MATH 113, QUIZ #3 September 10

1. Find three proper nontrivial subgroups of $GL(\mathbb{R},3)$ (the group of 3×3 invertible matrices), no two of which are isomorphic. You don't need to show that each one is a subgroup, but briefly explain why they are not isomorphic.

2. Prove or give a counterexample (with explanation): if G is an abelian group and $\varphi: G \to H$ is a group homomorphism, then H is an abelian group.

- 3. Give an example of each of the following. No justification necessary.
 - (a) A cyclic group with at least 12 elements.
 - (b) A noncyclic group with 8 or fewer elements.
 - (c) A group which is infinite and cyclic.
 - (d) An infinite nonabelian group.
 - (e) An infinite abelian group that is not cyclic.