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1) If $A = 4i + j - 2k$, $B = 3i - 2j + k$ and $C = i - 2k$

FIND (a) $(A - 2B) \times C$ (b) $A \times (2C \times 3B)$

1a) $(A - 2B) \times C$

$2B = 2(3i - 2j + k) = (6i - 4j + 2k)$

$(A - 2B) = (4i + j - 2k) - (6i - 4j + 2k)$

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

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

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

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

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

$= -10i - 5k$

2) $A = pi - 6j - 3k$, $B = 4i + 3j - k$ and $C = i - 3j + 2k$, find the value of p for which A, B and C are coplanar.

NOTE: Co-planar vectors $A \cdot (B \times C) = 0$

$$A \cdot (B \times C) = \begin{vmatrix} p & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix} = 0$$

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

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

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

$$3p + 99 = 0$$

$$3p = -99$$

$$p = -99/3$$

$$\therefore p = -33$$