

1. Fact: The matrix $A = \begin{bmatrix} 0 & 1 & 4 & -1 & -2 & -3 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 4 & 0 & -12 & 9 & 34 & 25 \\ 3 & 6 & 15 & 0 & 12 & -3 \\ 2 & 4 & 10 & 0 & 8 & -2 \end{bmatrix}$ is row equivalent to $\begin{bmatrix} 1 & 0 & -3 & 0 & 4 & -5 \\ 0 & 1 & 4 & 0 & 0 & 2 \\ 0 & 0 & 0 & 1 & 2 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$.

1A. Find each of the following:

i) The rank of A .

ii) The dimension of the null space of A .

iii) A basis for the column space of A .

iv) A basis for the row space of A .

2. Suppose $B \in M_{3 \times 5}$.

2A. What are the maximum and minimum possible dimensions for $\text{Nul}(B)$? MAX:

MIN:

2B. What are the maximum and minimum possible values for the rank of B ? MAX:

MIN:

3. Let $C = \begin{bmatrix} -4 & 4 \\ -5 & 8 \end{bmatrix}$

3A. Find the characteristic polynomial of C .

3B. Find the eigenvalues of C using the answer to (3A).

3C. Find an eigenvector of C corresponding to the *larger* of the two eigenvalues in (3B).