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Electrical/Electronics.

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1) $A = 4i + j - 2k \quad B = 3i - 2j + k \quad C = 1 - 2k$

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

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

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

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

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

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

b) $2C \times 3B = 2(1 - 2k) \times 3(3i - 2j + k)$

$= (2i - 4k) \times (9i - 6j + 3k)$

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

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

$2C \times 3B = -24i - 42j - 12k$

$$A \times (2C \times 3B) = \begin{vmatrix} 1 & J & K \\ 4 & 1 & -2 \\ -24 & -42 & -12 \end{vmatrix}$$

$$= 1 \begin{vmatrix} 1 & -2 \\ -42 & -12 \end{vmatrix} - J \begin{vmatrix} 4 & -2 \\ -24 & -12 \end{vmatrix} + K \begin{vmatrix} 4 & 1 \\ -24 & -42 \end{vmatrix}$$

$$A \times (2C \times 3B) = -96i + 96j - 144K$$

2) $A = Pi - 6j - 3K \quad B = 4i + 3j - K \quad C = i - 3j + 2K$

$$B \times C = \begin{vmatrix} 1 & J & K \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$$

$$= i \begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} - J \begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} + K \begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix}$$

$$B \times C = 3i - 9j - 15K$$

$$A \cdot (B \times C) = (Pi - 6j - 3K) \cdot (2i - 9j - 15K)$$

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

$$3P = -99$$

$$P = -33$$