# Math F307 Spring 2017

### Homework Exercises

### Instructions for writing up homework.

- Although you are encouraged to work with your classmates on the homework assignments, you must write up the solutions individually.
- Read the section!
- Use pen or non-smeary pencil. Do not have little scritchies on the side.
- Staple your homework.
- Write legibly, and leave lots of whitespace. Make sure your writing is dark enough to be readable. If this is problematic for you, consider typing your homework.
- Answer the question in complete sentences, where appropriate.
- Write the problem statements as well as the answers. This is not optional. Points will be deducted if you do not do this.
- Have headings indicating the section.
- In the upper right hand corner of your top page, write your name (first and last) on your assignment, along with the course number (Math 307) and which assignment it is.
- You are expected to ask questions in class about the homework problems!

Homework Set 8

# DUE Friday, March 24 at the beginning of class.

You should **read** each section!

**Section 6.6.** To turn in: 10, 11, 13

#### Additional Problems. Also turn in:

- (1) Use Kruskal's Algorithm to find a minimal distance spanning tree for the graph shown in Figure 1. Draw in the edges of the spanning tree on a new copy of the vertices. Break ties by choosing edges with a smaller-labelled endpoint. Also provide a list of the edges in the order you added them.
- (2) Use Prim's Algorithm to find a minimal distance spanning tree, **starting at vertex 6** for the graph shown in Figure 1. Draw in the edges of the spanning tree on a new copy of the vertices. Break ties by choosing edges with a smaller-labelled endpoint. Also provide a list of the edges in the order you added them.
- (3) Use Dijkstra's Algorithm to find a minimal distance spanning tree for the graph shown in Figure 1, **starting at vertex 0**. List all the vertices along with their distance from vertex 0. Also provide a list of edges in the order you added them.
- (4) Use Dijkstra's Algorithm to find a minimal distance directed spanning tree for the digraph shown in Figure 1, **starting at vertex A**. List all the vertices along with their distance from vertex A. Are there any unreachable vertices (from A)? Which ones?

- (5) List the vertices of the tree shown in Figure 3 using the preorder traversal.
- (6) List the vertices of the tree shown in Figure 3 using breadth first search.
- (7) Label the vertices of the tree shown in Figure 3 using a topological ordering.
- (8) Find a topological ordering of the vertices of the digraph shown in Figure 2, or explain why no such topological sorting exists.
- (9) The "while" statement of the topological ordering digraph algorithm includes the statement that we can find a vertex v with no incoming edges. Explain why, if every vertex of a digraph has at least one incoming edge, then the digraph must have a cycle.

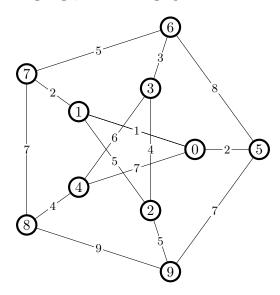


FIGURE 1. Graph for Kruskal, Prim, and Dijkstra's Algorithm

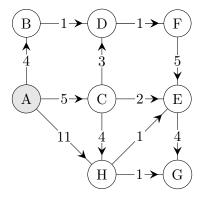


FIGURE 2. A digraph

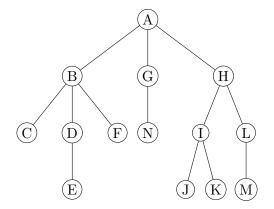


FIGURE 3. A tree