# MATH 161 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.

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| 2 | / 5 |
| 3 | / 5 |
| 4 | / 5 |
| 5 | / 5 |
| Total | / 23 |

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*Problem* 1 (3 points). State *either*

(1) Pasch's axiom, *or*

(2) the plane separation property.

Indicate which one you are attempting to state by circling (1) or (2) above.

*Problem* 2 (5 points). Prove that $\tan(45°) = 1$. (For the definition of $\tan(\alpha)$ you may use $\sin(\alpha)/\cos(\alpha)$ or you may use the "opposite over adjacent" definition.)

*Problem* 3 (5 points). Let $\triangle ABC$ and $\triangle A'B'C'$ be two acute triangles (all the internal angles are less than $90°$.) Assume that $\angle A \cong \angle A'$, $AB \cong A'B'$, and $BC \cong B'C'$. Prove that $\triangle ABC \cong \triangle A'B'C'$.

*Problem* 4 (5 points). Let $ABCD$ be a quadrilateral such that the sides $\overline{AB}$ and $\overline{CD}$ are parallel. The diagonal $\overline{AC}$ splits $ABCD$ into triangles $\triangle ABC$ and $\triangle CDA$. Show that

$$\frac{\text{Area}(\triangle ABC)}{\text{Area}(\triangle CDA)} = \frac{AB}{CD}.$$

You may use the usual formula for the area of a triangle.

*Problem* 5 (5 points). For this problem, do *not* assume Euclid's fifth postulate (the parallel postulate) or any of its consequences such as Playfair's postulate, or the statement that the sum of the angles of a triangle is 180°, *etc.*

Assuming that the sum of the interior angles of every *right* triangle is 180°, prove that the sum of the interior angles of *every* triangle is 180°.

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