

Question Q1.25

(a) If $\vec{\mathbf{A}} \cdot \vec{\mathbf{B}} = 0$, does it necessarily follow that $A = 0$ or $B = 0$? Explain. (b) If $\vec{\mathbf{A}} \times \vec{\mathbf{B}} = \mathbf{0}$, does it necessarily follow that $A = 0$ or $B = 0$? Explain.

Solution

(a) No, because if $\mathbf{A} \cdot \mathbf{B} = AB \cos \theta = 0$, then

$$A = 0 \quad \text{or} \quad B = 0 \quad \text{or} \quad \cos \theta = 0$$
$$\theta = 90^\circ.$$

(b) No, because if $\mathbf{A} \times \mathbf{B} = \mathbf{0}$, then $|\mathbf{A} \times \mathbf{B}| = AB \sin \theta = 0$, which means

$$A = 0 \quad \text{or} \quad B = 0 \quad \text{or} \quad \sin \theta = 0$$
$$\theta = 0^\circ.$$