CIS 315, Intermediate Algorithms
Spring 2018

Assignment 1

due April 13, 2018

1. Suppose you are given the adjacency matrix representation M of a directed graph $G = (V, E)$. Note that the size of M is $\Theta(n^2)$. The goal here is to determine if there is a node of G with in-degree $n-1$ and out-degree 0 (that is, all other nodes point to it and it points to no other node). Give an algorithm to do this which runs in $\Theta(n)$ time (so **not** $\Theta(n^2)$). **[5 points]**

2. exercise 22.2-7 from CLRS text **[5 points]**

3. exercise 22.3-2, from CLRS text **[5 points]**

4. exercise 22.4-1, from CLRS text **[5 points]**

5. Suppose you have an unweighted DAG (directed acyclic graph) G and know the topological ordering: assume that the ordering is $1, 2, \ldots, n$. Give a linear time algorithm to find the length of the *longest* path from node 1 to node n. **[7 points]**

Total: 27 points