Quiz 2

Name: Solutions Score: _____

1. Which of the following functions f are linear? Circle your answer.
   If the function is linear, write the matrix A such that $f(\vec{x}) = A\vec{x}$.

   - Let $\vec{p} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$. Define $f : \mathbb{R}^2 \to \mathbb{R}^2$ by $f(\vec{x}) = \vec{x} + \vec{p}$.
     Not Linear
   - Define $f : \mathbb{R}^2 \to \mathbb{R}^2$ by $f\left(\begin{bmatrix} a \\ b \end{bmatrix}\right) = \begin{bmatrix} a - 2b \\ -3a - b \end{bmatrix}$.
     Linear. $A = \begin{bmatrix} 1 & -2 \\ -3 & -1 \end{bmatrix}$
   - Let $f : \mathbb{R}^2 \to \mathbb{R}^2$ rotate each vector by 180° counterclockwise.
     Linear. $A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
   - Let $f : \mathbb{R}^3 \to \mathbb{R}^2$ be defined by

     $$f\left(\begin{bmatrix} a \\ b \\ c \end{bmatrix}\right) = \begin{bmatrix} ab \\ a + b \end{bmatrix}$$

     Not linear.

2. Is the set of vectors

   $$\left\{ \begin{bmatrix} 1 \\ 3 \\ 3 \\ -1 \end{bmatrix} \quad \begin{bmatrix} -1 \\ -6 \\ 0 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 0 \\ -5 \\ -2 \\ -8 \end{bmatrix} \right\}$$

   linearly independent?

   Yes No

   Yes.