Akure Daniel .O
Elect/Elect Engr
19/ENG04/004
S/N: 12

MAT 102

Questions

1 If $A = 4i + j - 2k$

$B = 3i - 2j + k$

$C = i - 2k$

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

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

Solution

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

$(A - 2B)$

$= 4i + j - 2k - (6i - 4j + 2k) = -2i + 5j - 4k$

$(A - 2B) \times C$

$$= \begin{vmatrix} + & - & + \\ i & j & k \\ -2 & 5 & -4 \\ 1 & 0 & -2 \end{vmatrix}$$

$i(-10 - 0) - j(4 - (-4)) + k(0 - 5)$

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

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

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

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

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

$i(0 - 24) - j(6 - (-36)) + k(-12 - 9)$

$(2C \times 3B) = -24i - 42j - 21k$ //

$$A \times (2C \times 3B) = \begin{vmatrix} i & j & k \\ 4 & 1 & -2 \\ -24 & -42 & -21 \end{vmatrix}$$

$i(-21 - (84)) - j(-84 + 48) + k(-168 - (-24))$

$= -105i + 36j - 144k$ //

$\therefore A \times (2C \times 3B) = -105i + 36j - 144k$ //

Questions

2 $A = Pi - 6j - 3k$;

$B = 4i + 3j - k$

$C = i - 3j + 2k$

Find the value of "P" for which A, B and C are co-plana

Solution

Vectors A, B and C are said to be co-planar if $A \cdot (B \times C) = 0$

Hence;

$$\begin{vmatrix} i & j & k \\ P & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$$

$$P\begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} - 6\begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} + (-3)\begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix} = 0$$

$$P(6-3) - 6(8-(-1)) - 3(-12-3) = 0$$

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

$$3P - 9 = 0$$

$$3P = 9$$

$$P = 9/3$$

$$P = 3_{11}$$

Hence; P is equal to 3 as 3 is the value in which Vectors A, B and C equal 0 in the equation "$A \cdot (B \times C) = 0$."