

Wisdom Friday Johnny

Civil Engineering

19/ENG03/015

MAT 102 Assignment

Answers

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

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

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

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

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

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

$$\begin{array}{c|cc|c|cc|c|cc} i & 5 & -4 & -j & -2 & -4 & +k & -2 & 5 \\ \hline & 0 & -2 & & 1 & -2 & & 1 & 0 \end{array}$$

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

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

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

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

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

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

$$\begin{array}{c|cc|c|cc|c|cc} i & 0 & 4 & -j & 2 & 4 & +k & 2 & 0 \\ \hline & -6 & 3 & & 9 & 3 & & 9 & -6 \end{array}$$

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

$$2C \times 3B = 24i + 30j - 12k$$

$$A \times (2C \times 3B) = \begin{array}{|c|c|c|} \hline i & j & k \\ \hline 4 & 1 & -2 \\ \hline 24 & 30 & -12 \\ \hline \end{array}$$

$$\begin{array}{|c|c|c|} \hline i & 1 & -2 \\ \hline 30 & -12 & \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline -j & 4 & -2 \\ \hline 24 & -12 & \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline +k & 4 & 1 \\ \hline 24 & 30 & \\ \hline \end{array}$$

$$i(-12 + 60) - j(-48 + 48) + k(120 - 24)$$

$$\therefore A \times (2C \times 3B) = 48i + 96k$$

2.) $A = P i - 6j - 3k$, $B = 4i + 3j - k$ and $c = i - 3j + 2k$

$$A \cdot (B \times c) = \begin{array}{|c|c|c|} \hline P & -6 & -3 \\ \hline 4 & 3 & -1 \\ \hline 1 & -3 & 2 \\ \hline \end{array} = 0$$

$$P \begin{array}{|c|c|} \hline 3 & -1 \\ \hline -3 & 2 \\ \hline \end{array} + 6 \begin{array}{|c|c|} \hline 4 & -1 \\ \hline 1 & 2 \\ \hline \end{array} - 3 \begin{array}{|c|c|} \hline 4 & 3 \\ \hline 1 & -3 \\ \hline \end{array} = 0$$

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

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

$$3P = -99$$

$$\therefore P = -33$$