Homework #6, Section # 3.6

- Let S be the collection of vectors $\mathbf{x}$,

$$\mathbf{x} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

in $\mathbb{R}^3$ that satisfy the given property. In each case prove that S forms a subspace of $\mathbb{R}^3$ or give a counterexample to show that it does not.

7. $x - 7 + z = 1$

8. $|x - y| = |y - z|$

- Determine whether $\mathbf{b}$ is in $col(A)$ and whether $\mathbf{w}$ is in $raw(A)$.

11.

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 1 & 1 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}, \quad \mathbf{w} = \begin{bmatrix} -1 & 1 & 1 \end{bmatrix}$$

12.

$$A = \begin{bmatrix} 1 & 1 & -3 \\ 0 & 2 & 1 \\ 1 & -1 & -4 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \quad \mathbf{w} = \begin{bmatrix} 2 & 4 & -5 \end{bmatrix}$$

- **16.** If A is determined as in **12.**, is

$$\mathbf{v} = \begin{bmatrix} 7 \\ -1 \\ 2 \end{bmatrix}$$

in $null(A)$?

- Give basis for $row(A)$, $col(A)$, and $null(A)$

17.

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

19.

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

- Find a basis for the span of the given vectors

27.

$$\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \quad \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}, \quad \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$$

29.

$$\begin{bmatrix} 2 & -3 & 1 \end{bmatrix}, \quad \begin{bmatrix} 1 & -1 & 0 \end{bmatrix}, \quad \begin{bmatrix} 4 & -4 & 1 \end{bmatrix}$$

- **43.** Find all possible values of $rank(A)$ as a varies.

$$A = \begin{bmatrix} 1 & 2 & a \\ -2 & 4a & 2 \\ a & -2 & 1 \end{bmatrix}$$

- **49.** Show that w is in $span(\mathfrak{B})$ and find the coordinate vector $[w]_{\mathfrak{B}}$

$$\mathfrak{B} = \left\{ \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} \right\}, \quad \mathbf{w} = \begin{bmatrix} 1 \\ 6 \\ 2 \end{bmatrix}$$