Math 110A—Outline for Exam 1

Sections covered: Beginning of notes through Section 3.1

Overview of Topics

A. Groups and subgroups

B. Generating sets and minimal generating sets

C. Group tables and Cayley diagrams

D. Examples (and nonexamples) of groups

Skills you should have

1. Be able to determine and prove if a set together with a binary operation is a group or not.

2. Be able to determine and prove if a subset of a group is a subgroup or not.

3. Be able to determine and prove if a subset of a group is a generating set and if it's minimal or not.

4. Be able to work with group tables (possibly for groups you have not seen before).

- Be able to read a group table to make computations (e.g. $x * y^{-1}$) and to determine properties of the group (e.g. is it abelian, is it cyclic, what is a generating set, or what are some subgroups).
- Be able to fill in a group table given some information about the group.

5. Be able to work with Cayley diagrams (possibly for groups you have not seen before).

- Be able to read a Cayley diagram to make computations (e.g. $x * y^{-1}$) and to determine properties of the group (e.g. is it abelian, is it cyclic, or what are some subgroups).
- Be able to look at a Cayley diagram and determine what generating set was used to make it.
- Be able to create a Cayley diagram given a generating set and some information about the group.

6. Be able to give examples of groups with or without certain properties.

- You will want to be reasonably familiar with the groups we've worked with a lot: R_3, R_4, R_5, R_6, D_3, D_4, S_2, S_3, V_4, Q_8, $\mathbb{Z}$, $\mathbb{R}$, $(\mathbb{R} \setminus \{0\}, \cdot)$.

7. Be able to prove or disprove statements abstract groups.

- A good starting point is to make sure you can reprove the theorems that we have covered.

How to study

1. Review core topics—make sure to have a working understanding of all definitions and theorems.

2. Review the many examples of groups we have, and think about their properties, e.g. which are abelian, which are cyclic, what are the orders of them, what are some subgroups they have.

3. Work problems similar to those from our notes. (You can also look in other books for problems to try.)

4. Practice proofs similar to those from our notes. (You can also look in other books for proofs to try.)

5. Come talk with me if you have any questions!