

ANSWERS TO Assignment 6W Due Monday 10/29

NAME _____

Problem 1: Let A be the matrix $\begin{bmatrix} 1 & 2 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 0 & 6 \\ 0 & 0 & 0 & 0 & 7 \end{bmatrix}$.

- (a) Find all vectors x that are solutions of the matrix equation $Ax = 0$. Write the solutions in vector form.

$$\text{RREF} = \begin{bmatrix} 1 & 2 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}. \text{ Solutions are set of vectors of form } x_2 \begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

- (b) The Nullity of A = 2.

- (c) The Rank of A = 3.

- (d) Write a basis for the null space of A.

$$\left\{ \begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \right\}$$

- (e) Write a basis for the column space of A.

$$\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 5 \\ 6 \\ 7 \end{bmatrix} \right\}$$

- (f) Write a basis for the row space of A.

$$\{[1 \ 2 \ 0 \ 0 \ 0], [0 \ 0 \ 1 \ 0 \ 0], [0 \ 0 \ 0 \ 0 \ 1]\}$$

Problem 2: Let B be the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & -1 \\ 1 & 2 & 1 \\ 2 & 1 & -1 \\ 0 & 2 & 2 \end{bmatrix}$.

- a) Find all vectors x that are solutions of the matrix equation $Bx = 0$. Write the solutions in vector form.

$$\text{RREF} = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}. \text{ Solutions are vectors of form } x_3 \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$$

- b) The Nullity of B = ____1____.

- c) The Rank of B = ____2____.

- d) Write a basis for the null space of B.

$$\left\{ \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix} \right\} \text{ Note: There are other bases but all of them have 1 vector.}$$

- e) Write a basis for the column space of B.

$$\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 2 \\ 1 \\ 2 \end{bmatrix} \right\} \text{ Note: There are other bases but all of them have 2 vectors.}$$

- f) Write a basis for the row space of B.

$$\left\{ \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 1 \end{bmatrix} \right\} \text{ Note: There are other bases but all of them have 2 vectors.}$$