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Computer Engineering

$$A = 3i + 4j - 6k \quad B = 5i - 11j + 2k \quad C = 7i - 7j + k$$

1)  $A \cdot C + B \cdot C$

$$\begin{aligned} A \cdot C &= (3i + 4j - 6k) \cdot (7i - 7j + k) \\ &= (3 \times 7) + (4 \times -7) + (-6 \times 1) \\ &= 21 - 28 - 6 \\ &= -13 \end{aligned}$$

$$\begin{aligned} B \cdot C &= (5i - 11j + 2k) \cdot (7i - 7j + k) \\ &= (5 \times 7) + (-11 \times -7) + (2 \times 1) \\ &= 35 + 77 + 2 \\ &= 114 \end{aligned}$$

$$\begin{aligned} A \cdot C + B \cdot C &= -13 + 114 \\ &= 101 \end{aligned}$$

2)  $(A - B) \cdot C$

$$\begin{aligned} (A - B) &= (3i + 4j - 6k) - (5i - 11j + 2k) \\ &= 3i + 4j - 6k - 5i + 11j - 2k \\ &= -2i + 15j - 8k \end{aligned}$$

$$\begin{aligned} (A - B) \cdot C &= (-2i + 15j - 8k) \cdot (7i - 7j + k) \\ &= (-2 \times 7) + (15 \times -7) + (-8 \times 1) \\ &= -14 - 105 - 8 \\ &= -127 \end{aligned}$$

3)  $A \cdot (B \times C)$

$$(B \times C) = \begin{vmatrix} i & j & k \\ 5 & -11 & 2 \\ 7 & -7 & 1 \end{vmatrix}$$

$$(B \times C) = i \begin{vmatrix} -11 & 2 \\ -7 & 1 \end{vmatrix} - j \begin{vmatrix} 5 & 2 \\ 7 & 1 \end{vmatrix} + k \begin{vmatrix} 5 & -11 \\ 7 & -7 \end{vmatrix}$$

$$\begin{aligned} (B \times C) &= i(-11 - (-14)) - j(5 - 14) + k(-35 - (-77)) \\ &= i(3) - j(-9) + k(42) \end{aligned}$$

$$(B \times C) = 3i + 9j + 42k$$

$$A \cdot (B \times C) = (3i + 4j - 6k) \cdot (3i + 9j + 42k)$$

$$= (3 \times 3) + (4 \times 9) + (-6 \times 42)$$

$$= 9 + 36 - 252$$

$$= -207$$