| Name | Student Number |
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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           |       |

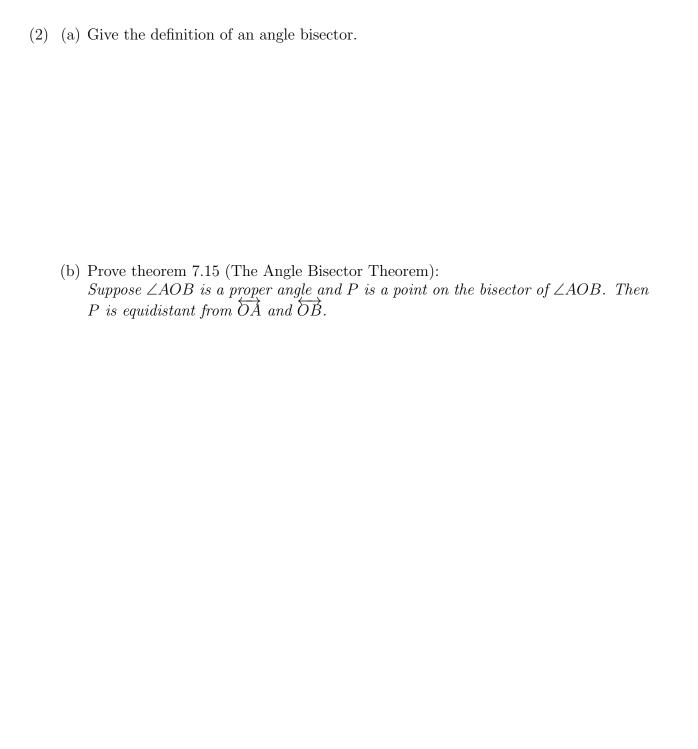
- You may use the distributed lists of axioms and theorems and one-sided page of your own notes prepared for the midterm.
- No other notes, books, or electronic devices. Please turn off your cell phone.
- Show all your work to get full credit. Write you solutions on the pages provided. Use backs for 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".

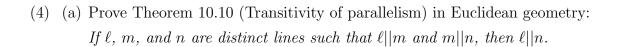
Neutral: The statement is true in Neutral geometry
Euclidean: The statement is true in Euclidean geometry
Hyperbolic: The statement is true in Hyperbolic geometry
None: The statement is not true in Neutral geometry

- (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  $180^{\circ}$ .
- (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.



## (3) Prove theorem 9.15:

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



(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} $ . |
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## (6) Prove Theorem 11.8:

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