Math 244 Midterm 1

Names: _____

1. Let $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ -2 & 1 & 1 & 4 \end{bmatrix}$ and let $S = \{\mathbf{x} \text{ in } \mathbb{R}^4 : A\mathbf{x} = \mathbf{0}\}$. Find a basis for S and the dimension of S.

2. Write the system $\begin{cases} x - z = 1 \\ y - z = -2 \\ -y + 2z = 0 \end{cases}$ as a matrix multiplication of the form $A\mathbf{x} = \mathbf{b}$. Solve using A^{-1}.

3. Find all eigenvalues and eigenvectors for $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$.

4. Are the vectors $\begin{bmatrix}1\\1\\0\\1\end{bmatrix}$, $\begin{bmatrix}1\\0\\-1\\1\end{bmatrix}$, $\begin{bmatrix}0\\2\\1\\1\end{bmatrix}$ linearly independent? Why or why not?

5. Let $S = \text{span}\{x+1, x-1, x^2+1, x^2-1\}$. Find a basis for S and the dimension of S.