

MTH 261

LINEAR ALGEBRA

SUMMER 2017

Eigenvalues and Eigenvectors

Find partners, and follow the instructions. You will not turn this in, but you must be working diligently to get attendance credit.

1. Let $A = \begin{bmatrix} 3 & 2 \\ 3 & 8 \end{bmatrix}$.

- (a) Determine which numbers in $\{1, 2, \dots, 9\}$ are eigenvalues for A .
- (b) For each eigenvalue that you found, find an eigenvector.
- (c) For each eigenvalue that you found, find a basis for the corresponding eigenspace.

2. Let $A = \begin{bmatrix} 2 & 7 & 0 \\ 1 & -4 & 0 \\ 0 & 0 & 2 \end{bmatrix}$.

- (a) Determine if 3 is an eigenvalue for A .
- (b) Can you find another eigenvalue for A just by inspecting A ?
- (c) A fact we will eventually prove is that the product of all of A 's eigenvalues equals its determinant. By this point you have found two eigenvalues of A . Can you now find a third?
- (d) Find a basis of \mathbb{R}^3 consisting entirely of eigenvectors of A .

3. Is $\begin{bmatrix} 4 \\ -3 \\ 1 \end{bmatrix}$ an eigenvector for $\begin{bmatrix} 3 & 7 & 9 \\ -4 & -5 & 1 \\ 2 & 4 & 4 \end{bmatrix}$. If not, how do you know? If so, what is its eigenvalue?

4. Is $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ an eigenvector for $\begin{bmatrix} 2 & 0 & 1 \\ 2 & 4 & -1 \\ 0 & 4 & 0 \end{bmatrix}$. If not, how do you know? If so, what is its eigenvalue?

5. Let $A = \begin{bmatrix} 2 & 5 \\ 6 & 3 \end{bmatrix}$.

- Find both of the eigenvalues for the matrix A . To speed things up, they are in the set $\{-3, 0, 2, 5, 8, 9\}$.
- Find a basis of \mathbb{R}^2 consisting entirely of eigenvectors of A .
- Sketch the two eigenspaces of A on the graph.
- What does T_A do to the picture? Overlay its image on the graph.

