Homework *Sec* 2.9

1. Given the matrix $\begin{pmatrix} 0 & -2 \\ 1 & -3 \end{pmatrix}$

a) Write row vectors

b) Write Column vectors

2. Find a basis for the row space and the rank of the matrix $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$

3. Find a basis for the row space and the rank of the matrix $\begin{pmatrix} 1 & 6 & 18 \\ 7 & 40 & 116 \\ -3 & -12 & -27 \end{pmatrix}$

4. Find the nullspace of the matrix $A = \begin{pmatrix} 2 & -1 \\ -6 & 3 \end{pmatrix}$

5. Find the nullspace of the matrix $A = \begin{pmatrix} 1 & 2 & -3 \\ 2 & -1 & 4 \\ 4 & 3 & -2 \end{pmatrix}$

6. Find the nullspace of the matrix $A = \begin{pmatrix} 5 & 2 \\ 3 & -1 \\ 2 & 1 \end{pmatrix}$

7. For $A = \begin{bmatrix} 1 & 2 & 1 & 0 & 0 \\ 2 & 5 & 1 & 1 & 0 \\ 3 & 7 & 2 & 2 & -2 \\ 4 & 9 & 3 & -1 & 4 \end{bmatrix} \xrightarrow{rref} B = \begin{bmatrix} 1 & 0 & 3 & 0 & -4 \\ 0 & 1 & -1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

a) Find the rank and nullity of A.

b) Find the basis of the nullspace of A.

c) Find the basis of the row space of A.

d) Find the basis of the column space of A.

e) Determine whether the rows of A are linearly independent.

f) Let the columns of A denoted by $a_1,\ a_2,\ a_3,\ a_4,\ and\ a_5$.

Determine whether each set is linearly independent

i) $\{a_1,\ a_2,\ a_4\}$ *ii)* $\{a_1,\ a_2,\ a_3\}$ *iii)* $\{a_1,\ a_3,\ a_5\}$

8. Determine whether the nonhomogeneous system $Ax = b$ is consistent. If it is, write the solution in the form $x = x_p + x_h$.

$$\begin{cases} x - 4y = 17 \\ 3x - 12y = 51 \\ -2x + 8y = -34 \end{cases}$$