Math 161 Modern Geometry Homework Questions 5
Due : Tuesday, May 30, 2017

(1) Let f be the composition of the reflection through the line $y = x$, followed by a rotation by $\pi/3$, and followed by a reflection through the y-axis. Identify f (i.e. determine whether f is a rotation or a reflection).

(2) Identify the product f of a reflection in the line $y = -x$, a rotation through $\pi/3$, and a reflection in the y-axis. Make sure you specify the exact nature of f and provide the matrix representation for f.

(3) Identify the product of a rotation through $\pi/6$ about the origin followed by a rotation through $\pi/3$ about the point $A = (1,0)$. **Hint:** It's fairly clear that this is a rotation; the main thing is to compute the center of the rotation.

(4) Identify the product of the reflection in the line $x + y = 1$ followed by the rotation through $\pi/4$ about the point $(1,0)$.

(5) The point $P = (1,1)$ is rotated through $\pi/6$ about the point $(2,3)$ and then translated in the direction of $(1,2)$ (i.e. translated in the direction of the vector $\vec{v} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$) through a distance of 3 units. Find the coordinates of the resulting point.

(6) $ABCD$ is a unit square and a point P is successively rotated through $\pi/2$ about each of the four points, in the given order. Show that, after the four rotations, the net effect will be to translate P in the direction AD through a distance of 4 units.