This list is intended as the start of a study guide. There is no guarantee that because a topic is listed here that it will be on the midterm, nor is there a guarantee that every problem on the midterm is represented in the list below. The exam will cover all material from Chapters 1–6.

You will be required to do straightedge and compass constructions in the course of the exam. If you have your own compass and ruler, please bring them.

- Know how to do basic proofs using Euclid's axioms and propositions. A list of the book I propositions will be given to you.
- Understand how the parallel postulate is used in book I. Know how to show a given statement is equivalent to the parallel postulate. (e.g. Homework 2 #3)
- What is the definition of a geometry? What is a transformation group?
- What is an invariant of a geometry? Be able to show that a given quantity is invariant. Be able to interpret the geometric meaning of an invariant. (E.g. 4.1, 4.2, 4.3).
- Know how to apply the Erlangen program technique (HW 3 #5, 5.22))
- What are Möbius transformations? Given three points z_i and three points w_i, how do you find a Möbius transformation taking each z_i to w_i? (E.g. 5.3)
- What is the cross ratio? What its its relationship with Möbius geometry? What are the geometric consequences of the cross ratio?
- Given a Möbius transformation, be able to find its fixed points, classify its type (elliptic, hyperbolic, parabolic, loxodromic) and sketch its action. (E.g. 5.8, 6.1, 6.2, 6.3)
- Be able to compute reflection about a Möbius line. (E.g. 5.19)
- What is stereographic projection? Be able to prove basic facts about it. (E.g. 3.11, 3.12, 3.13)