Mathematics 2260H – Geometry I: Euclidean geometry
TRENT UNIVERSITY, Winter 2012

Assignment #4
Similarity
Due on Thursday, 9 February, 2012.

Euclid's *Elements* doesn't get into similarity until Book VI, but it's a concept that comes in very handy for some things, a few of which we will hopefully get to cover later. We will therefore start developing it now.

DEFINITION. $\triangle ABC$ is *similar* to $\triangle DEF$, often written as $\triangle ABC \sim \triangle DEF$, if corresponding angles are equal (*i.e.* $\angle ABC = \angle DEF$, $\angle BCA = \angle EFD$, and $\angle CAB = \angle FDE$) and the lengths of corresponding sides are all in the same proportion (*i.e.* $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$).

For this assignment you may use all of Euclid's Postulates, plus all the trigonometry you know. (Or can look up!) The trigonometry is likely to be easier to use.

1. Prove the Side-Side-Side Similarity Criterion. *[3]*

If $\dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{CA}{FD}$, then $\triangle ABC \sim \triangle DEF$.

2. Prove the Angle-Angle Similarity Criterion. *[3]*

If $\angle ABC = \angle DEF$ and $\angle BCA = \angle EFD$, then $\triangle ABC \sim \triangle DEF$.

2. Prove the Side-Angle-Side Similarity Criterion. *[4]*

If $\angle ABC = \angle DEF$ and $\frac{AB}{DE} = \frac{BC}{EF}$, then $\triangle ABC \sim \triangle DEF$.