

Homework 4 - Math 531, Frank Thorne (thornef@mailbox.sc.edu)

Due Friday, October 12

Note: For proofs in this homework, write them roughly in the style of Euclid. You do not have to follow his style exactly, and feel free to describe triangles as being congruent (which he did not), but please do not depart too much from Euclid.

Also, don't appeal to unproved propositions beyond where we are in the text.

- (1) The proof of Proposition 5 appeals to eight previous facts (see the margins: I.Def.20, I.Post 2, etc.) For each of these, explicitly explain how this fact is being used.
- (2) In Proposition 2, there are two possibilities for how an equilateral triangle DAB might be constructed on AB . Draw two pictures with A, B, C in roughly the same spots in each, and draw the remaining picture both ways, with D constructed on either side of AB . Explain the difference, if any, in the resulting proof.
- (3) Write a proof of Proposition 3 which does not use Proposition 2. (Hint: You will end up essentially duplicating the proof of Proposition 2 in your proof.)
- (4) In the commentary, Joyce says: "Frequently, though, one end of the line C is already placed at A , and then the construction of $I.2$ isn't required. In that case, only one circle needs to be drawn.
Explain.
- (5) Proposition 6 is the same as Problem 1B.1 in Isaacs. How might you have solved Problem 1B.1 in a different way? Why would this proof be inappropriate here in Euclid?
- (6) Prove Proposition 7 in case D lies inside triangle ABC . (See the criteria.) Also, describe what other special cases can occur and prove the proposition in these cases as well.