Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Let $A = \begin{bmatrix} 1 & -3 & -5 \\ 7 & -7 & 5 \end{bmatrix}$ and define $T: R^3 \to R^2$ by $T(\vec{x}) = A\vec{x}$.

    a. Find the image under T of $\vec{u} = \begin{bmatrix} 2 \\ -11 \end{bmatrix}$.

    b. Find a vector whose image under T is $\vec{b} = \begin{bmatrix} 12 \\ -12 \end{bmatrix}$. Is it unique?

2. Determine if the transformation $T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} 3x_2 - 4x_3 \\ 1 - x_1^2 \\ x_1 + x_2 - x_3 \end{bmatrix}$ is linear. If it is not, explain why not. If it is, prove it. Is the transformation one-to-one, onto, both, or neither? Explain.