# Math 54: Worksheet #13

Name: ______________________ Date: October 14, 2021

Fall 2021

**Problem 1** (True/False)**.** An $n \times n$ matrix $A$ has $n$ real eigenvalues (counting multiplicity).

**Problem 2** (True/False)**.** Every square matrix $A$ is diagonalizable.

**Problem 3** (True/False)**.** If an $n \times n$ matrix $A$ is diagonalizable, then $A$ has $n$ distinct eigenvalues.

**Problem 4** (True/False)**. Requires future knowledge.** For an $n \times n$ matrix $A$, $\det A$ is the product of the eigenvalues of $A$.

**Problem 5** (5.2 #16)**.** List the eigenvalues of the following matrix, repeated according to their multiplicities:

$$\begin{bmatrix} 5 & 0 & 0 & 0 \\ 8 & -4 & 0 & 0 \\ 0 & 7 & 1 & 0 \\ 1 & -5 & 2 & 1 \end{bmatrix}$$

**Problem 6** (5.3 #6)**.** Consider the matrix

$$\begin{bmatrix} 4 & 0 & -2 \\ 2 & 5 & 4 \\ 0 & 0 & 5 \end{bmatrix} = \begin{bmatrix} -2 & 0 & -1 \\ 0 & 1 & 2 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 4 \end{bmatrix} \begin{bmatrix} 0 & 0 & 1 \\ 2 & 1 & 4 \\ -1 & 0 & -2 \end{bmatrix}.$$

This matrix is factored in the form $PDP^{-1}$. Use the Diagonalizatoin Theorem to find the eigenvalues of $A$ and a basis for each eigenspace.

**Problem 7** (5.3 #14-ish)**.** Consider the following matrix:

$$\begin{bmatrix} 4 & 0 & 2 \\ 2 & 5 & 4 \\ 0 & 0 & 5 \end{bmatrix}.$$

The eigenvalues for the following matrix are $\lambda = 5, 4$. Diagonalize the matrix, if possible.