

## CMPS 102 — Winter 2019 – Homework 2

Four problems, 35 points, due 11:50 pm Wednesday Feb 6th, see the *Homework Guidelines*

1. (10 pts) Problem 3 in Chapter 5 (Divide and Conquer). This is the equivalent back card problem: determine if *more than* half the  $n$  possible fraudulent bank cards are from the same account using a machine that detects if two cards are from the same account or not.  
Clearly describe your algorithm taking only  $O(n \log n)$  machine uses (3 pts), prove that it is correct (4 pts), and prove that your algorithm uses the machine only  $O(n \log n)$  times.
2. (6 pts) Problem 2 in Chapter 4 ( Greedy algorithms): Two true-or-false statements (3 pts each). Be sure to provide good justifications for your answers.
3. (9 pts) Problem 4 in Chapter 4 ( Greedy algorithms): Event subsequence identification. Clearly describe your algorithm (3 pts), prove that it is correct (4 pts) and analyze its running time (2 pts). Assume that comparing two events for equality takes 1 unit of time.
4. (10 pts) Problem 24 in Chapter 4 ( Greedy algorithms): Clock skew elimination. Clearly describe your algorithm (3 pts), prove that that it correctly equalizes the delays (2 pts) and prove that it uses the least possible additional sum of edge lengths (5 pts).

### Recommended exercises (not to be turned in)

1. The solved exercises in 4 (Greedy algorithms).
2. Solved exercise 1 in chapter 3 (graphs).
3. Exercises 2 and 6 from chapter 3 (graphs).
4. Write a routine that takes the adjacency matrix representation of a graph and produces its adjacency list representation.