CSE 521: Design and Analysis of Algorithms Assignment #1

due: Tuesday, Oct 11. 10:30AM

Each problem is worth 10 points. KT refers to *Algorithm Design*, first edition by Kleinberg and Tardos. "Give an algorithm" means pseudo-code, a high-level explanation and a proof of correctness. See the website for more grading guidelines.

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1. KT, Chapter 1, Problem 6
2. Give an efficient algorithm to determine whether there exists a *unique* stable matching.
3. Given an undirected graph with m edges and n vertices that is presented as an adjacency list, give an algorithm to determine whether a cycle is present. For full credit, your algorithm should run in time $O(m+n)$.
4. (a) KT, Chapter 2, Problem 5
   (b) Fix a constant $c > 0$. Solve the recurrence

   $$T(n) = cT(n/2) + n.$$

   Your answer should be in the form of an asymptotic bound $\Theta(f(n))$ for some simple function $f(n)$. There should be different cases depending on the value of c.
5. KT, Chapter 3, Problem 12
6. KT, Chapter 4, Problem 12