

Wisdom Friday Johnny

Civil Engineering

19/ENG03/015

MAT 102 Assignment

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

ii.) $-3A + 7B - 8C$

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

$$7B = 7(3i + j - 11k) = 21i + 7j - 77k$$

$$-8C = -8(4i + 4j - 5k) = -32i - 32j + 40k$$

$$\therefore -3A + 7B - 8C = -17i - 22j - 37k$$

iii.) $K = 2A + 4B - C$

$$2A = 2(2i - j) = 4i - 2j$$

$$4B = 4(3i + j - 11k) = 12i + 4j - 44k$$

$$\therefore 2A + 4B - C \Rightarrow 12i - 2j - 39k$$

$$|K| = \sqrt{(12)^2 + (-2)^2 + (-39)^2} = \sqrt{1669} \Rightarrow 40.85$$

∴ The direction cosines of K are:

$$\cos \alpha = \frac{12}{40.85} \Rightarrow 0.2938$$

$$40.85$$

$$\cos \beta = \frac{-2}{40.85} \Rightarrow -0.0490$$

$$40.85$$

$$\cos \gamma = \frac{-39}{40.85} \Rightarrow -0.9547$$

$$40.85$$

iv.) $A \times B \times C \Rightarrow A \times B =$

i	j	k
2	-1	0
3	1	-11

$$= i(11-0) - j(-22-0) + k(2+3)$$

$$= 11i + 22j + 5k$$

$$\angle A \times B \times C = \begin{vmatrix} i & j & k \\ 11 & 22 & 5 \\ 4 & 4 & -5 \end{vmatrix}$$

$$= i(-110-20) - j(-55-20) + k(44-88)$$

$$= -130i + 75j - 44k$$

$$iv.) (3A \times B) \cdot (A \times 2B)$$

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

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

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

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

$$\Rightarrow 33i + 66j + 15k$$

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

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

$$\Rightarrow 22i + 44j + 10k$$

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

$$= (33 \times 22) + (66 \times 44) + (15 \times 10) = 3780$$

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

$$\Rightarrow (2i - j) - (6i + 2j - 22k) - (4i + 4j - 5k)$$

$$\Rightarrow -8i - 7j + 27k$$

2.) Two vectors A and B are said to be perpendicular if their scalar product is equal to zero.

- Three vectors A, B and C are said to be coplanar if their triple scalar product $[A \cdot (B \times C)]$ is equal to zero.