

## Midterm 1 Standard 3 - Dijkstra's

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Due Date ..... March 10  
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Quiz Code (enter in Canvas to get access to the LaTeX template) ..... **BNOPP**

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### 1 Instructions

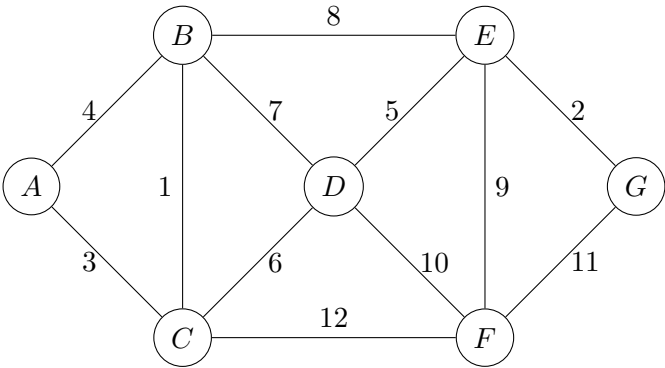
- The solutions **should be typed**, using proper mathematical notation. We cannot accept hand-written solutions. Here's a short intro to  $\text{\LaTeX}$ .
- You should submit your work through the **class Canvas page** only. Please submit one PDF file, compiled using this  $\text{\LaTeX}$  template.
- You may not need a full page for your solutions; pagebreaks are there to help Gradescope automatically find where each problem is. Even if you do not attempt every problem, please submit this document with no fewer pages than the blank template (or Gradescope has issues with it).
- You **may not collaborate with other students**. **Copying from any source is an Honor Code violation. Furthermore, all submissions must be in your own words and reflect your understanding of the material.** If there is any confusion about this policy, it is your responsibility to clarify before the due date.
- Posting to **any** service including, but not limited to Chegg, Discord, Reddit, StackExchange, etc., for help on an assignment is a violation of the Honor Code.

2 Standard 3 - Dijkstra's

2.1 Problem 1

**Problem 1.** Consider the weighted graph  $G(V, E, w)$  pictured below. Work through Dijkstra's algorithm on the following graph, using the source vertex  $A$ .

- Clearly include the contents of the priority queue, as well as the distance from  $A$  to each vertex at each iteration.
- If you use a table to store the distances, clearly label the keys according to the vertex names rather than numeric indices (i.e., `dist['B']` is more descriptive than `dist['1']`).
- You do **not** need to draw the graph at each iteration, though you are welcome to do so. [This may be helpful scratch work, which you do not need to include.]



*Answer.* The following block will outline the priority queue step-by-step (distances order corresponds to the priority queue):

Table 1: Priority Queue Contents		
Step	Queue Contents	Distance
0	A	N/A
1	C	3
2	C, B	3, 4
3	B, D, F	4, 9, 15
4	D, E, F	9, 12, 15
5	E, F	12, 15
6	G, F	14, 15
7	F	15
8	All Nodes Explored	All Nodes Explored

The final distances are as follows:  
A: 0  
C: 3  
B: 4  
D: 9  
E: 12  
G: 14  
F: 15

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