HOMEWORK 3 - MATH 325

DUE DATE: After Section 5.3 has been covered!
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. A few randomly selected problems will be graded for a total of 10 points. It is necessary to show your work.

GOOD LUCK!!

1. Assume that $\triangle ABC$ and $\triangle EFG$ are similar with ratio k. Let $\overline{AD}$ be an altitude of $\triangle ABC$ and $\overline{EH}$ be an altitude of $\triangle EFG$. Prove that $EH = k \cdot AD$. What can you conclude about the areas of the two triangles?

2. In triangles $\triangle ABC$ and $\triangle DEF$ assume that $ED = k \cdot AB$, $FE = k \cdot BC$ and that $\widehat{C}$ and $\widehat{F}$ are right angles. Prove that $\triangle ABC$ and $\triangle DEF$ are similar with ratio k.

3. Let $\triangle ABC$ be a right triangle at C and with altitude $\overline{CD}$. prove that $\triangle ABC \sim \triangle ACD \sim \triangle CBD$. Use this to give another proof of the Pythagorean Theorem.

4. Let $\triangle ABC$ and $\triangle DEF$ be such that $\overline{AB} \parallel \overline{DE}, \overline{BC} \parallel \overline{EF}$ and $\overline{AC} \parallel \overline{DF}$. Prove that $\triangle ABC \sim \triangle DEF$.

5. Assume that you are given a line segment $\overline{AB}$ of length 1.
   (a) Given line segments of lengths a and b, construct a segment of length $\frac{a}{b}$.
   (b) Given line segments of lengths a and b, construct a line segment of length ab.

6. Given a triangle $\triangle ABC$ and a point P on $\overline{AB}$ with $AP > PB$, show how to construct a point Q on $\overline{AC}$ such that $\triangle APQ$ will have one-half the area of $\triangle ABC$.

7. Find the indicated parts in each figure:

8. (a) Prove that the perpendicular bisector of a chord of a circle is a diameter.
   (b) Given a circle, how would you construct the center?

9. Given a quadrilateral $ABCD$ such that each of the four sides is tangent to a circle, prove that $AB + CD = AD + BC$.