Mathematics 435 Geometry Fall 2021

REVIEW QUESTIONS for EXAMINATION I

The questions below cover material covered in Mathematics 435 so far this semester. The first exam will cover similar topics. You should review the homework problems that were assigned so far in the course. If you wish to discuss these come by office hours or ask in class on 10/11/21.

1. Discuss the 4 pillars of geometry that the author of the course text uses to support different views of geometry.

2. Describe at least two different equivalent statements of the Parallel Postulate.

3. Explain why the composition of a translation and a nonidentity rotation about a point (in either order) must be a rotation. Describe geometrically how to find the center point and angle of this rotation in terms of the original translation vector, rotation angle and rotation center by expressing all isometries appearing in terms of reflections.

4. Given a segment AB in the Euclidean plane, and a line l intersecting the segment describe how to construct (with straightedge and compass) a right triangle with hypotenuse AB and third vertex C on the line l. Given a unit segment U of length 1, and a segment DE of length b explain how to use your right triangle construction to construct a square of area b.

5. Explain the rules of perspective drawing.

6. Find an isometry taking the points $(0,0),(0,1),(1,0)$ in order to $(2,2),(1,2),(2,1)$ Does there exist an isometry of the Euclidean plane taking the first 3 points above to $(1,2),(-1,2),(0,3)$?

7. Prove that the 3 altitudes of a triangle intersect in a common point.

8. State Thales theorem on triangles and lines parallel to one of the sides. Explain how it implies information about the ratios of corresponding sides in similar triangles.

9. What were Euclid's axioms for geometry that appeared in his Elements?

10. Explain carefully why in Euclidean geometry the sum of the angles in a triangle equals π radians.