Geometry I — Homework 3 — Due 28th Oct

1. If 3 sticks are nailed together to form a triangle at each vertex, will such a triangle be rigid? Justify your answer.

Sol: It is rigid because by the (SSS) criteria its angles are uniquely determined.

2. Prove that if all three sides of a triangle are equal, then the three angles are also equal. Also prove viceversa.

Sol: Let ABC be such triangle. Then, using the theorem about isosceles triangles, since AB = AC then $\angle B = \angle C$. Similarly, since BC = CB, $\angle A = \angle B$. This finishes the proof of the first part. The proof of viceversa is similar.

- 3. Let ABC and A'B'C' be two triangles such that ∠A = ∠A', ∠B = ∠B' and AB = 2A'B'. What is C'A'/CA and why?
 Sol: Using the (AAA) criteria for similarity gives that ABC and A'B'C' are similar. Thus C'A'/CA = B'A'/BA = 1/2.
- 4. Let ABC be an isoceles triangle, AC = CB and let M be the mid-point of AB. Prove that CM is perpendicular to AB and that it bisects $\angle C$.

Sol: By the (SSS) criteria AMC and MBC are similar triangles.

5. Let AD be a line segment and let C be a point in AD. Consider a point B which is not on the line containing AD. Show that $\angle BAC + \angle ABC = \angle BCD$. Sol: $\angle BAC + \angle ABC + \angle ACB = 180^\circ = \angle ACB + \angle BCD$.