Math 371 Homework#1

Due on 1/30 at the beginning of Lecture

1. Let $y_1, y_2 \in \mathrm{O}(2)$ be two reflections about lines l_1, l_2. Assume the angle between l_1 and l_2 is θ. Find all the possible compositions $y_1 y_2$.
2. Find a surjective group homomorphism from SO(2) to itself with three elements in the kernel.
3. Give two elements in SO(3) not commuting with each other. (Hint: think about rotations of 90 degrees along coordinate axes, you can rotate a book to demonstrate this.)
4. Artin, Chapter 8, problem 4.3
5. Artin, Chapter 8, problem 4.5
6. Artin, Chapter 8, problem 4.9
7. Artin, Chapter 8, problem 4.10
8. Artin, Chapter 8, problem 4.11
9. Artin, Chapter 8, problem 5.2
10. Artin, Chapter 8, problem 5.3. Here orthogonal matrix means an element in $\mathrm{O}(n)$, i.e. matrix P satisfying $P^T P = I_n$.