

## MAT402 CLASSICAL GEOMETRIES, FALL 2016

Read Euclid Book 1. Read John Lee Chapter 1.

You are encouraged to work in a group, but you must write your solution later, separately, on your own.

Due Friday Sept.16th in tutorial:

- If you worked in a group, please indicate with whom you worked.
- Copy the following sentence at the top of your submission, and sign it when you're done preparing your submission: "I declare that I wrote these solutions entirely on my own."

(1) Find which of Euclid's propositions gives each of the following results:

(a,b,c) Triangle congruency criteria: SAS, SSS, ASA.

(d) Isosceles triangle theorem.

(e) Vertical angle theorem.

(f) Exterior angle inequality.

(g) Triangle inequality.

(h) Alternate interior angle theorem.

(i) Converse to the alternate interior angle theorem.

(j) Transitivity of parallelism.

(k) Angle-sum theorem.

(l) Pythagorean theorem.

(2) Rewrite in modern English the statements and proofs of the following propositions of Euclid. See the guidelines on John Lee's p.21, Exercise 1C. Where relevant, use Euclid's phrase "two right angles" (and not "180 degrees"). It is not necessary to note or correct gaps in Euclid's arguments nor to answer the discussion questions in John Lee's Exercise 1C.

Euclid, Book 1, Propositions 11, 13, 15, 16, 17.

(3) Assume that Propositions 1 through 17 of Euclid's Book 1 are true.

(a) Suppose that two lines cross a third line such that the interior angles on one side of the third line add up to exactly two right angles. Prove that the two lines are parallel.

(b) Given any line  $\ell$  and any point  $A$  not on  $\ell$ , prove that there exists a line through  $A$  that is parallel to  $\ell$ .

(4) Find the flaw in the textbook "proof" that every triangle has at least two sides, according to John Lee's guidelines on p. 22, Question 1D.