Spring 2009 **Exam 3** **Honors** 213

April 16

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Name

Directions: Only write on one side of each page.

Do any (5) of the following

1. Using any previous results, prove Proposition 4.1 (SAA) in neutral geometry. Specifically, Given $AC \cong DF$, $\measuredangle A \cong \measuredangle D$, and $\measuredangle B \cong \measuredangle E$. Then $\triangle ABC \cong \triangle DEF$.

2. Using any previous results, prove the following half of Proposition 4.9.

   (If t is a transversal to l and m, $l \parallel m$, and $t \perp l$, then $t \perp m$) implies Hilbert's Euclidean parallel postulate.

3. A scalene triangle is defined to be any triangle that is not isosceles. Using any results through the end of Chapter 4, prove that in any Hilbert plane there is a triangle that is scalene.

4. In the figure on the board the pairs of angles ($\measuredangle A'B'B''$, $\measuredangle ABB''$) and ($\measuredangle C'B'B''$, $\measuredangle CBB''$) are called pairs of **corresponding angles** cut off on l and l' by transversal t. Using any results through Theorem 4.2 (Exterior Angle Theorem), prove that such corresponding angles are congruent if and only if alternate interior angles of the transversal t are congruent.

5. Here is a statement S_p: Given lines l, m, n.If $l \parallel m$ and $m \parallel n$, then $l \parallel n$.

   Using any results through Chapter 4, prove S_p holds if and only if Hilbert's Euclidean parallel postulate holds.

6. Using any result through Proposition 4.5, prove the following (Exercise 22 of Chapter 4.).

   Given $A * B * C$ and $\overleftrightarrow{DC} \perp \overleftrightarrow{AC}$. Prove that $AD > BD > CD$.