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ELECT/ELECT ENGINEERING
19/ENG04/055
MAT 102 ASSIGNMENT

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

$-3(2i - j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$

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

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

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

$2(2i - j) + 4(3i + j - 11k) - 4i - 4j + 5k$

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

$= 12i - 2i - 39k$

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

$= \sqrt{1669}$

$\cos\alpha = \frac{12}{\sqrt{1669}}$, $\cos\beta = \frac{-2}{\sqrt{1669}}$, $\cos\gamma = \frac{-39}{\sqrt{1669}}$

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

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

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

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

$39i - 29j + 8k$

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

	+	−	+
	i	j	k
	2	-1	0
	39	-29	8

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

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

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

(iv) $3A = 6i - 3j \qquad 2B = 6i + 2j - 22k$

$3A \times B =$

	+	−	+
	i	j	k
	6	-3	0
	3	1	-11

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

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

$= 33i + 66j + 15k$

$A \times 2B =$

	+	−	+
	i	j	k
	2	-1	0
	6	2	-22

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

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

$= 22i + 44j + 10k$

$(3A \times B) \cdot (A \times 2B) = 726 + 2904 + 150$

$= 3780,$

(v) $A - 2B - C$

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

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

(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 coplanar if $A \cdot (B \times C)$, their scalar product, is equal to 0