Analysis of Algorithms
CS 375, Spring 2019
Homework 4
Due **AT THE BEGINNING OF CLASS** Monday, February 25

- From your textbook (CLRS), please be sure to read Chapter 3.
- Unless otherwise specified, exercises will be from the CLRS textbook and will be named on HW assignments by exercise number used in the book.
- *A general note:* When writing up your homework, please write neatly and **explain your answers clearly**, giving all details needed to make your answers easy to understand. Graders may not award credit to incomplete or illegible solutions. Clear communication *is* the point, on every assignment.

Exercises

1. List the following functions according to their order of growth from lowest to highest:

   $$(n-2)!, \quad 5\lg(n+100)^{10}, \quad 2^{2n}, \quad 0.001n^4+3n^3+1, \quad \ln^2 n, \quad \sqrt[3]{n}, \quad 3^n.$$

2. Exercise 3-4, parts b and f (page 62).

   For each part, if the assertion is true, say so, and if not, provide a counterexample. There is no need to prove your answers, but please give short explanations (2–3 sentences or so) for each answer, explaining your reasoning (e.g., how you know the assertion is true, or what makes your counterexample a counterexample).

3. Express the running time (as a function of `n`) of the following pseudocode algorithm using Θ-notation.

   ```
   r = 0
   i = n * n
   while i > 1 do
     for j = 1 to i do
       r = r + 1
     i = i/2
   ```

   In the above, `i/2` is integer division (i.e., $\lfloor i/2 \rfloor$, for those who recall that *floor* notation).

   Be sure to explain the details behind your answer: state what *barometer operation(s)* you counted to arrive at your answer; show all work that you did to count those operations and arrive at a summation that expresses the running time; and briefly explain how you got from that summation to the Θ complexity bound.