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## PROBLEM SET

Problems on Eigenvalues and Diagonalization

Math 3351, Fall 2010

Oct. 20, 2010

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- Write all of your answers on separate sheets of paper. You can keep the question sheet.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g.,  $\sqrt{2}$ , not 1.414).
- This problem set has 2 problems. There are **0 points total**.

Good luck!

**Problem 1.** In each part, find the characteristic polynomial of the matrix and the eigenvalues of the matrix **by hand computation**.

A.

$$A = \begin{bmatrix} 15 & 16 \\ -12 & -13 \end{bmatrix}$$

B.

$$A = \begin{bmatrix} 2 & 0 & 1 \\ -82 & -11 & -25 \\ 24 & 4 & 6 \end{bmatrix}$$

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**Problem 2.** In each part, you are given a matrix  $A$  and the eigenvalues of  $A$ . Find a basis for each of the eigenspaces. Determine if  $A$  is diagonalizable and, if so, find an invertible matrix  $P$  and a diagonal matrix  $D$  so that  $P^{-1}AP = D$ .

A. The eigenvalues are  $-1$  and  $2$  and

$$A = \begin{bmatrix} -16 & 36 & -18 \\ -6 & 14 & -6 \\ 3 & -6 & 5 \end{bmatrix}.$$

B. The eigenvalues are  $-1$  and  $2$  and the matrix is

$$A = \begin{bmatrix} 2 & 13 & 29 \\ 0 & 26 & 54 \\ 0 & -12 & -25 \end{bmatrix}.$$

C. The eigenvectors are  $1$  and  $1 \pm i$ , and the matrix is

$$A = \begin{bmatrix} -2 & -4 & 5 \\ -3 & -3 & 5 \\ -5 & -5 & 8 \end{bmatrix}$$

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