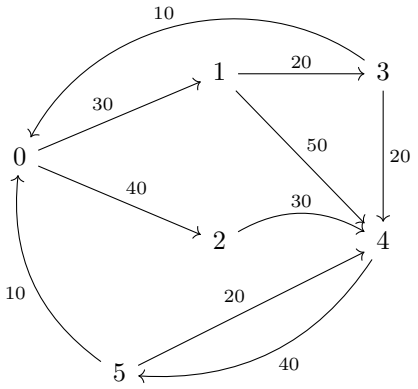
Problem Set 12

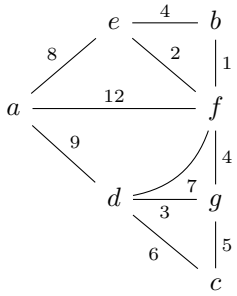
Question 1.

(a) Apply Dijkstra's algorithm to fill out the table over the following graph, starting at the node labeled 0.

vertex / iteration	0	1	2	3	4	5
0	0	∞	∞	∞	∞	∞
1						
2						
3						
4						
5						



(b) Apply Kruskal's algorithm to the following graph:



Question 2.

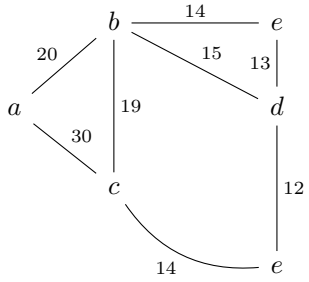
(a) Dikstra's algorithm only works where all weights are non-negative. Provide an undirected weighted graph with some negative weights together with a source and a target node, where Dijkstra's algorithm does not succeed in finding the shortest path

(b) Professor Balthazaar suggests that we could still use Dijkstra's algorithm to find the shortest path between two vertices if there are negative weights, by adding a positive number k to every edge so that they all become positive.

Give an counterexample to show that this does not work.

Question 3.

(a) Apply Prim's algorithm to the following graph, starting at a.



(b) Dijkstra's and Prim's algorithm have similar structure but solve different problems.

Provide an undirected graph with a source and a target node where the path generated by Dijkstra is not included in the minimal spanning tree generated by Prim.