

Scalars vs Vectors

Scalar Just a number

Vectors include direction

Speed vs Velocity

Speed scalar

Velocity vector

$$\text{Speed} = |\vec{v}|$$

$$\frac{d}{du} (\vec{P} + \vec{Q}) = \frac{d}{du} \vec{P} + \frac{d}{du} \vec{Q}$$

$$\frac{d}{du} f(u) \vec{P}(u) = \frac{df(u)}{du} \vec{P}(u) + f(u) \frac{d\vec{P}(u)}{du}$$

$$\frac{d}{du} \vec{P} \cdot \vec{Q} = \frac{d\vec{P}}{du} \cdot \vec{Q} + \vec{P} \cdot \frac{d\vec{Q}}{du}$$

$$\frac{d}{du} \vec{P} \times \vec{Q} = \frac{d\vec{P}}{du} \times \vec{Q} + \vec{P} \times \frac{d\vec{Q}}{du}$$

$$\vec{P} = P_x \mathbf{i} + P_y \mathbf{j} + P_z \mathbf{k}$$

$$\frac{d\vec{P}}{du} = \frac{dP_x}{du} \mathbf{i} + \frac{dP_y}{du} \mathbf{j} + \frac{dP_z}{du} \mathbf{k}$$