Math 530: Problem Set 1

Due Monday, 1/7

Present proofs in the style of Euclid, using any results you like from Book I, 1-34. Be sure to refer to Euclid’s definitions, postulates, common notions, and propositions by number whenever you use one. See Hartshorne for the corresponding diagrams.

1. ([H] 1.4) A rhombus is a figure with four equal sides. Show that the diagonals of a rhombus meet at right angles, and that the four small triangles thus formed are congruent to each other.

2. ([H] 1.5) A rectangle is a four-sided figure with four right angles. Show that the two diagonals of a rectangle are congruent and bisect each other.

3. ([H] 1.8) Show that the three angle bisectors of a triangle meet in a point. Be careful how you make your construction, and in what order you do the steps of your proof. (If you need a hint, look at IV.4. You may find [H] 1.7 (RASS) helpful.)

4. ([H] 1.10) Still using only results from Book I, show that if $AB$ is the diameter of a circle, and $C$ lies on the circle, then the angle $\angle ACB$ is a right angle.