

Kenneth C. Jumbo

Electrical/Electronics Engineering

19/ENG004/030

Maths 102 assignment

$A = 2i - j$, $B = 3i + j = 11K$, $C = 4i + 4j - 5K$ find

i) $-3A + 7B - 8C$

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

$$= -6i + 3j$$

$$7B = 7(3i + j - 11K)$$

$$= 21i + 7j - 77K$$

$$-8C = -8(4i + 4j - 5K)$$

$$= -32i - 32j + 40K$$

$$\therefore -3A + 7B - 8C$$

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

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

ii) $K = 2A + 4B - C$, Find the direction cosine of K

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

$$= 4i - 2j$$

$$4B = 4(3i + j - 11K)$$

$$= 12i + 4j - 44K$$

$$\therefore 2A + 4B - C$$

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

(ABUAD), The Road to Intellectualism, Quality and Excellence

$$v. A - 2B - C$$

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

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

$$2i - j - 6i - 2j + 22k - 4i - 2j + 15k$$

$$= -8i - 2j + 27k$$

$$ii. A - 2B - C = -8i - 2j + 27k.$$

2. Perpendicular vectors: Two vectors

A and B 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

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

$$K(a_i - 2j + 3k) + M(-4i - 2j + 5k) = N(-8i - 16j - 19k)$$

$$x = 12i + 2j - 29k$$

$$|K| = \sqrt{(12)^2 + (2)^2 + (-29)^2}$$

$$|K| = \sqrt{1624}$$

direction

$$l = \cos \alpha = \frac{12}{\sqrt{1624}}$$

$$m = \cos \beta = \frac{2}{\sqrt{1624}}$$

$$n = \cos \gamma = \frac{-29}{\sqrt{1624}}$$

ii) A, B, C

$$(A \times C) = \begin{vmatrix} 3 & 1 & -4 \\ 4 & 4 & -5 \end{vmatrix}$$

$$i \begin{vmatrix} 1 & -4 \\ 4 & -5 \end{vmatrix} - j \begin{vmatrix} 3 & -4 \\ 4 & -5 \end{vmatrix} + k \begin{vmatrix} 3 & 1 \\ 4 & 4 \end{vmatrix} = i \begin{vmatrix} 1 & 0 \\ 2 & -22 \end{vmatrix} - j \begin{vmatrix} 2 & 0 \\ 6 & -22 \end{vmatrix} + k \begin{vmatrix} 2 & -1 \\ 6 & 2 \end{vmatrix}$$

$$i(-5 - (-16)) - j(-15 - (-16)) + k(12 - 4)$$

$$39i - 29j + 8k$$

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

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

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

$$-8i - 16j - 19k$$

$$i \cdot A \times (B \times C) = -8i - 16j - 19k$$

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

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

$$3A \times B = \begin{vmatrix} 6 & -2 & 0 \\ 2 & 1 & -11 \end{vmatrix}$$

$$i \begin{vmatrix} -2 & 0 \\ 1 & -11 \end{vmatrix} - j \begin{vmatrix} 6 & 0 \\ 2 & -11 \end{vmatrix} + k \begin{vmatrix} 6 & -2 \\ 2 & 1 \end{vmatrix}$$

$$i(22 - 0) - j(-66 - 0) + k(6 - (-2))$$

$$22i + 66j + 8k$$

$$(A \times B)$$

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

$$\begin{vmatrix} 2 & -1 & 0 \\ 6 & 2 & -22 \end{vmatrix}$$

$$i(22 - 0) - j(-44 - 0) + k(12 - (-6))$$

$$22i + 44j + 18k$$

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

$$(33i + 66j + 15k) \cdot (39i + 29j + 8k)$$

$$= 726 + 2304 + 150$$

$$= 3280$$