

Instructions: Please answer the following legibly, logically, and **show all work**. No credit will be given for unjustified or unclear work. When you are finished, please scan your work (or take pictures) and submit via the Assignments link on Canvas.

Consider the transformation, $T(\mathbf{x}) : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ defined by $T(\mathbf{x}) = A\mathbf{x}$, where $A = \begin{bmatrix} 1 & -2 \\ 4 & 3 \\ 5 & -1 \end{bmatrix}$

1. Find $T(\mathbf{x})$, where...

(a) $\mathbf{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

(b) $\mathbf{x} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

(c) $\mathbf{x} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$

2. Does there exist a \mathbf{y} such that $T(\mathbf{y}) = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$? If so, what is it?

3. Does there exist a \mathbf{y} such that $T(\mathbf{y}) = \begin{bmatrix} 5 \\ 9 \\ 16 \end{bmatrix}$? If so, what is it?