

# CSCI 3322 (Principles of Algorithms), Fall 2022

## Homework 2

**Credit:** 20 points.

### 1 Reading

Be sure you have read, or at least skimmed, Chapter 3 of the textbook.

### 2 Problems

Answer the following questions. You may write out your answers by hand and scan them, or you may use a word processor or other program, but please turn in a PDF or plain text file. (No links to shared files on Google Drive please, and no word-processor files.) Turn it in by putting it in your course “TurnIn” folder on Google Drive. Please be sure to include your name somewhere in the file, so when I print it for grading I know whose work it is. (With the pledge is fine.)

1. (10 points) Prove Theorem 3.1 in the textbook. (Recall that proving something of the form “ $A$  if and only if  $B$ ” means you have to prove “if  $A$  then  $B$ ” and “if  $B$  then  $A$ ”.) Hint: If you write down the formal definitions of “ $f(n) = \Theta(g(n))$ ”, “ $f(n) = O(g(n))$ ”, and “ $f(n) = \Omega(g(n))$ ”, I think there is not much more to do.
2. (10 points) Is  $2^{n+1} = O(2^n)$ ? Is  $2^{2n} = O(2^n)$ ? Justify your answers. (For either you think *is*  $O(2^n)$ , you should be able to come up with constants that make it fit the definition of  $O(2^n)$ ; if you think either is *not*, just explain as best you can why you think it isn’t possible to come up with such constants.)

#### 2.1 Pledge

This should include the Honor Code pledge, or just the word “pledged”, *plus* at least one of the following about collaboration and help (as many as apply). Text *in italics* is explanatory or something for you to fill in; you don’t need to repeat it!

- I did not get outside help *aside from course materials, including starter code, readings, sample programs, the instructor.*
- I worked with *names of other students* on this assignment.
- I got help with this assignment from *source of help — ACM tutoring, another student in the course, etc. (Here, “help” means significant help, beyond a little assistance with tools or compiler errors.)*
- I got help from *outside source — a book other than the textbook (give title and author), a Web site (give its URL), etc.. (Here too, you only need to mention significant help — you don’t need to tell me that you looked up an error message on the Web, but if you found an algorithm or a code sketch, tell me about that.)*
- I provided help to *names of students* on this assignment. (*And here too, you only need to tell me about significant help.*)

## 2.2 Essay

This should be a brief essay (a sentence or two is fine, though you can write as much as you like) telling me what if anything you think you learned from the assignment, and what if anything you found interesting, difficult, or otherwise noteworthy.