Linear Algebra Review Questions: A solid understanding of linear algebra will make differential equations a breeze! Answer as many of the following as you can. Ask Piazza about questions you can't finish in Recitation.

1. Find the solution set to the matrix equation:
$$\begin{pmatrix} 1 & 2 & 0 \\ 2 & 4 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

2. Find the solution set to the matrix equation:
$$\begin{pmatrix} 1 & 2 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 13 \\ -3 \end{pmatrix}$$

3. Find the inverse matrix
$$\begin{pmatrix} 1 & 3 \\ -1 & 1 \end{pmatrix}$$

4. Find a basis for the column space of
$$\begin{pmatrix} 1 & -1 & 2 & 1 \\ 3 & 4 & 1 & 1 \\ 1 & -1 & 2 & 1 \end{pmatrix}$$

5. What is the characteristic polynomial for the matrix below? What are the eigenvalues? Find an eigenvector for each eigenvalue. Write the diagonalized form of the matrix.
$$\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$$

6. What are the eigenvalues of the matrix below? What are the eigenvectors associated to each eigenvalue?
$$\begin{pmatrix} 5 & 0 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

7. Find the eigenvalues for the matrix
$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$