Homework 1

Math 282 Computational Geometry
due 5:00pm on Tuesday, January 7

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 problem labeled **math only** instead of the problem labeled **CS only**.

Remember what the syllabus says about appropriate collaboration, and *document what sources you use and what assistance you receive* as you work on this homework

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 1.12
4. **all:** Exercise 1.17
5. **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.*
6. **math only:** Exercise 1.13
7. **CS only:** Computationally verify that the area formula in Exercise 1.15 holds for at least four polygons of your choice. That is, write code (in your favorite programming language) that takes a list of vertices (x_i, y_i) of a polygon and computes $\frac{1}{2}\left|\sum_i (x_i y_{i-1} - x_{i-1} y_i)\right|$. Check that your result is in fact equal to the area of each polygon.

   For this problem, you must hand in your code *and also* sample input and output from your program to show that your code works.
8. **all:** Exercise 1.21
9. **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?