Name: Saul Ushin **Math 308-L**

Student ID #: 5555555 **Quiz 4**

1. **[4 points]** Let $A = \begin{bmatrix} 3 & 9 \\ 1 & 4 \end{bmatrix}$. Compute A^{-1}.

Quick formula: $A^{-1} = \frac{1}{3\cdot 4 - 1\cdot 9}\begin{bmatrix} 4 & -9 \\ -1 & 3 \end{bmatrix} = \boxed{\begin{bmatrix} \frac{4}{3} & -3 \\ \frac{-1}{3} & 1 \end{bmatrix}}$

2. **[3 points]** Let $T(\mathbf{x}) = \begin{bmatrix} -7 & 3 & 2 \\ -2 & -2 & -3 \end{bmatrix}\mathbf{x}$. Which of these vectors are in the kernel of T?

(No credit for just circling the right answer. Show some justification!)

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \qquad \begin{bmatrix} -7 \\ 3 \\ 2 \end{bmatrix} \qquad \begin{bmatrix} 1 \\ 5 \\ -4 \end{bmatrix}$$

$T(\vec{0}) = \vec{0}$, so $\vec{0}$ is always in the kernel.

$T\left(\begin{bmatrix} -7 \\ 3 \\ 2 \end{bmatrix}\right) = \begin{bmatrix} -7 & 3 & 2 \\ -2 & -2 & -3 \end{bmatrix}\begin{bmatrix} -7 \\ 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 62 \\ 2 \end{bmatrix}$

so, nope!

$T\left(\begin{bmatrix} 1 \\ 5 \\ -4 \end{bmatrix}\right) = \begin{bmatrix} -7 & 3 & 2 \\ -2 & -2 & -3 \end{bmatrix}\begin{bmatrix} 1 \\ 5 \\ -4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

so, yup!

3. **[3 points]** Let S be the set of vectors $\begin{bmatrix} a \\ b \end{bmatrix}$ where $a^2 = b^2$. Is S a subspace of $\mathbb{R}^2$? Explain.

$\boxed{\text{No!}}$ $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ are in S, since $1^2 = (-1)^2$.

But $\begin{bmatrix} 1 \\ -1 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \end{bmatrix}$ is not in S since $2^2 \neq 0^2$.