
Show all work. 5 points each.

1. Define linearly independent. Are the columns of A linearly independent? Justify.

$$A = \begin{bmatrix} 1 & 4 & -3 & 0 \\ -2 & -7 & 5 & 1 \\ -4 & -5 & 7 & 5 \end{bmatrix}$$

2. Let $\mathbf{e}_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$, $\mathbf{e}_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, $\mathbf{y}_1 = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$ and $\mathbf{y}_2 = \begin{bmatrix} -1 \\ 6 \end{bmatrix}$, and let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be a linear transformation that maps \mathbf{e}_1 to \mathbf{y}_1 and \mathbf{e}_2 to \mathbf{y}_2 . Find the images of $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, $\begin{bmatrix} 5 \\ -3 \end{bmatrix}$, under the action of T .