MATH 309

Homework – Symmetry

Due on March 6

1. Let f be the rotation by $\pi/3$ and g be the rotation by $\pi/2$. What are the matrices of f and g? What are the matrices of $f \circ g$ and $g \circ f$? What are these product transformations?

2. Let f be the rotation by $\pi/2$ and g be the reflection to the line through the origin of angle $\pi/3$. What are the matrices of f and g? What are the matrices of $f \circ g$ and $g \circ f$? What are these product transformations?

3. Prove by matrix multiplication that the product of two reflections is a rotation.

4. List all the symmetries of a regular pentagon.

5. Show two symmetries of the regular triangle that do not commute with each other (i.e. their composition depends on the order).

6. List 10 symmetries of the cube. (There are 48 altogether, so there is plenty of options!)