Question Q1.24

Show that, no matter what $\vec{A}$ and $\vec{B}$ are, $\vec{A} \cdot (\vec{A} \times \vec{B}) = 0$. (*Hint:* Do not look for an elaborate mathematical proof. Rather look at the definition of the direction of the cross product.)

Solution

$\mathbf{A} \times \mathbf{B}$ is a vector that is perpendicular to $\mathbf{A}$. Therefore, the dot product of $\mathbf{A} \times \mathbf{B}$ and $\mathbf{A}$ is zero.

$$\mathbf{A} \cdot (\mathbf{A} \times \mathbf{B}) = A|\mathbf{A} \times \mathbf{B}| \underbrace{\cos 90^\circ}_{=0} = 0$$