

Math 420 - Homework 1

August 28, 2012

This first homework is designed to be rather gentle, and to get you acclimated to the way we work problems here. These problems can be found in various places throughout the book (I'll try to point out where). Please type up your answers (if you know LaTeX or are comfortable writing equations in Word) or write neatly if you must.

1 Proofs

This section deals with proofs involving geometric objects we have described in class. Some of them we have glossed over, so you will be expected to go through the text to learn about them. You may also use the internet, as I find this a useful source of information.

Question 1

From page 26: Prove that each diagonal of a quadrilateral either lies entirely in its interior, or entirely in its exterior. You may benefit here from a proof by contradiction. Give an example of a pentagon for which this is false.

Question 2

From page 26: Prove that in a right triangle, all three altitudes pass through a common point. Note that this point may be outside the triangle.

Question 3

From page 30: Prove that an equilateral triangle has all angles equal.

Question 4

From page 33: In a given triangle, an altitude is a bisector. Prove that this triangle is isosceles.

Question 5

From page 33: In a given triangle, an altitude is a median. Prove that this triangle is isosceles.

2 Constructions

This section deals with Geometric constructions that I would like you to work through. Once again, you can find this material in the book at the pages I have listed. Please use GeoGebra, or some other software, to complete these constructions, because it is the 21st century and I would be embarrassed to see my students using rulers and compasses.

If the problem calls for you to bisect an angle, just make up an angle and construct a bisection of it. The actual angle is irrelevant, the point of these exercises is for you to practice constructions.

Construction 1

From page 50: Bisect an angle.

Construction 2

From page 50: Given a line, and a point not on that line, construct a line perpendicular to that line, through that point.

Construction 3

From page 51: Bisect a given line segment with a perpendicular line.

Construction 4

From page 52: Given a segment of length b , an angle of measure α , and a length S , construct a triangle with one side b , adjacent angle α and perimeter $S + b$.