

Recall:

SMSG Postulate 16:(The Euclidean Parallel Postulate) Through a given external point there is at most one line parallel to a given line.

Playfair's Axiom: Through a point not on a line there is exactly one line parallel to the given line.

Note 1: As we discussed in class on Friday, we will spend class time today working on and presenting proofs of Euclidean Propositions. I will allow those who have proofs already prepared to present first, starting with those who have not yet had a chance to present yet. If we run out of prepared presenters, you can discuss and work together to develop proofs in your groups – let me know when someone in your group is ready to present a proof.

Note 2: The Content and problems given below are not intended to be done in class. You should complete them using Geogebra. Print out each requested construction and submit them by 4:00pm on Thursday, February 22nd. Make sure to download and use Dr. Peil's script and tools for the Poincaré Half-plane and use them to complete these constructions.

Hyperbolic Parallel Postulate: Through a point not on a line there is more than one line parallel to the given line.

Hyperbolic Proposition 2.1: The sum of the measures of the angles of a triangle is less than 180.

Hyperbolic Proposition 2.2: Similar triangles are congruent triangles.

Hyperbolic Proposition 2.3: Through a given point not on a line there are infinitely many lines parallel to the given line.

Hyperbolic Proposition 2.4: The summit angles of a Saccheri quadrilateral each measure less than 90.

Hyperbolic Proposition 2.5: No quadrilateral is a rectangle.

Use the Poincaré Half-plane construction and measurement tools in Geogebra to complete each of the following. You should submit printouts of each of these when you submit your solutions on Thursday.

1. Construct an example that shows that the Poincaré Half-plane does not satisfy the Euclidean Parallel Postulate.
2. Construct a Saccheri Quadrilateral in the Poincaré Half-plane and use the Angle MeasureHP tool to find the measure of the summit angles.
3. Construct a quadrilateral in the Poincaré Half-plane that has three right angles. (This quadrilateral is called a Lambert quadrilateral after Johann Lambert (1728 - 1777).) What is the measure of the fourth angle?
4. Construct a triangle in the Poincaré Half-plane and find the sum of the measures of the angles.
5. By moving the points in your previous triangle, produce a triangle where the sum of the measures of the angles is less than 5.
6. By moving the points in your previous triangle, produce a triangle where the sum of the measures of the angles is more than 175.