

Name: \_\_\_\_\_

## Math 402, Section C13 - Test #2 - March 13, 2006

Time: 55 minutes. Write your answers on the blank paper provided. Be sure to number the problems. You may not use any books or notes (except for those provided) or calculator. There are 100 points possible. To get full credit, you must show your work.

1. (7 points) Give the definition of *isometry* (also called *Euclidean isometry* in the textbook). Don't give extra properties - just the definition.
2. (7 points) Give the definition of *congruent triangles*.
3. (8 points) State *Pasch's Axiom* (concerning a line intersecting a triangle).
4. (18 points) For each part, answer True or False. No explanation is needed and there is no partial credit.
  - (a) Isometries preserve angle measure.
  - (b) Isometries map parallel lines to parallel lines.
  - (c) Every isometry has an inverse which is also an isometry.
  - (d) Every isometry can be written as the composition of exactly three reflections.
  - (e) An isometry maps a circle to a circle.
  - (f) If an isometry fixes three or more points, then it must be the identity.
5. (20 points) Find a sequence of at most three reflections whose composition takes  $\triangle ABC$  to  $\triangle PQR$ , where
  - $A = (0, 2)$
  - $B = (0, 0)$
  - $C = (1, 0)$
  - $P = (4, 2)$
  - $Q = (2, 2)$
  - $R = (2, 3)$ .State exactly which lines you are reflecting over (e.g. "the line  $y = 2x + 1$ ") and in which order.
6. (20 points) Prove that Playfair's Postulate implies the statement "If a line intersects but is not coincident with one of two parallel lines, it must intersect the other."
7. (20 points) Let  $\triangle ABC$  and  $\triangle PQR$  be similar triangles. Suppose that  $D$  is a point on  $\overline{BC}$  with  $\overline{AD} \perp \overline{BC}$  and  $T$  is a point on  $\overline{QR}$  with  $\overline{PT} \perp \overline{QR}$ . Prove

$$\frac{AD}{PT} = \frac{AB}{PQ}.$$