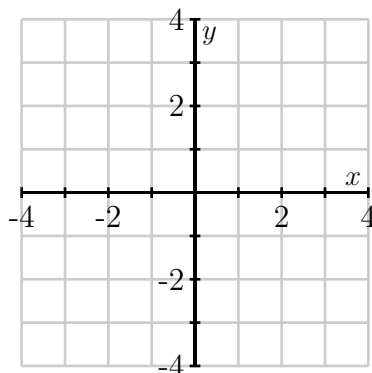


Mathematics 327
Dot Products

1. Sketch the following vectors below

$$\mathbf{v} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}, \quad \mathbf{w} = \begin{bmatrix} -1 \\ 3 \end{bmatrix}.$$



Find the lengths $|\mathbf{v}|$ and $|\mathbf{w}|$ using the dot product.

Find the angle between \mathbf{v} and \mathbf{w} using the dot product.

Consider the vector $\mathbf{x} = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$. Include it in the sketch above and then find the angle between \mathbf{v} and \mathbf{x} .

If two vectors are perpendicular, what can you say about their dot product? Explain your thinking.

For what value of k is the vector $\begin{bmatrix} 2 \\ k \end{bmatrix}$ perpendicular to w ?

2. What can you conclude about two vectors if the angle between them is zero?
3. What can you conclude about two vectors if the angle between them is 180° ?
4. There is a Jupyter notebook called `dot_products` for you on cocalc.com. Please open that notebook and complete the activities in there.
5. What is the angle between the two four-dimensional vectors v and w ?
6. What is the angle between the vector `veterans` and
`memorial`
`labor`
`golden`
`super`
What is the significance of these angles?

7. What is the correlation between the time series s_1 and s_2 ?

What is the correlation between the time series s_1 and s_3 ?