Homework 1

Math 282 Computational Geometry
due 5:00pm on Thursday, January 5

Solve the following problems from the textbook, and write your solutions clearly and neatly. Make sure to explain your reasoning and provide mathematical details that support your answers. For a few tips on writing solutions, see this helpful guide for mathematical writing.

If you are taking this course for elective credit towards the computer science major, then do the problem labeled **CS only** and not the problem labeled **math only**. Otherwise, do the problems labeled **math only** instead of the problem labeled **CS only**.

You may write or type your solutions electronically, or write them on paper and scan/photograph them. If you photograph your papers, please use a scanning app to produce a single PDF file containing your solutions. Upload your written solutions (and your code/output if you do the CS only problem) to the Homework 1 assignment on Moodle.

1. **all:** Exercise 1.6

2. **all:** Exercise 1.11

3. **all:** Exercise 1.17

4. **all:** Exercise 1.10
   Note that Corollary 1.9 should say: *Every polygon with more than three vertices has at least two ears with nonadjacent tips.*

5. **math only:** Exercise 1.13

6. **CS only:** Exercise 1.15 modified — Code up the equation in this exercise (in your favorite programming language) and verify that it works on several polygons with integer coordinates. To check the area of your polygons, you could use the area given by by Pick's Theorem. You don't need to prove that the equation in Exercise 1.15 is correct.

   For this problem, hand in your code *and also* sample output from your program to show that your code works.

7. **all:** Exercise 1.21

8. **all:** The Catalan numbers count not only triangulations of convex polygons, but also many other sequences of items. Look up the Catalan numbers and state three other items whose count is given by the Catalan number C_n. Do you see any correspondences between these items and triangulations of polygons?