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:

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

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

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

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

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

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

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

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:*

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

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

Multiple Choice:

(a) *85*

(b) $\sqrt{85}$ ✓

(c) *65*

(d) $\sqrt{65}$

Question 4 *True/False: Two vectors in* $\mathbf{R^n}$ *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* ✓

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 $\vec{v}$: $||\vec{v}|| = \boxed{5}$.

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

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

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

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