

Math 9 Fall 19 Homework 6 (Due on Nov 6 before class)

(1) (3 pts) Linear Algebra 5.6.7

(2) (3 pts) Linear Algebra 5.6.8

(3) (3 pts each) Recall that a rotation of degree θ , denoted by Rot_θ , is a linear transformation whose representing matrix can be written as

$$[\text{Rot}_\theta] = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}.$$

(a) Let T be a linear transformation with

$$[T] = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}.$$

Is T a rotation? Why?

(b) Verify that the the rotation $\text{Rot}_\alpha \circ \text{Rot}_\beta$ is the rotation $\text{Rot}_{\alpha+\beta}$.

(c) Let $S, L : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be two linear transformations. Suppose that L is a rotation, but S is not a rotation. Can their compositions $S \circ L$ and $L \circ S$ be rotations? (extra credit)

(4) (3 pts) Linear Algebra 6.1.5

(5) (3 pts) Linear Algebra 6.2.2 (We will cover this problem on Monday)