Question Q1.22

Which of the following are legitimate mathematical operations: (a) $\vec{A} \cdot (\vec{B} - \vec{C})$; (b) $(\vec{A} - \vec{B}) \times \vec{C}$; (c) $\vec{A} \cdot (\vec{B} \times \vec{C})$; (d) $\vec{A} \times (\vec{B} \times \vec{C})$; (e) $\vec{A} \times (\vec{B} \cdot \vec{C})$? In each case, give the reason for your answer.

Solution

The following are legitimate mathematical operations

(a) $\mathbf{A} \cdot (\mathbf{B} - \mathbf{C})$

(b) $(\mathbf{A} - \mathbf{B}) \times \mathbf{C}$

(c) $\mathbf{A} \cdot (\mathbf{B} \times \mathbf{C})$

(d) $\mathbf{A} \times (\mathbf{B} \times \mathbf{C})$

because the quantity in each set of parentheses is a vector. However,

(e) $\mathbf{A} \times (\mathbf{B} \cdot \mathbf{C})$

is not a legitimate mathematical operation because the quantity in parentheses is not a vector.