Homework 6
due November 21, 2014 in class

Read: Artin 5.1, 6.1, 6.2

1. **Artin 5.1.1(a)** pg. 150
   What is the matrix of the three-dimensional rotation through the angle θ about the axis e_2?

2. (a) Prove that O_n and SO_n are subgroups of $GL_n(\mathbb{R})$, and determine the index of SO_n in O_n.

   (b) **Artin 5.1.3** pg. 150
   Is O_2 isomorphic to the product group $SO_2 \times \{\pm I\}$? Is O_3 isomorphic to $SO_3 \times \{\pm I\}$?

3. Let A be a matrix in O_3 whose determinant is -1. Prove that -1 is an eigenvalue of A.

4. Prove that an isometry, as defined by Artin (6.2.1), is bijective.

5. **Artin 6.1.1** pg. 188
   List all symmetries of the following figures.
   (a) (6.1.4) (b) (6.1.5) (c) (6.1.6) (d) (6.1.7)

6. Let G be a finite group of rotations of the plane about the origin. Prove that G is cyclic.