

MTH 309 - Activity 13  
Singular Value Decomposition

1. Consider the linear transformation  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  with matrix representation

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

- (a) Use compute  $T(\cos \theta, \sin \theta)$  for  $\theta = 0, \frac{\pi}{4}, \frac{\pi}{2}, \dots, \frac{7\pi}{4}$ .
- (b) Plot the points you computed. What shape do they make?
- (c) How would you describe this shape to someone who doesn't have a picture to look at? Be as detailed as you can.

2. Repeat the steps above for the transformation with matrix representation

$$A = \begin{bmatrix} -1 & 5 \\ 4 & 3 \end{bmatrix}.$$

3. What are the differences between the two graphs, and how might you quantify those differences?