Lay 6.1

Math 2210Q

Question 1 Let
$$\vec{u} = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$
, $\vec{v} = \begin{bmatrix} -5 \\ 2 \end{bmatrix}$, $\vec{w} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$, $\vec{x} = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$.

Compute the following:

$$\vec{u} \cdot \vec{u} = \boxed{10}$$

$$||\vec{u}|| = \sqrt{\boxed{10}}$$

$$||\vec{u}||^2 = \boxed{10}$$

$$\vec{u} \cdot \vec{v} = \boxed{1}$$

$$\vec{x} \cdot \vec{w} = \boxed{1}$$

$$||\vec{v}||^2 = 29$$

$$||\vec{w} - \vec{x}|| = \sqrt{\boxed{14}}$$

Is the computation $\vec{u} \cdot \vec{w}$ possible?

Multiple Choice:

- (a) Yes
- (b) *No* ✓

Question 2 Let $\vec{u} = \begin{bmatrix} -1 \\ 7 \\ 2 \end{bmatrix}$. Compute the following:

$$\left(\frac{1}{\vec{u}\cdot\vec{u}}\right)\vec{u} = \begin{bmatrix} \boxed{-1}\\ \boxed{54}\\ \boxed{7}\\ \boxed{54}\\ \boxed{1}\\ \boxed{27} \end{bmatrix}$$

Question 3 What is the distance between $\vec{x} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$ and $\vec{y} = \begin{bmatrix} 5 \\ -5 \end{bmatrix}$?

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Multiple Choice:

- (a) 85
- (b) $\sqrt{85}$
- (c) 65
- (d) $\sqrt{65}$

Question 4 True/False: Two vectors in ${\bf R^n}$ are orthogonal if and only if their inner product (dot product) is zero.

Multiple Choice:

- (a) True ✓
- (b) False

Question 5 True/False: The vectors $\vec{x} = \begin{bmatrix} -1 \\ 4 \\ 3 \end{bmatrix}$ and $\vec{y} = \begin{bmatrix} 2 \\ 6 \\ 2 \end{bmatrix}$ are orthogonal.

Multiple Choice:

- (a) True
- (b) False ✓

Question 6 True/False: $\vec{v} = \begin{bmatrix} 1/2 \\ 1/2 \end{bmatrix}$ is a unit vector.

Multiple Choice:

- (a) True
- (b) False ✓

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Question 7 Find a unit vector in the direction of $\vec{v} = \begin{bmatrix} -1\\2\\-2\\4 \end{bmatrix}$.

First find the length of \vec{v} : $||\vec{v}|| = 5$.

Then find a unit vector $\vec{u} = \begin{bmatrix} -1/5 \\ 2/5 \\ -2/5 \\ 4/5 \end{bmatrix}$

Question 8 Find a unit vector in the direction of $\vec{v} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

First find the length of \vec{v} : $||\vec{v}|| = \sqrt{2}$.

Then find a unit vector $\vec{u} = \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$.