

**Group Work Instructions:** Form groups of two or three people. Prepare one neat solution for your group to turn in with the names of all group members on that solution.

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1. Let  $A = \begin{bmatrix} 1 & 3 & 1 & 3 \\ 2 & 6 & 4 & 8 \end{bmatrix}$ .

(a) Find  $\text{Nul } A$

(b) Let  $x = \begin{bmatrix} 4 \\ 3 \\ 2 \\ 1 \end{bmatrix}$ . Then  $Ax = \begin{bmatrix} 18 \\ 42 \end{bmatrix}$ . Use your answer to part (a) to find a second vector  $y$  such that  $Ay = \begin{bmatrix} 18 \\ 42 \end{bmatrix}$ .

2. Let  $A = \begin{bmatrix} 4 & 1 & 2 & 1 \\ 2 & -5 & 1 & 6 \\ 3 & 2 & 4 & 7 \end{bmatrix}$ .

(a) Find  $\text{Nul } A$ , given that the reduced echelon form of  $A$  is  $\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix}$ .

(b) Bryan, Maryam and Alana are studying for the exam.

- Bryan writes, "Col  $A = \text{span} \left\{ \begin{bmatrix} 4 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ -5 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix}, \begin{bmatrix} 1 \\ 6 \\ 7 \end{bmatrix} \right\}$ "
- Maryam writes, "Col  $A = \text{span} \left\{ \begin{bmatrix} 4 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ -5 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix} \right\}$ "
- Alana writes, "Col  $A = \text{span} \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \right\}$ "

Comment on the accuracy of each student's statement.