Question 24

What is the dot product of a vector with the cross product that this vector has with another vector?

Solution

The dot product that a vector $\vec{\mathbf{A}}$ has with the cross product of this vector with another vector $\vec{\mathbf{B}}$ is

$$\vec{\mathbf{A}} \cdot \left(\vec{\mathbf{A}} \times \vec{\mathbf{B}}\right) = 0.$$

The vector $\vec{\mathbf{A}} \times \vec{\mathbf{B}}$ is perpendicular to both $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$, and the dot product of $\vec{\mathbf{A}}$ with any vector perpendicular to it is zero.