

1.(1 pt) Let

$$x = \begin{bmatrix} -1 \\ -3 \\ 3 \end{bmatrix} \text{ and } y = \begin{bmatrix} 0 \\ -5 \\ 5 \end{bmatrix},$$

find the dot product of x and y :

$x \cdot y =$ _____

2.(1 pt) Find the value of k for which the vectors

$$x = \begin{bmatrix} 0 \\ -4 \\ 5 \\ 3 \end{bmatrix} \text{ and } y = \begin{bmatrix} -4 \\ 4 \\ 4 \\ k \end{bmatrix}$$

are orthogonal:

$k =$ _____

3.(1 pt) You'll need to use the formatted text mode in order to do this problem: click on the "formatted text" button on the bottom of the page and then click "submit answer".

Let

$$x = \begin{bmatrix} 2 \\ -4 \\ 3 \\ 1 \end{bmatrix}.$$

Find the norm of x :

$\|x\| =$ _____

Find the unit vector in the direction of x :

$$u = \begin{bmatrix} - \\ - \\ - \\ - \end{bmatrix}$$

4.(1 pt) Let

$$x = \begin{bmatrix} 5 \\ 3 \\ -1 \end{bmatrix} \text{ and } y = \begin{bmatrix} 4 \\ -2 \\ -4 \end{bmatrix},$$

find the angle between x and y : $\alpha =$ _____

5.(1 pt) If

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \text{ and } B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

are arbitrary vectors in $M_2(\mathbb{R})$, then the mapping

$$\langle A, B \rangle = a_{11}b_{11} + a_{12}b_{12} + a_{21}b_{21} + a_{22}b_{22}$$

defines an inner product in $M_2(\mathbb{R})$.

Use this inner product to determine $\langle A, B \rangle$, $\|A\|$, $\|B\|$, and the angle $\alpha_{A,B}$ between A and B for

$$A = \begin{bmatrix} -1 & 1 \\ 2 & -2 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & -3 \\ 2 & 1 \end{bmatrix}$$

$\langle A, B \rangle =$ _____

$\|A\| =$ _____

$\|B\| =$ _____

$\alpha_{A,B} =$ _____

6.(1 pt) You'll need to use the formatted text mode in order to do this problem: click on the "formatted text" button on the bottom of the page, and then click "submit answer".

Let

$$x = \begin{bmatrix} 1 \\ 1 \\ 4 \\ 0 \end{bmatrix}, \quad y = \begin{bmatrix} 2 \\ -2 \\ -9 \\ 1 \end{bmatrix}, \quad \text{and } z = \begin{bmatrix} 4 \\ 12 \\ -8.5 \\ -15.5 \end{bmatrix},$$

Use the Gram-Schmidt process to determine an orthonormal basis for the subspace of \mathbb{R}^n spanned by x , y , and z :

$$\left\{ \begin{bmatrix} - \\ - \\ - \\ - \end{bmatrix}, \begin{bmatrix} - \\ - \\ - \\ - \end{bmatrix}, \begin{bmatrix} - \\ - \\ - \\ - \end{bmatrix} \right\}$$

7.(1 pt) Use the inner product $\langle f, g \rangle = \int_0^1 f(x)g(x)dx$ in the vector space $C^0[0, 1]$ to find $\langle f, g \rangle$, $\|f\|$, $\|g\|$, and the angle $\alpha_{f,g}$ between $f(x)$ and $g(x)$ for $f(x) = -10x^2 - 9$ and $g(x) = 9x + 2$.

$\langle f, g \rangle =$ _____

$\|f\| =$ _____

$\|g\| =$ _____

$\alpha_{f,g} =$ _____