CSE 347 Analysis of Algorithms February 14, 2017

Homework 3

Instructor: Brendan Juba/Robert Utterback *Due: February 23, 2017, 11:59 PM*

Reminder: You may work in groups and use outside sources. But, you must write up solutions in your own words and properly reference your sources for each problem. This includes listing your collaborators and properly citing any sources you use. Solutions to each problem must be electronically typeset and submitted online via Blackboard. Instructions appear in the E-Homework Guide: `http://www.cse.wustl.edu/~bjuba/cse347/s17/ehomework/` For all problems in this course, your solutions should provide a proof of *both* correctness and a running time bound, unless the problem explicitly states that this is not necessary.

1. Consider the task of searching a sorted n-element array A for a given element x. The standard algorithm for this task is binary search, which finds x (if it is present in A) in time $O(\log n)$. Show that any algorithm that accesses the array only via comparisons (here, queries of the form *"Is* $A[i] \leq z$*?"*) must take $\Omega(\log n)$ steps. (You may assume that the range of possible elements is as large as you wish.)

2. *Kleinberg & Tardos* – Chapter 6, exercise 14

3. *Kleinberg & Tardos* – Chapter 6, exercise 16

4. *Kleinberg & Tardos* – Chapter 6, exercise 24