

Vector Identities

1. $\vec{P} \cdot \vec{Q} = \vec{Q} \cdot \vec{P}$
2. $\vec{P} \cdot (\vec{Q} + \vec{R}) = \vec{P} \cdot \vec{Q} + \vec{P} \cdot \vec{R}$
3. $\vec{Q} \times \vec{P} = -\vec{P} \times \vec{Q}$
4. $\vec{P} \times (\vec{Q} + \vec{R}) = \vec{P} \times \vec{Q} + \vec{P} \times \vec{R}$
5. $\vec{P} \cdot (\vec{Q} \times \vec{R}) = \vec{Q} \cdot (\vec{R} \times \vec{P}) = \vec{R} \cdot (\vec{P} \times \vec{Q})$
6. $\vec{P} \times \vec{Q} \times \vec{R} = (\vec{R} \cdot \vec{P})\vec{Q} - (\vec{R} \cdot \vec{Q})\vec{P}$
7. $(\vec{A} \times \vec{B}) \cdot (\vec{C} \times \vec{D}) = (\vec{A} \cdot \vec{C})(\vec{B} \cdot \vec{D}) - (\vec{A} \cdot \vec{D})(\vec{B} \cdot \vec{C})$

Derivatives

1. $\frac{d\vec{P}}{dt} = \dot{\vec{P}} = \dot{P}_x\hat{i} + \dot{P}_y\hat{j} + \dot{P}_z\hat{k}$
2. $\frac{d}{dt}(u\vec{P}) = \vec{P}\dot{u} + u\dot{\vec{P}}$
3. $\frac{d}{dt}(\vec{P} \cdot \vec{Q}) = \dot{\vec{P}} \cdot \vec{Q} + \vec{P} \cdot \dot{\vec{Q}}$
4. $\frac{d}{dt}(\vec{P} \times \vec{Q}) = \dot{\vec{P}} \times \vec{Q} + \vec{P} \times \dot{\vec{Q}}$