csce750 — Analysis of Algorithms
Fall 2019 — Homework 00

Assigned: August 21
Due: never

This assignment is a review of some algorithm analysis techniques.

Page 14: Problem 1-1

Not in textbook: Examine the pseudocode for INSERTIONSORT on page 18. Write a summation expressing the number of element comparisons made by this algorithm, in the worst case, for an input size n. Simplify this summation to a form that does not include any summation symbols. Use the simplest possible Θ notation to classify the order of growth of this expression. Repeat these steps for the best case number of comparisons.

Page 39: Exercise 2.3-4

Not in textbook: Examine the pseudocode for MERGESORT on page 34 and its MERGE subroutine from page 31. Write a recurrence, with an appropriate base case, expressing the number of element comparisons made by this algorithm, in the worst case, for an input size n. Solve this recurrence—that is, express its growth using the simplest possible Θ notation—using your favorite (correct) method.

Not in the textbook: Arrange the following functions from left to right in descending order by asymptotic growth rate:

$$0.1n^4 + n^3 \quad 2^{2n} \quad 2^{(\lg n)^2)} \quad 2^{\lg n} \quad 3^n \quad 3^{n+1} \quad 5\lg(n+100)^{10}$$

$$(\lg n)^2 \quad (n-2)! \quad n^{20} \quad n^{20}(\lg n)^{20} \quad n^4 + 0.1n^3 \quad \sqrt[3]{n}$$

If two or more functions have the same growth rate (that is, if one is Θ of another), arrange them vertically within the list.