Name: _____

Math 338 Practice Final Exam

Answer each question in the space provided. To receive full credit, you must clearly present your solution and any necessary computations.

1. (15 points) Decide if each of the following statements is True or False. Explain your answer.

    (a) If two triangles are congruent in Euclidean geometry, then they're congruent in Taxicab geometry.

    (b) If $ABCD$ is a parallelogram, then $\triangle ABC \cong \triangle CDA$.

    (c) If $ABCD$ is a quadrilateral inscribed in a circle, then $\angle ABC$ and $\angle CDA$ are supplementary.

2. (10 points) Define the following terms.

    (a) Euclidean metric (give the formula too!)

    (b) Circle inversion

3. (15 points) Prove that if $ABCD$ is a parallelogram inscribed in a circle, $ABCD$ is a rectangle.

4. (10 points) Explain why it isn't possible to construct a square in the Poincare disk.

5. (25 points) Fill in the missing steps in the following proof.

Claim: Suppose ΔABC and ΔDEF are triangles such that $\angle ABC \cong \angle DEF$, and $\angle BCA \cong \angle EFD$, then $\Delta ABC \sim \Delta DEF$.

Proof:

- Apply a dilation to ΔABC with center B and scaling factor $k = $ _____.
- After the dilation, call the triangle $\Delta A'B'C'$ where $B = B'$ and A moved to A', C moved to C'.
- Then $A'B' = DE$ by our choice of k.
- We also know that $\angle A'B'C' \cong \angle DEF$ because _____.
- Further, $\angle B'C'A' \cong \angle EFD$ because _____.
- So by the _____ Triangle Congruence Theorem, $\Delta A'B'C' \cong \Delta DEF$.
- Therefore _____.

6. (25 points) Suppose $ABCD$ is a parallelogram. Prove that if X is a point on $\overline{CD}$ such that $\overline{BX}$ is perpendicular to $\overline{CD}$, then the area of $ABCD$ is $BX \cdot CD$. (You can use the axioms for area, including the area of a rectangle formula, but **not** the area of a triangle formula.)