

Math 21C  
Kouba  
Dot Product

Properties: assume  $\vec{u}$ ,  $\vec{v}$ , and  $\vec{w}$  are vectors in  $\mathbb{R}^2$  or  $\mathbb{R}^3$  and  $c$  is a constant. Then

1.)  $\vec{u} \cdot \vec{v} = \vec{v} \cdot \vec{u}$

2.)  $(c\vec{u}) \cdot \vec{v} = \vec{u} \cdot (c\vec{v}) = c(\vec{u} \cdot \vec{v})$

3.)  $\vec{u} \cdot (\vec{v} + \vec{w}) = \vec{u} \cdot \vec{v} + \vec{u} \cdot \vec{w}$

4.)  $\vec{u} \cdot \vec{u} = |\vec{u}|^2$

Projection Vector

The projection of vector  $\vec{A}$  onto vector  $\vec{B}$  is

$$\text{proj}_{\vec{B}} \vec{A} = \left( \frac{\vec{A} \cdot \vec{B}}{\vec{B} \cdot \vec{B}} \right) \vec{B}$$

(Why? SEE class notes.)

