CSE548/AMS542 Fall 2013 Analysis of Algorithms

Jie Gao*

October 9, 2013

Due **October 20th** midnight. Each problem, unless specified otherwise, has a maximum of 10 points. Avoid too many details. A succinct and clean proof is the best. You may use the algorithms we covered in class without referring to the details.

Homework 4

1. Textbook [Kleinberg & Tardos] Chapter 5, page 246, problem #1, #4, #5.
2. Solve the following recurrences and give an Θ bound for each of them.
   (a) $T(n) = 49T(n/25) + n^{3/2}\log n$.
   (b) $T(n) = T(n-1) + 2$.
   (c) $T(n) = 2T(n-1) + 1$.
   (d) $T(n) = T(\sqrt{n}) + 1$.
3. **Sum to Zero?**
   (a) Describe an algorithm that determines whether a given set of n integers contains two elements whose sum is zero, in $O(n \log n)$ time.
   (b) Describe an algorithm that determines whether a given set of n integers contains three elements whose sum is zero, in $O(n^2 \log n)$ time.
   (c) Now suppose the input set X contains only integers between $-10000n$ and $10000n$. Describe an algorithm that determines whether X contains three elements whose sum is zero, in $O(n \log n)$ time.

*Department of Computer Science, Stony Brook University, Stony Brook, NY 11794, USA, jgao@cs.sunysb.edu.