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10. Let $A = \begin{bmatrix} 1 & 2 & 0 & 3 & 5 & 0 & 9 \\ 1 & 2 & 1 & 7 & 11 & 0 & 17 \\ 1 & 2 & 0 & 3 & 5 & 1 & 16 \\ 1 & 2 & 0 & 3 & 5 & 1 & 16 \\ 1 & 2 & 0 & 3 & 5 & 0 & 9 \end{bmatrix}$. Find a basis for the null space of A .

Find a basis for the column space of A . Show your work. Check your answer.

$$\begin{array}{l} R_2 \rightarrow R_2 - R_1 \\ R_3 \rightarrow R_3 - R_1 \\ R_4 \rightarrow R_4 - R_1 \\ R_5 \rightarrow R_5 - R_1 \end{array} \quad \begin{bmatrix} 1 & 2 & 0 & 3 & 5 & 0 & 9 \\ 0 & 0 & 1 & 4 & 6 & 0 & 8 \\ 0 & 0 & 0 & 0 & 0 & 1 & 7 \\ 0 & 0 & 0 & 0 & 0 & 1 & 7 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad R_4 \rightarrow R_4 - R_3 \quad \begin{bmatrix} 1 & 2 & 0 & 3 & 5 & 0 & 9 \\ 0 & 0 & 1 & 4 & 6 & 0 & 8 \\ 0 & 0 & 0 & 0 & 0 & 1 & 7 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

cols 1, 3, 6 from A are a basis for the column space of A

basis for col space of A

$$\left[\begin{array}{c} | \\ | \\ | \\ | \\ | \\ | \\ | \end{array} \right] \quad \left[\begin{array}{c} 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} \right] \quad \left[\begin{array}{c} 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} \right]$$

null space

$$x_1 = -2x_2 - 3x_4 - 5x_5 - 9x_7$$

$$x_2 = x_2 - 4x_4 - 6x_5 - 8x_7$$

$$x_3 =$$

$$x_4 = x_4$$

$$x_5 = x_5$$

$$x_6 = -7x_7$$

$$x_7 = x_7$$

A basis for the null space of A :

$$\left[\begin{array}{c} -2 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} \right] \quad \left[\begin{array}{c} -3 \\ 0 \\ -4 \\ 1 \\ 0 \\ 0 \\ 0 \end{array} \right] \quad \left[\begin{array}{c} -5 \\ 0 \\ -6 \\ 0 \\ 1 \\ 0 \\ 0 \end{array} \right] \quad \left[\begin{array}{c} -9 \\ 0 \\ -8 \\ 0 \\ 0 \\ 0 \\ -7 \end{array} \right]$$