

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 7–10. All hyperbolic, all the time.

- Know the two models of hyperbolic geometry: the ball model and the upper half plane model. What are the points of the geometry? What are the transformation groups? What are the lines? How are the two models connected to each other?
- Be able to recognize congruent shapes in the two different models of this geometry.
- What is parallelism in hyperbolic geometry?
- Show that any three ideal points in hyperbolic geometry can get mapped to any other three ideal points.
- What are hyperbolic rotations? Hyperbolic translations? Hyperbolic rotations at infinity? How are they represented in the ball model? What about the half plane model?
- What is a hyperbolic circle? A horocycle? A hypercycle? Are all circles congruent? What about horocycles and hypercycles?
- Know how to compute the length of curves in both the ball model and the upper half plane model.
- What is the distance between two points on the imaginary axis in the half plane model?
- What is the distance between two points on the imaginary axis in the ball model?
- What is the distance between two points on the upper unit circle in the upper half space model?
- How is distance related to the cross ratio?
- Why does the cross-ratio formulation of distance imply that distance is invariant in hyperbolic geometry?
- How do you compute the area of a region in hyperbolic geometry in both the ball and upper-half plane models?
- Why is the area of a trebly asymptotic triangle finite?
- How are angle sums for triangles and area related in hyperbolic geometry?
- Can you tile the hyperbolic plane with equiangular triangles such that six triangles meet at every vertex?
- Can you tile the hyperbolic plane with equiangular triangles such that eight triangles meet at every vertex?