

$$2) A = p\hat{i} - 6\hat{j} - 3\hat{k}$$

$$B = 4\hat{i} + 3\hat{j} - \hat{k}$$

$$C = \hat{i} - 3\hat{j} + 2\hat{k}$$

Find the value of  $p$  for which A, B and C are co-planar

Answer

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

$$p \begin{vmatrix} 3 & -1 \\ -3 & -2 \end{vmatrix} + 6 \begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3 \begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix}$$

$$p[6 - 3] + 6[8 - (-1)] - 3[-12 - 3]$$

$$= 3p + 54 + 45 \neq 0$$

$$3p + 99 = 0$$

$$3p = -99$$

$$p = -33 //$$

Milvane Michelle ORORON-4

CHEMICAL ENGINEERING

19/09/2011

### MAT 102 Assignment

$$1.) A = 4i + j - 2k$$

$$B = 3i - 2j + k$$

$$C = i - 2k$$

$$a.) (A - 2B) \times C$$

Answer

$$2B = 2[3i - 2j + k]$$

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

$$\therefore A - 2B = [4i + j - 2k] - [6i - 4j + 2k]$$

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

$$(A - 2B) \times C = \begin{vmatrix} 1 & 1 & k \\ -2 & 5 & -4 \\ 1 & 0 & -2 \end{vmatrix}$$

$$i \begin{vmatrix} 5 & -4 \\ 0 & -2 \end{vmatrix} - j \begin{vmatrix} -2 & -4 \\ 1 & -2 \end{vmatrix} + k \begin{vmatrix} -2 & 5 \\ 1 & 0 \end{vmatrix}$$

$$i[-10 - 0] - j[4 - (-4)] + k[0 - 5]$$

$$= -10i - 8j - 5k //$$

$$B) Ax (20 \times 3B)$$

Answer

$$2C = 2i + 0j + 4k$$

$$3B = 0i - 6j + 3k$$

$$\therefore 2C \times 3B = \begin{vmatrix} 1 & j & k \\ 2 & 0 & -4 \\ 9 & -6 & 3 \end{vmatrix}$$

$$C \begin{vmatrix} 0 & -4 \\ -6 & 3 \end{vmatrix} - j \begin{vmatrix} 2 & -4 \\ 9 & 3 \end{vmatrix} + k \begin{vmatrix} 2 & 0 \\ 9 & -6 \end{vmatrix}$$

$$C [0 + 24] - j [2(-12) - (-36)] + k [-12 - 0]$$

$$= 24i - 42j - 12k //$$

$$Ax (20 \times 3B) = \begin{vmatrix} 1 & j & k \\ 4 & 1 & -2 \\ -24 & -42 & 12 \end{vmatrix}$$

$$C \begin{vmatrix} 1 & -2 \\ -42 & 12 \end{vmatrix} - j \begin{vmatrix} 4 & -2 \\ -24 & 12 \end{vmatrix} + k \begin{vmatrix} 4 & 1 \\ -24 & -42 \end{vmatrix}$$

$$C [12 - 84] - j [48 - 48] + k [168 - (-24)]$$

$$= -72i - 144k //$$