Ajayi Morosogofiluwa Goodness
Computer Engineering
19/ENG02/006

Maths 102 assignment.

1) If $A = 4i + j - 2k$, $B = 3i - 2j + k$ and $C = i - 2k$. Find:

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

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

Solution.

a) $A = 4i + j - 2k$

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

$A - 2B = (4i + j - 2k) - (6i - 4j + 2k)$

$A - 2B = -2i + 5j - 4k$

$C = i - 2k$

$$(A - 2B) \times C = \begin{vmatrix} \overset{+}{i} & \overset{-}{j} & \overset{+}{k} \\ -2 & 5 & -4 \\ 1 & 0 & -2 \end{vmatrix}$$

$$(A - 2B) \times C = i \begin{vmatrix} 5 & -4 \\ 0 & -2 \end{vmatrix} - j \begin{vmatrix} -2 & -4 \\ 1 & -2 \end{vmatrix} + k \begin{vmatrix} -2 & 5 \\ 1 & 0 \end{vmatrix}$$

$(A - 2B) \times C = (-10 - 0)i - j(4 + 4) + k(0 - 5)$

$(A - 2B) \times C = -10i - 5j - 5k$

$\therefore (A - 2B) \times C = -10i - 8j - 5k$

(b) $2C = 2(i - 2k) = 2i - 4k$

~~$3B = 3(4i + 3j - k) = 12i + 9j - 3k$~~

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

$$2C \times 3B = \begin{vmatrix} i & j & k \\ 2 & 0 & -4 \\ 9 & -6 & 3 \end{vmatrix}$$

$$2C \times 3B = i\begin{vmatrix} 0 & -4 \\ -6 & 3 \end{vmatrix} - j\begin{vmatrix} 2 & -4 \\ 9 & 3 \end{vmatrix} + k\begin{vmatrix} 2 & 0 \\ 9 & -6 \end{vmatrix}$$

$2C \times 3B = i(0 - 24) - j(6 + 36) + k(-12 - 0)$

$2C \times 3B = -24i - 42j - 12k$

~~$A \times (2C \times 3B)$~~

$A = 4i + j - 2k$

$2C \times 3B = -24i - 42j - 12k$

$$A \times (2C \times 3B) = \begin{vmatrix} i & j & k \\ 4 & 1 & -2 \\ -24 & -42 & -12 \end{vmatrix}$$

$$A \times (2C \times 3B) = i\begin{vmatrix} 1 & -2 \\ -42 & -12 \end{vmatrix} - j\begin{vmatrix} 4 & -2 \\ -24 & -12 \end{vmatrix} + k\begin{vmatrix} 4 & 1 \\ -24 & -42 \end{vmatrix}$$

$A \times (2C \times 3B) = i(-12 - 84) - j(-48 - 48) + k(-168 + 24)$

$A \times (2C \times 3B) = -96i + 96j - 144k$

3. $A = pi - 6j - 3k$, $B = 4i + 3j - k$ and $C = i - 3j + 2k$. Find the value of p for which A, B and C are co-planer.

Solution: when A, B and C are coplanar

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

$$A \cdot (B \times C) = \begin{vmatrix} p & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix} = 0$$

$$A \cdot (B \times C) = p\begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} + 6\begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3\begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix} = 0$$

$A \cdot (B \times C) = p(6 - 3) + 6(8 + 1) - 3(-12 - 3) = 0$

$A \cdot (B \times C) = 3p + 54 + 45 = 0$

$3p + 99 = 0$

$3p = -99$

$p = -99/3$

$p = -33$