

Instructions: Clearly answer each of the questions below. Remember to check the back side. Show your work and any formulas you employ. Simplify all answers as far as possible.

1. (1 pt) Is the set $\left\{ \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}, \begin{bmatrix} 10 \\ 2 \\ 13 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right\}$ linearly dependent or independent? linearly dependent

2. (1 pt) Is $T(x) = \begin{bmatrix} x_1 + 2x_2 \\ 3 - x_2 \end{bmatrix}$ a linear transformation? no. $T(\vec{0}) \neq \vec{0}$

3. (4 pts) For each of the matrices below, determine if the matrix represents a dilation, rotation, reflection, projection, or shear.

(a) $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ a dilation

(b) $\begin{bmatrix} 1 & 0 \\ -3 & 1 \end{bmatrix}$ a shear

(c) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ a reflection

(d) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ a rotation

4. (2 pts) If the linear transformation $T(\mathbf{x}) = A\mathbf{x}$, where $A = \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}$, plot the linear transformation of the set of 3 position vectors $\{(0, 0), (2, 2), (-2, 2)\}$ shown below.

