

TADESE VICIOR ADEDAMOLA

ELECT/ELECT ENGINEERING

19/ENGG41055

MAT 102 ASSIGNMENT

$$1) 2B = 6i - 4j + 2k, 2C = 2i - 4k, 3B = 9i - 6j + 3k$$

$$\begin{aligned} A - 2B &= (4i + j - 2k) - 6i + 4j - 2k \\ &= -2i + 5j - 4k \end{aligned}$$

$$(a) (A - 2B) \times C = \begin{array}{ccc|ccc} & + & - & + & & & \\ & i & j & k & & & \\ -2 & 5 & -4 & & & & \\ 1 & -2 & 0 & & & & \end{array}$$

$$\begin{array}{c|cc|c|cc|cc} i & 5 & -4 & -j & -2 & -4 & +k & -2 & -5 \\ & -2 & 0 & & 1 & 0 & & 1 & -2 \end{array}$$

$$= i(0 - 8) - j(0 + 4) + k(4 - 5)$$

$$= -8i - 4j - k$$

$$(b) (2C \times 3B) = \begin{array}{ccc|ccc} & + & - & + & & & \\ & i & j & k & & & \\ 2 & -4 & 0 & & & & \\ 9 & -6 & 3 & & & & \end{array}$$

$$\begin{array}{c|cc|c|cc|cc} i & -4 & 0 & -j & 2 & 0 & +k & 2 & -4 \\ & -6 & 3 & & 9 & 3 & & 9 & -6 \end{array}$$

$$= i(-12 - 0) - j(6 - 0) + k(-12 + 36)$$

$$= -12i - 6j + 24k$$

$$A \times (2C \times 3B) = \begin{vmatrix} + & - & + \\ i & j & k \\ 4 & 1 & -2 \\ -12 & -6 & 24 \end{vmatrix}$$

$$i \begin{vmatrix} 1 & -2 \\ -6 & 24 \end{vmatrix} - j \begin{vmatrix} 4 & -2 \\ -12 & 24 \end{vmatrix} + k \begin{vmatrix} 4 & 1 \\ -12 & -6 \end{vmatrix}$$

$$i(24 - 12) - j(96 - 24) + k(-24 + 12)$$

$$12i - 72j - 12k$$

2) Vectors A, B and C are said to be coplanar when their scalar triple product equals zero

$$A \cdot (B \times C) = \begin{vmatrix} + & - & + \\ P & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$$

$$P \begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} + 6 \begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3 \begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix} = 0$$

$$= P(6 - 3) + 6(8 + 1) - 3(-12 - 3) = 0$$

$$= 3P + 54 + 45 = 0$$

$$3P = -99$$

$$P = -33$$