

**ADVICE.** Take advantage of the TA’s office hours Monday, Tuesday and Thursday 5–6pm in the Theory lounge (Ry-162).

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DATES TO REMEMBER. Wed Feb 4: Midterm 1; Mon Feb 23: Quiz 2.

**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. 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 write your solutions to graduate problems on **separate sheets**.

- 9.1 (U,G) (5 points) Write pseudocode to turn the edge-list representation of the digraph  $G = (V, E)$  into an adjacency list representation in linear time. (“Linear time” means  $O(|V| + |E|)$  steps. Copying an integer between 1 and  $V$  counts as one step.) Your algorithm should be very short.
- 9.2 (U,G) (5 points) Write pseudocode to turn an adjacency list representation of the digraph  $G = (V, E)$  into a monotone increasing adjacency list representation in linear time, i.e., the out-neighbors of each vertex must be listed in increasing order. Your algorithm should be elegant, very short.
- 9.3 (U,G) (5 points) Describe an algorithm to decide, in linear time, whether or not a digraph is undirected (the reverse of every edge is an edge). The digraph is given in adjacency list representation. Your algorithm should be elegant, very short.