Dot Product

The dot product of two vectors u and v is denoted by $u \cdot v$.

$$\vec{u} = \langle u_1, u_2, u_3 \rangle, \vec{v} = \langle v_1, v_2, v_3 \rangle$$

$$u \cdot v = u_1 v_1 + u_2 v_2 + u_3 v_3$$

The Angle Between Two Vectors u and v is,

$$\theta = \cos^{-1}\left(\frac{\vec{u} \cdot \vec{u}}{||\vec{u}|| \, ||\vec{v}||}\right)$$

Dot product of two vectors u and v is also given by,

$$\vec{u} \cdot \vec{v} = ||\vec{u}|| \, ||\vec{v}|| \cos\theta$$

Projection,

$$\text{proj}_b a = \left(\frac{a \cdot b}{||b||}\right)\frac{b}{||b||}$$

scalar component of a in the direction of b,

$$\text{comp}_b a = \frac{a \cdot b}{||b||} = ||a|| \cos\theta$$

Properties