

1. Suppose we have a linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^5$. T sends \mathbf{e}_1 to the vector $(1, 2, 3, 4, 5)$ and \mathbf{e}_2 to the vector $(1, -1, 1, -1, 1)$. Write the standard matrix A for T . Then find $T\left(\begin{bmatrix} 2 \\ 3 \end{bmatrix}\right)$.

2. Suppose a transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ reflects vectors about the vertical y (or x_2) axis. Find the associated matrix A . Show work (by using graphs showing what T does to \mathbf{e}_1 and \mathbf{e}_2).

3. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ and let $T(\mathbf{x}) = A\mathbf{x}$.

a. If $T: \mathbb{R}^a \rightarrow \mathbb{R}^b$, find a and b .

b. Is this transformation one-to-one? Justify briefly.

c. Is this transformation onto? Justify briefly.