MATH 161 SAMPLE MIDTERM EXAM

2014 MAY 5

Student name:

Student ID number:

Instructions

- Books, notes, and electronic devices may NOT be used. These items must be kept in a closed backpack or otherwise hidden from view during the exam.
- Cheating in any form may result in an F grade for the course as well as administrative sanctions.
- The time remaining will be written on the board periodically.
- You may hand in your exam and leave early, but please do not do this during the last 5 minutes of the exam period because it may disturb other students.

1	/ 3
2	/ 5
3	/ 5
4	/ 5
5	/ 5
6	/ 5
Total	/ 28

Problem 1 (3 points). State, but do *not* prove, the SAS (side-angle-side) similarity theorem.

Problem 2 (5 points). Let $ABCD$ be a quadrilateral and let ℓ be a line that does not pass through any of the vertices A, B, C, or D. Prove that if ℓ intersects three sides of $ABCD$, then it also intersects the fourth side of $ABCD$.

Problem 3 (5 points). Given a triangle $\triangle ABC$, let D, E, and F be the midpoints of $\overline{AB}$, $\overline{AC}$, and $\overline{BC}$ respectively. Show that the four smaller triangles $\triangle ADE$, $\triangle DBF$, $\triangle FED$, and $\triangle EFC$ are all congruent to one another.

Problem 4 (5 points). Let $\triangle ABC$ and $\triangle A'B'C'$ be triangles such that $\triangle ABC \sim \triangle A'B'C'$ with similarity constant k (so $A'B' = kAB$, *etc.*) Prove that $\text{Area}(\triangle A'B'C') = k^2\,\text{Area}(\triangle ABC)$. You may use the usual formula for the area of a triangle.

Problem 5 (5 points). Prove that $\cos(30°) = \sqrt{3}/2$.

Problem 6 (5 points). Let O_1, A and O_2 be collinear points with A between O_1 and O_2. Let c_1 be the circle with center O_1 and radius O_1A, and let c_2 be the circle with center O_2 and radius O_2A. Prove that the circles c_1 and c_2 do not intersect at any point other than A.