Math 002B Assignment 1.7

1. Determine if the given vectors are Linearly independent.

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix} \mathbf{v}_3 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

2. Find the number of linearly independent columns in the given matrix A.

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 2 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$$

3. For what value of h is $\mathbf{v_3}$ is in Linear Span of $\{\mathbf{v_1}, \mathbf{v_2}\}$

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix} \mathbf{v}_3 = \begin{bmatrix} 2 \\ h \\ 9 \end{bmatrix}$$

4. Find the value of h so that the set $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} 2 \\ h \\ 1 \end{bmatrix} \mathbf{v}_3 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

5. Given observe that the third row is the sum of the first two rows.

a. Find a nontrivial solution of $A\mathbf{x}=0$, and show that the solution vector is orthogonal to the first two rows of the matrix A.

b. Find a nontrivial solution of $\mathbf{A}^{\mathbf{T}}\mathbf{x}=\mathbf{0}$, and show that the solution vector is orthogonal to the first two rows of the matrix $\mathbf{A}^{\mathbf{T}}$.

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 3 & 3 \end{bmatrix}$$