CS41 Homework 6

This homework is due at 5PM on Friday, October 11. Note the unusual deadline. This is a 6 point homework. Write your solution using \LaTeX. Submit this homework using github as a .tex file. This is a partnered homework. It’s ok to discuss approaches at a high level with others. However, you should not reveal specific details of a solution, nor should you show your written solution to anyone else. The only exception to this rule is work you’ve done with a lab partner while in lab. In this case, note (in your homework submission poll) who you’ve worked with and what parts were solved during lab.

1. Recurrence Relations. Solve the following recurrence relation:

\[ S(n) = 4S(n/2) + 3n^2, \text{ for all } n > 1 \]
\[ S(1) = 3 \]

Use either Recursion Trees or the Substitution Method.

2. Cell service on the Appalachian Trail.

The Appalachian Trail is an approximately 2100 mile trail that runs north-south from Maine to Georgia. Several hikers recently demanded cell service along the trail. Other hikers objected, believing that cell phones will ruin the hiking experience. Leaders of the Appalachian Trail Conservatory, who manage the trail, decided on a compromise – they plan to install cell phone base stations, but only for service at one of the campground areas on the trail. You’ve been hired to help decide where to place the base stations. Your goal is to place cell phone base stations at certain points on the trail, so that every campground is within five miles of the base stations.

Give an efficient algorithm that achieves this goal, using as few base stations as possible. The input to your algorithm is a List of campground locations, represented as points on a line. Your output should be a List of locations for the base stations, such that all campgrounds are covered and your solution uses the minimum possible number of base stations.