Linear Algebra Quiz 2

Name:_____

1. Let $S = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}, \begin{bmatrix} 1/\sqrt{2} \\ -1/\sqrt{2} \end{bmatrix} \right\}$.

   (a) Find the lengths of the vectors in S. (2 pts)

   (b) Is the set S orthogonal, orthonormal, or neither? Explain. (4 pts)

2. Find an orthogonal basis for the 2-dimensional subspace of $\mathbb{R}^3$ with basis $\left\{ \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right\}$.

   (6 pts)

3. Let $S = \{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}\}$ be an orthonormal set of vectors in $\mathbb{R}^n$. The following two questions are multiple choice - circle the best possible answer. You do not need to show work or explain your answer. (4 points each)

Question 1: What can we say about n?

(a) $n = 3$

(b) $n \leq 3$

(c) $n \geq 3$

(d) $n \neq 3$

(e) We cannot tell anything about n from the given information

Question 2: Let $\mathbf{u} = \mathbf{v_1} - \mathbf{v_3}$ and $\mathbf{w} = 3\mathbf{v_1} + 2\mathbf{v_2}$. What is $\mathbf{u} \cdot \mathbf{w}$?

(a) 1

(b) 3

(c) 4

(d) 9

(e) This cannot be determined from the given information