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MATH 102 Assignment:

1) If $A = 2i - j$, $B = 3i + j - 11k$ and $C = 4i + 4j - 5k$ find the following

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

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

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

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

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

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

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

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

$\therefore K = [4i - 2j] + [12i + 4j - 44k] - [4i + 4j - 5k]$

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

Direction cosine of $K \Rightarrow |K| = \sqrt{(12)^2 + (-2)^2 + (-39)^2} = \sqrt{144 + 4 + 1521} = \sqrt{1669}$

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

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

$B \times C =$

+ i	− j	+ K									
3	1	−11	= i	1	−11	−j	3	−11	+K	3	1
4	4	−5		4	−5		4	−5		4	4

$B \times C = 39i - 29j + 8K$

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

+ i	− j	+ K									
2	−1	0	= i	−1	0	−j	2	0	+K	2	−1
39	−29	8		−29	8		39	8		39	−29

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

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

$3A \times B \Rightarrow \quad 3A = 3(2i - j) = 6i - 3j$

$3A \times B =$

+	−	+									
i	j	K									
6	−3	0	= i	−3	0	−j	6	0	+K	6	−3
3	1	−11		1	−11		3	−11		3	1

$= 33i - 66j + 15K$

$(A \times 2B) \Rightarrow \quad 2B = 2(3i + j - 11K) = 6i + 2j - 22K$

$A \times 2B =$

+	−	+									
i	j	K									
2	−1	0	= i	−1	0	−j	2	0	+K	2	−1
6	2	−22		2	−22		6	−22		6	2

$= 22i + 44j + 10K$

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

$= 726 - 2904 + 150 = -2028$

(v) $A - 2B - C$

$= (2i - j) - (6i + 2j - 22K) - (4i - 4j - 5K)$

$= (2i - 6i - 4i) + (-j - 2j + 4j) + (22K + 5K)$

$= -8i + j + 27K$

2.) Define Perpendicular and co-planar vectors

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

Two vectors are said to be coplanar co-planar when they are parallel to a same plane whereas their scalar triple product is zero.