Study Guide for the Midterm Exam

Definitions, notions and axioms to remember

1. Axioms: Euclid's postulates (I may ask you also about Birkhoff's and Hilbert's axioms, or to use the SMSG postulates, but if I do so, I will provide a copy of those), Playfair's postulate (page 48), Elliptic Parallel Postulate (page 78).
2. Definitions and notions: incidence, betweenness, rays, line segments, similarity, congruence (see Section 3.2), sensed ratio, parallelism, and the following triangle centers: centroid, orthocenter, incenter, circumcenter. You should also be able to use inner products .

Statements you should remember with their proof

1. From our textbook: Incidence theorems in section 1.4 (pages 29-30), the sum of the angles of a triangle in Euclidean geometry is 180^o (section 2.2), two distinct lines can not intersect in more than one point (section 2.4), Isoceles Triangle Theorem (Theorem 3.2.7), Perpendicular Bisector Theorem (Theorem 3.2.8), Exterior Angle Theorem (Theorem 3.2.9), triangle congruence conditions (Theorems 3.3.1, 3.3.2, 3.3.3 and 3.3.5), Triangle Inequality (Theorem 3.3.7), Hinge Theorem (Theorem 3.3.8), Saccheri-Legendre Theorem (Theorem 3.5.1, also the proofs of the lemmas used), base of a Saccheri quadrilateral is not longer than the summit (Theorem 3.6.6), sum of all angles in a triangle is 180^o (Theorem 4.2.2), Euclidean exterior angle theorem (Corollary 4.2.3), opposite sides of a parallelogram are congruent (Theorem 4.2.4), parallel transversals theorem (Theorem 4.2.5), Median Concurrence Theorem (Theorem 4.2.7), area formulas (Theorems 4.3.2 through 4.3.6), Basic Proportionality Theorem and its converse (Theorems 4.4.2 and 4.4.4, see also parallel transversals theorem), AAA similarity condition (Theorem 4.4.5)
2. From lecture and handouts: Symmetries of the Saccheri quadrilateral (Theorems 3.6.1, 3.6.2, 3.6.4), summit angles of a Saccheri quadrilateral can not be obtuse (Theorem 3.6.3), least distance between the base and summit of a Saccheri quadrilateral is at the common perpendicular (Theorem 3.6.9), theorems on the existence of a rectangle (Theorems 3.6.12 and 3.6.13), generalization and converse of the parallel transversal theorem (Theorem 4.2.5)
3. From homework: sum of the interior angles of a triangle from Euclid's fifth postulate, Theorem 3.3.6, SSS congruence (Theorem 3.3.9),fourth angle of a Lambert quadrilateral is not obtuse (Theorem 3.6.7), sides between the two right angles are not longer than the opposite sides in a Lamber quadrilateral (Theorem 3.6.8) distance formula, midpoint formula, existence of the Euler line, formula for the radius of the excircle, converse of the "Star Trek lemma" (Theorem 4.5.11).

If a proof was covered in several ways you may choose your favorite one. You may also invent your own proof.

Statements you should know (without proof)

1. From our textbook: consequences of negating Euclid's fifth postulate on page 76, elementary facts about congruence (Theorems 3.2.1 through 3.2.4) Pasch Axiom (Theorem 3.2.5), Crossbar Theorem (Theorem 3.2.6), equivalent forms of Euclid's fifth postulate (theorems in section 3.4), if there is one rectangle then all triangles have angle sum 180^o (Theorem 3.6.15), the Euclidean parallel postulate is equivalent to every triangle having angle sum 180^o, Inscribed Angle Theorem (Theorem 4.5.11).
2. From lecture: description of Pythagorean triplets.

What to expect

The exam will be *closed book*. You will have 80 minutes. Some questions may ask you to state and prove a theorem from the list I gave, others may be exercises similar to your homework assignments. There may be questions about examples, whether they have certain properties.