Your name:

Instructor (please circle): Samantha Allen Angelica Babei

Math 22 Fall 2018 Homework 7, due Fri Nov 2 4:00 pm in homework boxes in front of Kemeny 108 *Please show your work, and check your answers. No credit is given for solutions without work or justification.*

(1) Consider

$$A = \begin{bmatrix} 2 & -2 & 1 \\ -1 & 3 & -1 \\ 2 & -4 & 3 \end{bmatrix}.$$

(a) What is the characteristic polynomial of A? Find all of the eigenvalues for A, and state their algebraic multiplicities.

(b) For each of the eigenvalues found in part (a), find the dimensions of their respective eigenspaces.

(2) True or false (no working needed, just circle the answer):

(a) T / F: An $n \times n$ matrix A is invertible if and only if $\lambda = 0$ is an eigenvalue.

(b) T / F: If $\mathbf{x}$ is an eigenvector for A, so is $3\mathbf{x}$.

(c) T / F: Every matrix is similar to a diagonal matrix.

(d) T / F: If $\mathbf{u}$ and $\mathbf{v}$ are eigenvectors for A in the same eigenspace, then any nonzero linear combination of $\mathbf{u}$ ad $\mathbf{v}$ is also an eigenvector.

(e) T / F: A matrix is diagonalizable if and only if the algebraic multiplicity of each eigenvalue is equal to the dimension of its eigenspace.

(3) Consider

$$B = \begin{bmatrix} 17 & -6 \\ 45 & -16 \end{bmatrix}.$$

Find B^{11}. Explain all the intermediary steps, but no need to simplify the end result (for example, you may leave unsimplified entries in the matrices such as $8 \cdot 3^{12} - 4$).