

2. MATH 30A, FALL 2009
Practice Quiz 2

Rules: Closed book. 15 minutes. You may bring notes written on a single piece of paper. You need to decide what should be written on your paper. You may use a pseudonym on the practice quiz.

Choose 2 questions and answer them completely. If you think you did a good job write your real name on this practice quiz. (On the actual quiz 2 you choose 4 out of 5.)

2.1. Factor groups

- (1) What is the definition of a factor group?
- (2) What are the elements of the factor group $GL(2, \mathbb{Z})/SL(2, \mathbb{Z})$? Explain how they are multiplied.

2.2. Find all elements of order 2 in S_4 . Which ones are conjugate? Use your answer to prove that

$$K := \{e, (12)(34), (13)(24), (14)(23)\}$$

is a normal subgroup of S_4 .

2.3. The group S_3 acts on the set $\{1, 2, 3\}$

- (1) Find the stabilizer subgroup of the “letter” 3?
- (2) What is the orbit-stabilizer formula and how does it apply to this case? (Alternative question: What is the orbit-coset correspondence in general and what is it in this case?)

2.4. Ring definitions

- (1) What is the definition of a ring?
- (2) What is the definition of a commutative ring with unity?
- (3) Give an example of a ring which is not one of these (commutative ring with unity).