

Math 402, Practice Test #2

Problem 1 (20 points)

State **Euclid's Exterior Angle Theorem** (EEAT).

Consider any space that satisfies the five axioms. Prove that, if l' is the parallel transport of l along a line m (and $l \neq l'$), then l and l' do not intersect. You may use EEAT. You may also use any theorem that we used in class before we proved PTDI. But you may not use any theorem that we proved afterwards.

Problem 2 (20 points)

The **triangle inequality** states: Given $\triangle ABC$,

$$m(\overline{AB}) \leq m(\overline{BC}) + m(\overline{AC}).$$

Is the triangle inequality true or false on H^2 ?

Give a proof or a counter-example.

Hint: Pick a point D on \overrightarrow{BC} past C so that $\overline{CD} \sim \overline{CA}$.

Problem 3 (20 points)

There are six possible triangle congruence theorems: AAA, AAS, ASA, SSA, SAS, SSS. List the ones which are true in every space which satisfies the first five axioms.

For each one which you did **not** list, give a counter-example.

Problem 4 (20 points)

Consider a hyperbolic plane with hyperbolic radius ρ .¹ Consider a convex hexagon (six sides). Assume that it is regular, that is, all the angles have the same measure and all the sides have the same length.

Find a formula for the measure of each interior angle. Show your calculations. (You do not have to give a proof.)

Problem 5 (20 points)

Give a statement of the Isosceles Bisector Theorem (IBT). Give a proof of IBT for triangles in the hyperbolic plane E^2 .

¹Consider a sphere of radius r if you prefer.