CSE 331: Introduction to Algorithm Analysis and Design Fall 2012

HOMEWORK 5

Due Friday, October 12, 2012 by 1:15pm in class

IMPORTANT: Please submit each problem separately, i.e. each problem should begin on a new page and only the pages for one problem should be stapled together. Failure to do so might result in some problem(s) not being graded.

For general homework policies and our suggestions, please see the policy document.

Do NOT submit the last problem. It will not be graded. However, we highly encourage you to think about the problem to get more comfortable with graphs.

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1. (40 points) Exercise 2 in Chapter 3.

2. (45 points) Exercise 4 in Chapter 3.

   (*Hint*: It *might* be useful to represent the input as a graph and run one of the connectivity algorithms we have seen in class. Also in one way of representing the "relationships," there might be two kinds of edges: i.e., it might be useful to "label" the edges. As usual, feel free to ignore this hint and come up with an algorithm from scratch.)

3. (15 points) Exercise 10 in Chapter 3.

4. (**Do NOT turn this problem in**) Given a directed graph $G = (V, E)$, a vertex $s \in V$ is called a *sink* if there are incoming edges from every other vertex to s but no outgoing edge from s, i.e. $|\{(u, s) \in E\}| = |V| - 1$ and $|\{(s, u) \in E\}| = 0$.

   - As a warmup present an $O(n^2)$ algorithm to find out if G has a sink and if so, to output it. (Recall that $n = |V|$).
   - Now present an $O(n)$ time algorithm for the same problem.