) = \begin{vmatrix} pi - 6j - 3k & i & j & k \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$$

$$= p \begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} - 6 \begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3 \begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix}$$

$$= p(6 - 3) - 6(8 - -1) - 3(-12 - 3)$$

$$0 = 3p - 54 + 45$$

$$\begin{aligned} 3p &= -9 \\ \underline{\underline{3}} & \quad \underline{\underline{-3}} \end{aligned}$$

$$p = 3$$

\therefore The value for which A, B and C are coplanar is $p = 3 //$