Name Inyang Peculiar Inyang
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Assignment

1 $A = 2i - j$, $B = 3i + j - 11k$, $C = 4i + 4j - 5k$

1I) $-3A + 7B - 8C$

$-3A + 7B - 8C = -3(2i - j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$

$= -6i + 3j + 21i + 7j - 77k - 32i - 32j + 40k$

$= -6i + 21i - 32i + 3j + 7j - 32j \cancel{77}k + 40k$

$= -17i - 22j - 37k$

1II $K = 2A + 4B - C$

$2A + 4B - C = 2(2i - j) + 4(3i + j - 11k) - 4i - 4j + 5k$

$= 4i - 2j + 12i + 4j - 44k - 4i - 4j + 5k$

$= 4i + 12i - 4i - 2j + 4j - 4j - 44k + 5k$

$K = 12i - 2j - 39k$

$|K| = \sqrt{(12^2) + (-2^2) + (-39^2)}$

$= \sqrt{144 + 4 + 1521}$

$= \sqrt{1669}$

$= 40.85$

$L = \cos\alpha = \frac{12}{\sqrt{1669}}$

$m = \cos\beta = -2/\sqrt{1669}$

$n = \cos\gamma = -39/\sqrt{1669}$

1III) $A \times (B \times C)$

$B \times C = \begin{vmatrix} i & j & k \\ 3 & 1 & -11 \\ 4 & 4 & -5 \end{vmatrix}$

$$i\begin{vmatrix}1 & -11\\ 4 & -5\end{vmatrix} - j\begin{vmatrix}3 & -11\\ 4 & -5\end{vmatrix} + k\begin{vmatrix}3 & 1\\ 4 & 4\end{vmatrix}$$

$i(-5-(-44)) - j(-15-(-44)) + k(12-4)$

$i(-5+44) - j(-15+44) + k(12-4)$

$39i - 29j - 8k$

$$A\times(B\times C) = \begin{vmatrix}i & j & k\\ 2 & -1 & 0\\ 39 & -29 & -8\end{vmatrix}$$

$$i\begin{vmatrix}-1 & 0\\ -29 & -8\end{vmatrix} - j\begin{vmatrix}2 & 0\\ 39 & -8\end{vmatrix} + k\begin{vmatrix}2 & -1\\ 39 & -29\end{vmatrix}$$

$i(8-(-0)) - j(-16-(0)) + k(-58-(-39))$

$i(8+0) - j(16-0) + k(-58+39)$

$8i - 16j - 19k$

(IV) $(3A\times B)\cdot(A\times 2B)$

$3A = 3(2i - j) = 6i - 3j$

$$(6i-3j)\times(3i+j-11k) = \begin{vmatrix}i & j & k\\ 6 & -3 & 0\\ 3 & 1 & -11\end{vmatrix}$$

$$= i\begin{vmatrix}-3 & 0\\ 1 & -11\end{vmatrix} - j\begin{vmatrix}6 & 0\\ 3 & 11\end{vmatrix} + k\begin{vmatrix}6 & -3\\ 3 & 1\end{vmatrix}$$

$= i(33-0) - j(66-0) + k(6+9)$

$= 33i - 66j + 15k$

$A\times 2B = 2i - j \times 2(3i + j - 11k)$

$A\times 2B = (2i - j)\times(6i + 2j - 22k)$

$$= \begin{vmatrix}i & j & k\\ 2 & -1 & 0\\ 6 & 2 & -22\end{vmatrix} = i\begin{vmatrix}-1 & 0\\ 2 & -22\end{vmatrix} - j\begin{vmatrix}2 & 0\\ 6 & -22\end{vmatrix} + k\begin{vmatrix}2 & -1\\ 6 & 2\end{vmatrix}$$

$= i(22-0)\ j(-44-0) + k(4+6) = 22i - 44j + 10k$

$(3A\times B)\cdot(A\times 2B) = |3A\times B|\,|A\times 2B|\cos\theta$

P.T.O

$\checkmark$ $A - 2B - C = 2i - j - 2(3i + j - 11k) - 4i - 4j + 5k$

~~$= 2i - j - 6i$~~

$= 2i - j - 6i - 2j + 22k - 4i - 4j + 5k$

$= 2i - 6i - 4i - j - 2j - 4j + 22k + 5k$

$= -8i - 7j + 27k$

2 Perpendicular vectors: Two vectors are said to be perpendicular if $A \cdot B = 0$

Coplanar vectors! Three vectors are said to be coplanar if $A \cdot (B \times C) = 0$

Continuation of NO 1 IV

$3A \times B = 33i - 66j + 15k$

$|3A \times B| = \sqrt{(33^2) + (-66)^2 + (15)^2}$

$= \sqrt{1089 + 4356 + 225}$

$= \sqrt{5670}$

$A \times 2B = 22i - 44j + 10k$

$|A \times 2B| = \sqrt{(22^2) + (-44)^2 + (10)^2}$

$= \sqrt{484 + 1936 + 100}$

$= \sqrt{2520}$

~~$(3A \times B) \cdot (A \times 2B) = \sqrt{5670} \times \sqrt{2520} \cos$~~

$\underline{u} \cdot \underline{v} = |u||v| \cos\theta$

$\cos\theta = \frac{u \cdot v}{|u||v|}$

$\underline{u} \cdot \underline{v} = (33i - 66j + 15k) \cdot (22i - 44j + 10k)$

$= 726 + 2904 + 150$

$= 3780$

$\cos\theta = \frac{3780}{\sqrt{5670} \cdot \sqrt{2520}} = 1$

$\theta = \cos^{-1} 1$