

Name: _____

Math 303, Section D1 - Final Exam - May 10, 2002

Answer all questions. No books or notes allowed. A calculator may be used. 3 hours. 200 points total.

1. (5 points each part) Give the definition of each of the following:

(a) Centroid of mass points $(a_1, A_1), (a_2, A_2), (a_3, A_3)$.

(b) Central dilatation.

(c) Rectangle.

(d) Isometry.

(e) Rotation.

~~(f) Cyclic group.~~

2. (a) (5 points) Give the definition of "rhombus".
- (b) (15 points) Prove that a parallelogram is a rhombus if and only if its diagonals are orthogonal.
3. (10 points) Give the statement of Menelaus' theorem.
4. (20 points) Menelaus' theorem is an "if and only if" statement. Prove one of the directions of the theorem (your choice). Be sure to state clearly which direction you are proving.

Note - I'll give you a list this week of several theorems you should know how to prove.

5. (20 points) Prove, from the definition of isometry, that the set of all isometries is a group under composition.

7. (10 points each part) For each part, answer True or False, with a brief explanation.

(a) The product of three reflections in parallel lines is a translation.

(b) The product of three reflections in concurrent lines is a glide.

(c) The reflections in two parallel lines commute.

(d) Every isometry of the plane is a linear map.

(e) The medians of a triangle are concurrent.

(f) The composition of two central dilatations is always a central dilatation.

(g) Every transformation of the plane has at least one fixed point.