Homework 13

MATH 231

Complete before the final exam.

Instructions. *There will be no quiz on this assignment, but the material will be on the final exam.*

Exercise 1. Complete the following exercises from Section 6.2 in the course textbook:

35, 37, 38

Exercise 2. Complete the following exercises from Section 6.4 in the course textbook:

1, 7, 13, 24, 26

Exercise 3. Complete the following exercises from Section 6.5 in the course textbook:

9, 15, 32

Exercise 4. Let A be an $n \times n$ orthogonal matrix. Show that if $\mathbf{u}, \mathbf{v} \in \mathbb{R}^n$, then

$$(A\mathbf{u}) \cdot (A\mathbf{v}) = \mathbf{u} \cdot \mathbf{v}.$$

(This says that orthogonal matrices, as linear transformations, preserve distance. As they also fix the origin, they must fix the sphere, which is made up of unit vectors. So, it induces an isometry of the $(n-1)$-sphere.)

Exercise 5. Let $R_\theta = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$. Show that R_θ is an orthogonal matrix.