Name:_____

Math 303, Section D1 - Test #2 - March 6, 2002

Answer all questions. No books or notes allowed. A calculator may be used. 55 minutes. 100 points total.

1. Give the definition of each of the following:

   (a) (6 points) One-to-one map.

   (b) (6 points) Onto map

   (c) (6 points) Translation τ_A.

   (d) (6 points) Central reflection σ_C.

   (e) (6 points) Central dilatation $\delta_{C,r}$.

2. (15 points) Give an example of two central dilatations whose composition is not a central dilatation. Show that the composition is not a central dilatation.

3. (15 points) Recall that $\delta_r(X) = rX$ for $r \neq 0$. Prove that δ_r is a collineation (that is, maps lines to lines).

4. (20 points) In each part, several properties of a transformation of the plane are given. Use these properties to identify the transformation from the following list (you do NOT need to prove that your answer is correct):

$$\tau_{(3,3)} \quad \sigma_{(3,3)} \quad \delta_3 \quad \delta_{(1,1),-2} \quad \delta_{(1,1),3} \quad \delta_{(1,0),2}$$

(a) $f(f(X)) = X$ for all X.

(b) g has no fixed points.

(c) For all X, $k(X)$ and X lie on a line through the origin.

(d) $h(0,0) = (3,3)$ and $h(1,0) = (1,3)$.

5. (25 points) State and prove either Desargues' theorem or Pappus' theorem (your choice).