Spring 2009 **Exam 1** **Honors** 213

February 17

____

Name

Directions: Only write on one side of each page.

Do any (5) of the following

1. Using any previous results, carefully prove the following proposition of Incidence geometry. Proposition 2.5: For every point P there exist at least two lines through P.

2. Present two models of incidence geometry that show, using the axioms of incidence geometry, it is impossible to either prove or disprove the statement "for every line l and every line m not equal to l, l and m are incident with exactly the same number of points" using the axioms of incidence geometry.

3. Using any previous results, carefully prove Proposition 2.7 of incidence geometry. For every line l there are at least two distinct lines neither of which is l.

4. Recall that a projective plane is a model of incidence geometry satisfying the elliptic parallel property and in which every line has at least three points incident with it.

   Let M be a projective plane and let M' be the interpretation of the undefined terms obtained by interpreting M' points to be the lines of M and interpreting the M' lines to be the points of M. Cite results that show the interpretation M' is both a model of incidence geometry and satisfies the elliptic parallel property.

5. Complete the argument, started in problem 4. above, that M' is a projective plane by carefully proving every 'line' in M' is incident with at least three 'points'.

6. What is the smallest number of lines possible in a model of incidence geometry in which there are exactly 4 points? Include a careful argument supporting your claim (but you need not provide a formal proof.)