CS 180: Homework 3

Due 5/1 at 11:59 PM

For all problems requiring an algorithm, please also provide a corresponding proof and time complexity analysis.

Problem 1

Exercise 6 on page 108.

Problem 2

Exercise 10 Page 110.

Problem 3

Exercise 3 on page 189.

Problem 4

Exercise 6 on page 191.

Problem 5

Exercise 12 on page 193.

Problem 6

You are given a matrix of dimension $M \times N$, where each cell in the matrix is initialized with values 0, 1, 2, or 3 which has the following meaning:

- 0: This cell contains no orange.
- 1: Cell has a fresh orange.
- 2: Cell has a dirty orange.
- 3: Cell has a rotten orange.

The input matrix represents the state of all cells at day 0. The task is to find the first day all oranges become rotten. A dirty or rotten orange at index (i, j) will make all neighboring fresh oranges dirty by the next day. The neighbors of any cell are the cells directly above, below, to the left, and to the right (assuming the neighbor is in the bounds of the matrix). All dirty oranges will become rotten by the next day. If it is impossible to rot every orange then simply return -1.