Stony Brook University
Mathematics Department
Oleg Viro

Geometry for Teachers
MAT 515
December 16, 2010

Final Exam

Examination time: 2:15-4:45pm. No electronic devices, books or notes. Show all your work. Answers without solutions will give no credit.

Name ____

Student ID # ____

Problem #	Points/total
1	/10
2	/5
3	/15
4	/5
5	/5
6	/5
7	/5
Total	/100

Name ________________________________

Problem 1. (10 pt) Formulate and prove the theorem about the center of circle circumscribed about a triangle and the theorem about concurrence of altitudes in a triangle.

Name ________________________________

Problem 2. (5 pt) Construct a triangle ABC, given an angle congruent to its interior angle at vertex A, a segment congruent to the median BM, and a segment congruent to the side AB.

Name ______________________________

Problem 3. (15 pt) (a) Formulate necessary and sufficient conditions for two lines to be parallel in terms of same-side interior angles formed by each of the lines and a line transversal to them.

(b) Formulate the Euclidean parallel axiom.

(c) What is the relation between the Euclidean parallel axiom and the condition for parallel lines considered in the part (a) of this problem? Is the axiom necessary

- in the proof of necessity,
- in the proof of sufficiency?

Name ______________________________

Problem 4. (5 pt) Let ABC be a triangle, and c be a circle tangent to the side BC and lines extending the sides AB and AC. Find the degree of A with respect to c, if the lengths of sides $a = |BC|$, $b = |AC|$ and $c = |AB|$ are known.

Name ______________________________

Problem 5. (5 pt) Let chords AB and CD of the same circle q bisect each other (i.e., their intersection point E is the midpoint for both AB and CD). Does it follow that $|AB|$ and $|CD|$ are diameters of q? Justify your answer with a proof.

Name ____________________________

Problem 6. (5 pt) Given a circle c and a point A outside of c, find a line passing through A and meeting c at points P and Q such that $|AP| = |PQ|$.

Name ____________________________________

Problem 7. (5 pt) Two lines orthogonal to each other pass through the center of a square. Prove that the segments of the lines cut by sides of the square are congruent.