Homework Assignment 1

This assignment is due by Tuesday January 29 (in class).
Assignments should be handed in before the class begins.

Please note:
(1) I would like to emphasize the process of analysis and writing of proofs. Please make sure to
write clearly, and explain your arguments or line of thought as clearly as possible. If you do not
know the answer for a particular question, explain what partial analysis you can make and/or how
you can approach the problem.
(2) Please make sure you read and understand the course policy on collaboration and the general
university rules regarding academic integrity. Text and links are given on the course web page.

Problem 1: Solve exercises 2.1-3 (page 22), 2.2-3 (page 29), 3.1-6, 3.1-7 (page 53), and 3.2-5, 3.2-7
(page 60), in the textbook.

Problem 2: Demonstrate the working of the divide-and-conquer algorithm for integer multiplication
for 5132\*6293, using a size of one digit as the base case. Make sure to show the details of all
the recursive levels and calls in your solution.

Problem 3: For each of the following claims, state whether it is true or false and prove your
statement. \((c\) is a constant independent of \(n\).)

- \(n^8 = \Omega(n^9)\)
- \(O(f(n)) \cdot O(g(n)) = O(f(n) \cdot g(n))\)
- \(f(n) = O(g(n))\) implies \(2^{f(n)} = O(2^{g(n)})\)
- \(\binom{n}{c} = O(n^c)\) where \(\binom{n}{c} = \frac{n!}{c!(n-c)!}\)
- \(\binom{n}{c} = \Omega(n^c)\)

Problem 4: Solve problem 2-3 (page 41) in the textbook.