Notes on Grading

• You can write “I don’t know” for any question and receive 25% credit. You can take this option for any numbered problem, but not for part of a problem. For example, you can answer 3.1 and write “I don’t know” for 3.2, but you can’t write part of the solution for 3.2 and then write “I don’t know” for the rest.

• You get a 10% bonus for typing your homework. You are encouraged to use \LaTeX. You must type your entire homework to receive the bonus. The 10% bonus does not apply to problems answered with “I don’t know.”

1 Longest paths

Can you modify Dijkstra’s algorithm to find the length of the longest path from a vertex \( s \) to another vertex \( t \) in a directed acyclic graph?

2 Maximum matching

A bipartite graph is a graph whose vertices can be divided into sets \( L \) and \( R \) such that every edge crosses between \( L \) and \( R \). A matching is a subset of edges of a bipartite graph such that no two edges share a vertex.

Show how to find maximum matching in a bipartite graph. (Hint: you can convert the problem into a max flow problem and use the max flow algorithm we covered in class.)
3 Detecting cycles

The computer science department wants to ensure that they have not introduced any circular requirements. An example of circular requirements would be

- CSE 325 is a prerequisite for CSE 335
- CSE 345 is a prerequisite for CSE 345
- CSE 345 is a prerequisite for CSE 325

Such a circular set of dependencies would make it impossible for students to take any of these courses, since they would never have fulfilled the prerequisites.

Assume there are no “or” prerequisites, i.e. if a class has multiple prerequisites, then a student must take all the prerequisites before taking the class.

Describe an algorithm for detecting such cycles.

4 How quickly can you graduate?

Describe an algorithm that, given class prerequisites like in the previous question, plus graduation requirements, determines the shortest possible amount of time required to graduate. As before, assume there are no “or” prerequisites or graduation requirements. You may assume students can take as many classes as they want during a single semester.