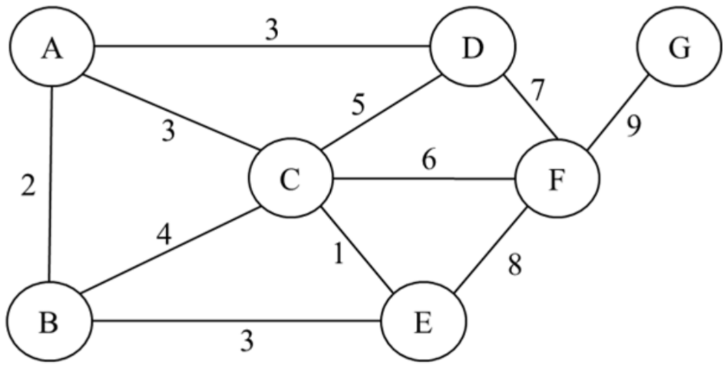
CS 61B
Summer 2020

Small Group Tutoring
Section 11: MSTs

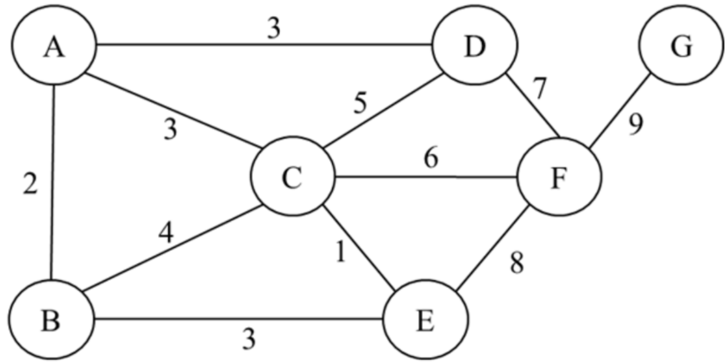
Worksheet 11

1 Minimum Spanning Tree



(a) Given the graph above, run Prim's algorithm to determine the minimum spanning tree of this graph. For Prim's algorithm, assume we start at node A and fill in the following chart including the value cost(v) for all vertices v for that iteration as well as which node was popped off of the fringe for that iteration. (Note: Ties are broken in alphabetical order.)

v	init	Pop __	Pop __	Pop __	Pop __	Pop __	Pop __	Pop __
cost(a)	**0**							
cost(b)	∞							
cost(c)	∞							
cost(d)	∞							
cost(e)	∞							
cost(f)	∞							
cost(g)	∞							



(b) Run Kruskal's algorithm on the same graph.

(c) Does Kruskal's algorithm for finding the minimum spanning tree work on graphs with negative edge weights? Does Prim's?

(d) True or False: A graph with unique edge weights has a unique minimum spanning tree.

2 Fiat Lux

After graduating from Berkeley with solid understanding of CS61B topics, Josh became a billionaire and wants to build power stations across Berkeley campus to help students survive from PG&E power outages. Josh want to minimize his cost, but due to the numerous power outages when he took CS61B, he did not learn anything about Prim's or Kruskal's algorithm and he is asking for your help! We must meet the following constrains to power the whole campus:

- There are V locations where Josh can build power stations, and it costs v_i dollars to build a power station at the i^{th} position.
- There are E positions we can build wires and it cost e_{ij} to build a wire between location i and j.
- All locations must have a power station itself or be connected to another position with power station.
- $e_{ij} << v_i, \forall i, j$

Modify the Prim's or Kruskal's algorithm taught in class that will minimize the cost Josh will spend while still fulfilling the constrains above.