Honors 213 - A Spring 2002

Exam 2

March 29, 2002

Textbook/Notes used: ______________________________

Directions: Be sure to include in-line citations, including page numbers if appropriate, every time you use a text or notes or technology. Include a careful sketch of any graph obtained by technology in solving a problem. **Only write on one side of each page.**

The Problems

Do any two (2) of the following.

1. Using any previous results, prove part (d) of Proposition 3.13.

   If $AB < CD$ and $CD < EF$, then $AB < EF$.

2. Let γ be a circle with center O, and let A and B be two points on γ. The segment AB is called a **chord** of γ. Suppose segment AB is not a diameter of γ and let M be the midpoint of segment AB (so $M \neq O$). Prove that line $\overleftrightarrow{OM}$ is perpendicular to line $\overleftrightarrow{AB}$.

3. Using any previous result, prove the portion of Proposition 4.9

   $$(\text{Statement } S_{4.9}) \Rightarrow (\text{Hilbert's parallel postulate})$$

   Here statement $S_{4.9}$ is: "If t is a transversal to lines l and m, $l \parallel m$, and $t \perp l$, then $t \perp m$."

Do any two (2) of the following.

1. Using any result up to and including Proposition 4.5 and exercise 26 prove the following. If $A * B * C$ and line $\overleftrightarrow{DC}$ is perpendicular to line $\overleftrightarrow{AC}$, then $AD > BD > CD$. [Hint: Use Proposition 4.5.]

2. Using any previous result, prove Proposition 4.11

   Hilbert's parallel postulate $\Rightarrow$ the angle sum of every triangle is exactly 180°.

3. **Definition:** Let l and l' be two distinct lines and t a transversal meeting l, l' at B and B', respectively. Let A, C be on l with $A * B * C$ and A', C' on l' with A, A' on the same side of t and $A' * B' * C'$. Further let B''on t be such that $B * B' * B''$. Then the pairs of angles $(\measuredangle A'B'B'', \measuredangle ABB'')$ and $(\measuredangle C'B'B'', \measuredangle CBB'')$ are called **corresponding** angles cut off on l and l' by transversal t.

   Using any result in Chapter 4 (but not any exercises) prove that corresponding angles are congruent if and only if alternate interior angles are congruent.

4. Using any result in Chapter 4 previous to exercise 31 prove that if line l meets circle γ at two points C and D and $C * P * D$, then P is interior to γ.[That is, show that if O is the center of γ then $OP < OC$.]