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Assignment

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

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

$7B = 21i + 7j - 77k$

$-8C = -32i - 32j + 40k$

$$-3A + 7B - 8C = -6i + 3j + 21i + 7j - 77k - 32i - 32j + 40k$$

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

$$= -5i - 22j - 37k$$

(ii) $K = 2A + 4B - C$

$2A = 4i - 2j$

$4B = 12i + 4j - 44k$

$-C = -4i - 4j + 5k$

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

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

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

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

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

$$= \sqrt{1669}$$

$$= 40.85$$

$$L = \cos \alpha = \frac{12}{\sqrt{1669}} = 0.29$$

$$M = \cos \beta = \frac{-2}{\sqrt{1669}} = -0.05$$

$$n = \cos \theta = \frac{-39}{\sqrt{1669}} = -0.96 //$$

iii AX(BXC)

$$BXC = \begin{vmatrix} + & - & + \\ i & j & k \\ 3 & 21 & -11 \\ 4 & 4 & -5 \end{vmatrix}$$

$$i[-5 \times 1 - (4 \times -11)] - j[-5 \times 3 - (4 \times -11)] + k[4 \times 3 - (4 \times 1)]$$

$$i[-5 + 44] - j[-15 + 44] + k[12 - 4]$$

$$BXC = 39i - 29j + 8k //$$

$$AX(BXC) = \begin{vmatrix} + & - & + \\ i & j & k \\ 2 & -1 & 0 \\ 39 & -29 & 8 \end{vmatrix}$$

$$i[39 \times -1 - (-29 \times 0)] - j[2 \times 8 - (39 \times 0)] + k[-29 \times 2 - (39 \times -1)]$$

$$i[-39 + 0] - j[16 - 0] + k[-58 + 39]$$

$$AX(BXC) = -39i - 16j - 19k //$$

iv (3AXB) \cdot (AX2B)

$$3A = 6i - 3j$$

$$2B = 6i + 2j - 22k$$

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

$$i[6 \times 1 - (-3 \times -11)] - j[6 \times -11 - (3 \times -6)] + k[6 \times 3 - (3 \times -3)]$$

$$i[6 - 33] - j[-66 - (-18)] + k[18 + 9]$$

$$(3AXB) = -27i - 48j + 27k //$$

$$(AX2B) = \begin{vmatrix} + & - & + \\ i & j & k \\ 2 & -1 & 0 \\ 6 & 2 & -22 \end{vmatrix}$$

$$i[-22 \times 1 - (2 \times 0)] - j[-22 \times 2 - (6 \times 0)] + k[(2 \times 2) - (6 \times -1)]$$

$$i[-22 - 0] - j[-44 - 0] + k[4 + 6]$$

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

$$(3A \times B) \cdot (A \times 2B) = (33i + 66j + 15k) \cdot (22i + 44j + 10k)$$

$$= 726 + 2904 + 150$$

$$= 3780$$

v) $A - 2B - C$

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

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

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

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

Co-Planar vectors: three vectors A, B and C are said to be co-planar if $A \cdot (B \times C) = 0$.