Math 54: Worksheet #12

Name: _____ Date: October 12, 2021

Fall 2021

Problem 1 (True/False)**.** The concepts of eigenvectors and eigenvalues only make sense for *square* matrices.

Problem 2 (True/False)**.** For an $n \times n$ matrix A, λ is an eigenvalue of A if and only if $A + \lambda I_n$ is not invertible.

Problem 3 (True/False)**.** If $\underline{v}_1$ and $\underline{v}_2$ are linearly independent eigenvectors of a matrix A, then they correspond to distinct eigenvalues.

Problem 4 (True/False)**.** For an $n \times n$ matrix A, λ is an eigenvalue of A if and only if λ is a root of the characteristic polynomial of A

Problem 5 (5.1 #8)**.** Is $\lambda = 3$ an eigenvalue of $\begin{bmatrix} 1 & 2 & 2 \\ 3 & -2 & 1 \\ 0 & 1 & 1 \end{bmatrix}$? If so, find one corresponding eigenvector.

Problem 6 (5.1 #15)**.** Find a basis for the eigenspace corresponding to $\lambda = 3$ for the following matrix:

$$\begin{bmatrix} 4 & 2 & 3 \\ -1 & 1 & -3 \\ 2 & 4 & 9 \end{bmatrix}$$

Problem 7 (5.2 #12)**.** Find the characteristic polynomial of the following matrix, and then list all the eigenvalues and their multiplicities:

$$\begin{bmatrix} -1 & 0 & 1 \\ -3 & 4 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$