CS 210N: Numerical and Scientific Computing

Tutorial – 6

1. For the matrix $\begin{bmatrix} 0 & 1 & 4 & 0 \\ 0 & 2 & 8 & 0 \end{bmatrix}$, determine the Echelon form U, the pivot variables and null space. Then apply elimination to $Ax = b$, with components b_1 **and** b_2 on the right side; find the condition for $Ax = b$ to be consistent (i.e. to have a solution and find the general solution. What is the rank of A?

2. Carry out the above for $\begin{bmatrix} 0 & 0 \\ 1 & 2 \\ 4 & 8 \\ 0 & 0 \end{bmatrix}$.

3. Write the general solution to $\begin{bmatrix} 0 & 1 & 4 & 0 \\ 0 & 2 & 8 & 0 \end{bmatrix}\begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$

4. Describe the set of attainable right sides b for $\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$, by finding the constraints on b that turn the third equation into $0 = 0$ (after elimination). What is the Rank?

5. What is the most general solution to
$$u + v + w = 1$$
$$u - w = 2$$
?