## EXERCISES FOR MATH 2331 DUE APRIL 1

(1) Find the characteristic polynomial and the (real) eigenvalues for the matrix

$$A = \begin{bmatrix} -3 & 3 \\ 8 & -1 \end{bmatrix}$$

For each eigenvalue, find a basis for the corresponding eigenspace.

(2) The matrix $A = \begin{bmatrix} 1 & 3 \\ 3 & -7 \end{bmatrix}$ has eigenvalues $\lambda_1 = -8$ and $\lambda_2 = 2$. Find eigenvectors for $A$ that correspond to these eigenvalues.

(3) Find an invertible matrix $P$ and a real matrix $C = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ such that

$$A = \begin{bmatrix} 1 & 2 \\ -4 & 5 \end{bmatrix} = PCP^{-1}.$$

(See Theorem 9 on page 301).

(4) Find an invertible matrix $P$ and a diagonal matrix $D$ such that

$$A = \begin{bmatrix} 1 & -3 \\ 1 & 5 \end{bmatrix} = PDP^{-1}.$$

(5) If $A = \begin{bmatrix} 2 & 1 & 0 & 0 & 0 \\ 0 & 2 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 3 & 1 \\ 0 & 0 & 0 & 0 & 3 \end{bmatrix}$, find all of the eigenvalues of $A$ , their algebraic multiplicities, and a basis for each eigenspace. Is $A$ diagonalizable?