

The scalar product or the dot product

Ex., $\vec{u} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$

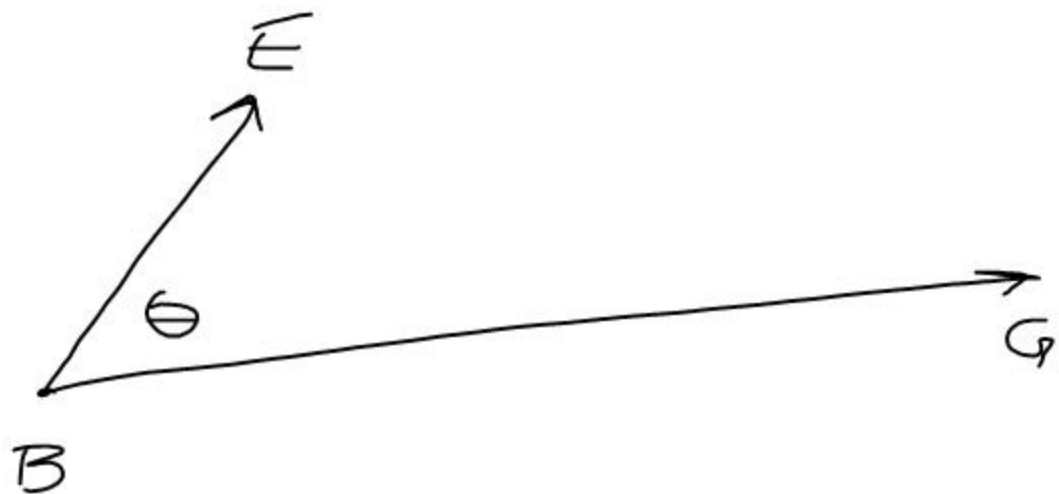
$$\vec{u} \cdot \vec{v} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} \cdot \begin{pmatrix} 5 \\ 2 \end{pmatrix} = 3 \cdot 5 + (-4) \cdot 2$$

$$x \cdot y = xy = 15 - 8 = \underline{7}$$

$$\vec{u} \cdot \vec{v} = 7$$

$\vec{u} \vec{v} \leftarrow$ meaningless (not a vector)

$\vec{u} \times \vec{v} \leftarrow$ This the vector product
(only work for 3-D vectors)



What's the angle between these vectors?

$$\underline{\underline{\cos \theta}} = \frac{\vec{BE} \cdot \vec{BG}}{|\vec{BE}| |\vec{BG}|} = \frac{\begin{pmatrix} 1 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} 10 \\ 2 \end{pmatrix}}{\left| \begin{pmatrix} 1 \\ 4 \end{pmatrix} \right| \left| \begin{pmatrix} 10 \\ 2 \end{pmatrix} \right|}$$

$$= \frac{18}{\sqrt{1^2 + 4^2} \sqrt{10^2 + 2^2}} = \frac{18}{\sqrt{17} \sqrt{104}}$$

$$\approx 0.4281$$

$$\theta = \cos^{-1}(0.4281) = 64.7^\circ$$