Math 322 Section 3 Written Homework 2

1) Consider the matrix

$$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}.$$

Compute its eigenvalues and corresponding eigenvectors (note: you may need to use complex numbers).

2) Consider the following matrix:

$$B = \begin{pmatrix} 11 & -5 & 5 \\ 7 & -1 & 7 \\ -1 & 1 & 5 \end{pmatrix}$$

A) Compute the eigenvalues of the matrix.
B) Compute the corresponding eigenvectors.
C) Show that the eigenvectors span all of $\mathbb{R}^3$ (Note: $\mathbb{R}^3$ denotes all vectors with three real number components).

3) Consider the following matrix:

$$C = \begin{pmatrix} 2 & 1 & 0 \\ -1 & 0 & 1 \\ 1 & 3 & 1 \end{pmatrix}$$

A) Compute the eigenvalues of the matrix.
B) Compute the corresponding eigenvectors.
C) Show that the eigenvectors do not span all of $\mathbb{R}^3$ (Note: $\mathbb{R}^3$ denotes all vectors with three real number components).

4) Consider the problem $Mx = 0$ where M is a square matrix and x is a vector of unknowns. Give three different conditions on M that each ensure that M has only one solution. What is that solution?