Math 221A, problem set 05
Due: Mon Oct 11
Last revision due: Mon Dec 06

Problems to be turned in: Problem x.y.z of Artin denotes problem y.z in Chapter x.

1. Artin 6.3.2. Note that this is only true for isometries of $\mathbf{R}^2$.
2. Artin 6.3.4.
3. Let $L = \langle a, b \rangle$ be a lattice in $\mathbf{R}^2$. Note that we write the operation in L as $+$.
   (a) Prove that every sublattice of index n in L is the kernel of a surjective homomorphism $\varphi : L \to G$, where G is an abelian group of order n.
   (b) List all sublattices of index 4 in L in terms of their generators. (For example, $\langle 4a, b \rangle$ is a sublattice of index 4 in L.) For each such sublattice L', draw a picture of L' inside L. (You can draw L as the standard unit lattice $L = \langle e_1, e_2 \rangle$.)
4. Artin 6.5.6.
5. Artin 6.5.8.