Name ____________________ Student Number ____________

Practice MIDTERM

Math 445A: Geometry for teachers

April 25, 2014

Problem	Total Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
Total	60	

- You may use the distributed lists of axioms and theorems and one-sided page of your own notes prepared for the midterm.

- No other notes, books, or electronic devices. Please turn off your cell phone.

- Show all your work to get full credit. Write you solutions on the pages provided. Use backs for scratch paper if you need it.

- Read instructions for each problem CAREFULLY.

-*Proofs:* If you are asked to prove a specific theorem, you can use any theorem that comes prior in the book.

(1) This is a multiple choice question. Just circle the right answer, no justification necessary. Correct answer is worth 2 points, no answer or partial answer 0 points, incorrect answer (-1) point.

What is a *Partial answer*? If the statement is true in Neutral geometry but you only circle Euclidean, then the answer is considered "partial".

Neutral:	The statement is *true in Neutral* geometry
Euclidean:	The statement is *true in Euclidean* geometry
Hyperbolic:	The statement is *true in Hyperbolic* geometry
None:	The statement is *not true in Neutral* geometry

(a) **Neutral** **Euclidean** **Hyperbolic** **None** If all three sides of a triangle are congruent then the triangle is regular.

(b) **Neutral** **Euclidean** **Hyperbolic** **None** Two opposite angles of a parallelogram are congruent.

(c) **Neutral** **Euclidean** **Hyperbolic** **None** The sum of angles of a triangle is 180^0.

(d) **Neutral** **Euclidean** **Hyperbolic** **None** If two lines are cut by a transversal making a pair of congruent alternate interior angles, then they are parallel.

(e) **Neutral** **Euclidean** **Hyperbolic** **None** There exists a rhombus.

(2) (a) Give the definition of an angle bisector.

(b) Prove theorem 7.15 (The Angle Bisector Theorem):
Suppose $\angle AOB$ is a proper angle and P is a point on the bisector of $\angle AOB$. Then P is equidistant from $\overleftrightarrow{OA}$ and $\overleftrightarrow{OB}$.

(3) Prove theorem 9.15:

A convex quadrilateral with two pairs of opposite congruent angles is a parallelogram.

(4) (a) Prove Theorem 10.10 (Transitivity of parallelism) in Euclidean geometry:

If ℓ, m, and n are distinct lines such that $\ell || m$ and $m || n$, then $\ell || n$.

(b) Using Escher's picture of the Poincare disk (Circle Limits III), give an examle of three lines on the Poincare disk model of the Hyperbolic geometry for which Theorem 10.10 fails.

(5) Show that in Neutral geometry there exists a trapezoid $ABCD$ such that $|\overline{AB}| = 2|\overline{CD}|$.

(6) Prove Theorem 11.8:

The area of a rectangle is the product of the lengths of any two adjacent sides.