Homework 2

Math 282 Computational Geometry
due 5:00pm on Tuesday, March 2

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.

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 2 assignment on Moodle.

1. Exercise 1.6

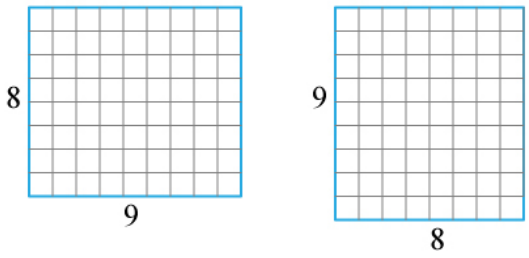
2. Exercise 1.23

3. Exercise 1.29 — Prove this directly, without using Theorem 1.32.

4. Exercise 1.45 — *Hint*: If all edges of the Greek cross have length 1, then the resulting square must have edge length $\sqrt{5}$. Find a diagonal of the Greek cross with length $\sqrt{5}$.

5. Exercise 1.46 — *Hint*: What must be the edge length of the resulting square?

6. A *translation dissection* is a dissection such that the pieces may only be translated, not rotated or flipped. Find a two-piece translation dissection of an 8×9 rectangle to a 9×8 rectangle. For this, each piece will be an orthogonal polygon. Your cuts may consist of many straight segments that meet at right angles.



7. Draw a single plot that shows the following functions $f(n)$ for $n > 1$:

(a) $f(n) = 1$
(b) $f(n) = n$
(c) $f(n) = n^2$
(d) $f(n) = \log(n)$
(e) $f(n) = n \log(n)$

Your plot should show the relative growth rates of these functions for large n. (This will help us compare the runtime complexities of algorithms next week.)