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IMPORTANT. If you have not done so yet, please send e-mail to the instructor with your name, major, year, type of credit sought (letter grade, P/F, etc.), list of proof-oriented math courses previously taken; include whether or not you took CMSC-27100 (Discrete Math). In the subject write 27200 info or 37000 info, as appropriate.

HOMEWORK. Please **print your name on each sheet**. Print “U” next to your name if you seek 27200 credit and “G” if you seek 37000 credit. Undergraduates receive the stated number of points as *bonus points* for “G only” problems. – Please try to make your solutions readable. Unless expressly stated otherwise, all solutions are due at the **beginning of the next class**.

**Homework is collected in three separate piles (U, G, “G only”).** Please put your solutions to “G only” problems on that pile, and your solutions to other problems on the “U” or “G” pile according to the credit you seek.

READING. Graduate students: study Depth-First Search and its applications.

- 7.1 (U, G) Suppose we permit that the adjacency list of a vertex mention the same out-neighbor more than once. For instance, the list  $\text{adj}[5] = [1, 7, 3, 7, 2, 3]$  means that vertex 5 has 4 out-neighbors, namely 1, 2, 3, and 7. In a *multiplicity free* representation, we do not permit such repetition. Given an adjacency-list representation of a digraph with repeated entries permitted, construct a multiplicity-free adjacency-list representation in linear time ( $= O(\text{length of input})$ ).