MATH2210Q - Quiz #3 **Name:**

For full credit, you must show all work and circle your final answer.

$\boxed{1}$ Determine if the following set of vectors is orthogonal.

$$\left\{ \begin{bmatrix} -1 \\ 4 \\ -3 \end{bmatrix}, \begin{bmatrix} 5 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ -4 \\ -7 \end{bmatrix} \right\}$$

$\boxed{2}$ (a) Verify that $\{\mathbf{u}_1, \mathbf{u}_2\}$ is an orthogonal set then compute the orthogonal projection of $\mathbf{y}$ onto span$\{\mathbf{u}_1, \mathbf{u}_2\}$.

$$\mathbf{y} = \begin{bmatrix} 6 \\ 3 \\ -2 \end{bmatrix}, \ \mathbf{u}_1 = \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix}, \ \mathbf{u}_2 = \begin{bmatrix} -4 \\ 3 \\ 0 \end{bmatrix}$$

(b) What is the distance between $\mathbf{y}$ and the plane formed from $\mathbf{u}_1$ and $\mathbf{u}_2$?

$\boxed{3}$ Suppose we have the following

$$\left\{ \mathbf{u}_1 = \begin{bmatrix} 3/\sqrt{11} \\ 1/\sqrt{11} \\ 1/\sqrt{11} \end{bmatrix},\ \mathbf{u}_2 = \begin{bmatrix} -1/\sqrt{6} \\ 2/\sqrt{6} \\ 1/\sqrt{6} \end{bmatrix},\ \mathbf{u}_3 = \begin{bmatrix} -1/\sqrt{66} \\ -4/\sqrt{66} \\ 7/\sqrt{66} \end{bmatrix} \right\}$$

as an orthonormal basis for $\mathbb{R}^3$.

Let $\mathbf{y} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$. Find c_1, c_2, and c_3 such that $y = c_1\mathbf{u}_1 + c_2\mathbf{u}_2 + c_3\mathbf{u}_3$.