Question 1 *Let* $A = \begin{bmatrix} 3 & 0 \\ 0 & 1 \end{bmatrix}$ *and define* $T : \mathbf{R^2} \to \mathbf{R^2}$ *by* $T(\mathbf{x}) = A\mathbf{x}$. *Let* $\mathbf{u} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ *and compute* $T(\mathbf{u})$.

$$T(\mathbf{u}) = \begin{bmatrix} \boxed{3} \\ \boxed{-1} \end{bmatrix}$$

Question 2 *Let* $A = \begin{bmatrix} -1 & 2 \\ 4 & 1 \end{bmatrix}$ *and define* $T : \mathbf{R^2} \to \mathbf{R^2}$ *by* $T(\mathbf{x}) = A\mathbf{x}$. *Let* $\mathbf{u} = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$ *and compute* $T(\mathbf{u})$.

$$T(\mathbf{u}) = \begin{bmatrix} \boxed{5} \\ \boxed{-11} \end{bmatrix}$$

Question 3 *Let* A *be a* 7×6 *matrix. What must* a *and* b *be in order to define* $T : \mathbf{R^a} \to \mathbf{R^b}$ *by* $T(\mathbf{x}) = A\mathbf{x}$*?*

$$a = \boxed{6} \qquad b = \boxed{7}$$

Question 4 *Let* $T : \mathbf{R^3} \to \mathbf{R}$ *be a linear transformation. Then*

$$T(\mathbf{0}) = \boxed{0}$$
