1. Here are the row reductions of five $m \times n$ matrices into reduced row echelon form.

$$A \to \begin{bmatrix} 1 & 0 & 5 & -3 & 0 \\ 0 & 1 & -2 & 8 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad B \to \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad C \to \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad D \to \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix} \quad E \to \begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Let $T_A : \mathbb{R}^n \to \mathbb{R}^m$ be the linear transformation whose matrix is A. That is, $T_A(x) = Ax$. Determine the appropriate values for n and m, and decide whether T_A is one-to-one and/or onto and whether the columns span $\mathbb{R}^m$ and are linearly independent. Do the same for B, C, D, E.

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