Math02B Assignment 6.1, 6.2 Name________________________________

Give complete solutions to the following problems. Be sure to provide all the necessary steps to support your answers.

1. Find the distance between **u** and **v**, $\mathbf{u} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} -1 \\ 3 \end{bmatrix}$

2. Let W be a subspace of $\Re^n$ and $W^{\perp}$ Is the orthogonal complement of W. Prove $W^{\perp}$ Is a vector subspace of $\Re^n$. Hint Show that $W^{\perp}$ Is closed under vector addition and scalar multiplication.

3. Let $W = span\{u_1, u_2, \ldots u_m\}$

Show that if **x** is orthogonal to every vector u_i, $1 \le i \le m$, then it is contained in the orthogonal complement of W. Hint let u be an arbitrary vector in W......

4. Determine which of the given sets is orthogonal?

a. $\mathbf{u}_1 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} -2 \\ 4 \\ 2 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$

b. $\mathbf{u}_1 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} -5 \\ -2 \\ 1 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$

5. Show that $\{u_1, u_2, u_3\}$ is an orthogonal basis for set of real numbers R^3. Then express x as a linear combination of the **u**'s.

$$\mathbf{u}_1 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \ \mathbf{u}_2 = \begin{bmatrix} -1 \\ 4 \\ 1 \end{bmatrix}, \mathbf{u}_3 = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}, \ \mathbf{x} = \begin{bmatrix} 8 \\ -4 \\ -3 \end{bmatrix}.$$

6. Express the given vector v as a linear combination of vectors **u** and another vector orthogonal to **u**.

$\mathbf{v} = 4\mathbf{i} - 3\mathbf{j}, \ \ \mathbf{u} = \mathbf{i} + \mathbf{j}$