Math 002B Assignment 1.8 Last Name__________________1st___________

1. Let $\mathbf{A} = \begin{bmatrix} 1 & -1 \\ 1 & 2 \end{bmatrix}$.

   Define Linear Transformation $T: R^2 \to R^2$, by $T(x) = \mathbf{A}x$. Find the images under T of $\mathbf{u} = \begin{bmatrix} 1 \\ 3 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$.

2. Define a Linear Transformation $T: R^3 \to R^3$, by $T(x) = \mathbf{A}x$.
   Find the vector **x** who is image under T is **b**, and determine if **x** is unique.

   $$\mathbf{A} = \begin{bmatrix} 1 & 0 & -2 \\ -2 & 1 & 6 \\ 3 & -2 & -5 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} -1 \\ 7 \\ -3 \end{bmatrix}$$

3. Let $T: R^2 \to R^2$ be a linear transformation such that T(1,0) = (–1,1) and T(0,1) = (1, – 2)
   Find the image of (1, –4) under T.

4. Given $\mathbf{v} = (v_1, v_2, v_2)$, and $T(\mathbf{v}) = (v_1 + v_2, v_1 + 2v_2 + v_3, v_2 + v_3)$

Find all vectors in the domain of T so that $T(\mathbf{v}) = 0$

5. Let $T : R^3 \rightarrow R^3$ be a linear transformation that projects each vector $x = (x_1, x_2, x_3)$ onto the plane $x_2 = 0$, so $T(x) = (x_1, 0, x_3)$. Show that T is a linear transformation.

6. Show that the transformation T defined by $T(x) = (x_1, x_2).) = (4x_1 - 2x_2, x_1 + 4 + 4x_2)$ is not linear.