

$$\text{Let } A = \begin{bmatrix} 2 & 1 & -4 & 3 & -2 & -5 \\ -1 & 1 & 2 & 3 & 1 & -11 \\ 1 & 4 & -2 & -3 & -1 & 11 \\ -2 & -2 & 4 & -1 & 2 & -1 \end{bmatrix}. \text{ Then } A \sim \begin{bmatrix} 1 & 0 & -2 & 0 & -1 & 2 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & -3 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

What are the dimensions of the null space and column space of  $A$  and how do you know. What do these dimensions sum to?

State bases for the null space and column space of  $A$ .

Determine the dimension of  $\text{span} \left( \left\{ \begin{bmatrix} 1 \\ -1 \\ 0 \\ 4 \\ -2 \end{bmatrix}, \begin{bmatrix} -4 \\ 4 \\ 0 \\ -16 \\ 8 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ 1 \\ 3 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \\ 11 \\ -6 \end{bmatrix}, \begin{bmatrix} -2 \\ 3 \\ 1 \\ -1 \\ 0 \end{bmatrix} \right\} \right)$ . Explain your thought process!

Find a basis for the null space of  $B$  where  $B = \begin{bmatrix} -i & 1 \\ -1 & -i \end{bmatrix}$ .