

Quiz 3 section A04 solutions

The angle between vectors \vec{A} and \vec{B} is θ . Find $\tan(\theta)$ if:

$$\vec{A} \times \vec{B} = 7\vec{i} + \vec{j} - \vec{k} \quad \text{and} \quad \vec{A} \cdot \vec{B} = 2$$

Solution: Since $\|\vec{A} \times \vec{B}\| = \|\vec{A}\| \|\vec{B}\| \sin \theta$ and $\vec{A} \cdot \vec{B} = \|\vec{A}\| \|\vec{B}\| \cos \theta$,

We have:

$$\frac{\|\vec{A} \times \vec{B}\|}{\vec{A} \cdot \vec{B}} = \frac{\|\vec{A}\| \|\vec{B}\| \sin \theta}{\|\vec{A}\| \|\vec{B}\| \cos \theta} = \frac{\sin \theta}{\cos \theta} = \tan \theta$$

$$\text{So: } \tan(\theta) = \frac{\|7\vec{i} + \vec{j} - \vec{k}\|}{2} = \frac{\sqrt{7^2 + 1^2 + 1^2}}{2} = \boxed{\frac{\sqrt{51}}{2}}$$