

MATH 113, QUIZ #4  
SEPTEMBER 17

1. Suppose that  $H$  and  $K$  are two subgroups of a group  $G$ . Prove that the intersection  $H \cap K$  is also a subgroup of  $G$ .

2. Find an example that shows the union of two subgroups of a group  $G$  might not be a subgroup of  $G$ .

3. Give an example of each of the following. No justification is required.

(a) An infinite cyclic subgroup of  $GL(2, \mathbb{R})$ .

(b) A finite nontrivial subgroup of  $GL(2, \mathbb{R})$ .

(c) A subgroup of  $GL(2, \mathbb{R})$  which is not cyclic.

(d) Two different subgroups of  $\mathbb{C}^* \times \mathbb{C}^*$  which are both isomorphic to  $\mathbb{Z}_8$  (and of course, to each other).

(e) A subgroup of  $\langle \mathbb{R}^3, + \rangle$  which is isomorphic to  $\mathbb{Z}$ .