Date _____

MTH 261
Linear Algebra
Summer 2017

Linear Transformations

Find partners, and follow the instructions. You will not turn this in, but you must be working diligently to get attendance credit.

1. Let $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 1 & -3 \\ 2 & -5 & 6 \end{bmatrix}$ and $\vec{b} = \begin{bmatrix} -6 \\ -4 \\ -5 \end{bmatrix}$. Is $\vec{b}$ in the image of T_A?

2. Let $A = \begin{bmatrix} 1 & -3 & 2 \\ 3 & -8 & 8 \\ 0 & 1 & 2 \\ 1 & 0 & 8 \end{bmatrix}$, $\vec{b} = \begin{bmatrix} 2 \\ 1 \\ -3 \end{bmatrix}$, and $\vec{c} = \begin{bmatrix} 1 \\ 6 \\ 3 \\ 10 \end{bmatrix}$. Is $\vec{b}$ in the image of T_A? Is $\vec{c}$ in the image of T_A? What is $T_A\left(\vec{b}\right)$?

3. Define $T\colon \mathbb{R}^2 \to \mathbb{R}^3$ by $T(\vec{x}) = \begin{bmatrix} x_2 - x_1 \\ 3x_1 + x_2 \\ x_1 \end{bmatrix}$. Is T a linear transformation? If so, prove it according to the definition of a linear transformation. If not, show why not.

4. Define $T\colon \mathbb{R}^3 \to \mathbb{R}^2$ by $T(\vec{x}) = \begin{bmatrix} x_3 + 1 \\ x_1 - x_2 \end{bmatrix}$. Is T a linear transformation? If so, prove it according to the definition of a linear transformation. If not, show why not.

5. Define $T\colon \mathbb{R}^3 \to \mathbb{R}^3$ by $T(\vec{x}) = \begin{bmatrix} |x_1| \\ x_1 + x_2 \\ \sin(x_3) \end{bmatrix}$. Is T a linear transformation? If so, prove it according to the definition of a linear transformation. If not, show why not.