

Analisis Momen dan Goodness

19/ENIG02/006

Computer Engineering

Maths 102 assignment

1) If $A = 2\hat{i} - \hat{j}$, $B = 3\hat{i} + \hat{j} - 11\hat{k}$, $C = 4\hat{i} + 4\hat{j} - 5\hat{k}$, find the following:

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

$$-3(2\hat{i} - \hat{j}) + 7(3\hat{i} + \hat{j} - 11\hat{k}) - 8(4\hat{i} + 4\hat{j} - 5\hat{k})$$

$$-3A + 7B - 8C = (-6\hat{i} + 3\hat{j}) + (21\hat{i} + 7\hat{j} - 77\hat{k}) - (32\hat{i} + 32\hat{j} + 40\hat{k})$$

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

$$-3A + 7B - 8C = -16\hat{i} - 20\hat{j} - 117\hat{k}$$

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

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

$$K = 2(2\hat{i} - \hat{j}) + 4(3\hat{i} + \hat{j} - 11\hat{k}) - (4\hat{i} + 4\hat{j} - 5\hat{k})$$

$$K = 4\hat{i} - 2\hat{j} + 12\hat{i} + 4\hat{j} - 44\hat{k} - 4\hat{i} - 4\hat{j} + 5\hat{k}$$

$$K = 4\hat{i} + 12\hat{i} - 4\hat{i} - 2\hat{j} + 4\hat{j} - 4\hat{j} - 44\hat{k} + 5\hat{k}$$

$$K = 12\hat{i} - 2\hat{j} - 39\hat{k}$$

$$|K| = \sqrt{12^2 + (-2)^2 + (-39)^2} = \sqrt{1669}$$

$$|K| = \sqrt{1669} \quad 40.85$$

$$l = \cos \alpha = \frac{12}{\sqrt{1669}} = \frac{12}{40.85}$$

$$m = \cos \beta = \frac{-2}{\sqrt{1669}} = \frac{-2}{40.85}$$

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

11) $(A+B) \times C$

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

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

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

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

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

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

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

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

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

10) $(3A \times B) \cdot (A \times 2B)$

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

$$2B = 2(3i + j - 11k) = 6i + 2j - 22k$$

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

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

$$3A \times B = i(33-0) - j(-66-0) + k(6+9)$$

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

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

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

$$A \times 2B = i(22-0) - j(-44-0) + k(4+6)$$

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

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

$$= 726i + 2904j + 150k$$

$$\Rightarrow A - 2B - C$$

$$(2i - j) - (6i + 2j - 22k) - (4i + 4j - 5k) = A - 2B - C$$

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

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

$$-8i - 7j + 27k = A - 2B - C$$

27 Define perpendicular and Coplanar vectors -

Perpendicular vectors are vectors that their dot product equals zero.

Coplanar vectors are vectors that their scalar triple product equals zero i.e. they are parallel.