

Transportation Logistics - Homework 1 (5 points)

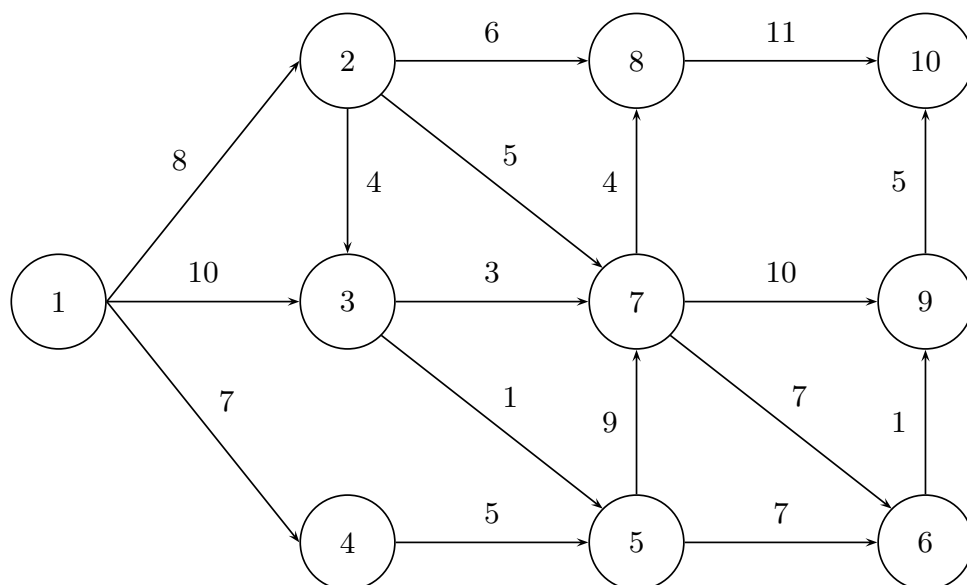
Exercise 1 (2 pts)

In a remote part of Lower Austria the farms of the families Gruber, Wagner, Müller, Pichler, Steiner, Reiter and Fischer shall finally be connected to the High Speed Internet cable network. The closest hub is located in Neudorf. The following cable connections are possible (they can be used in both directions) and they have the following lengths (in km):

Neudorf	Gruber	5
Neudorf	Wagner	6
Gruber	Wagner	3
Gruber	Müller	7
Gruber	Pichler	4
Wagner	Pichler	8
Müller	Pichler	5
Müller	Steiner	9
Müller	Reiter	6
Pichler	Steiner	8
Pichler	Reiter	10
Steiner	Reiter	3
Steiner	Fischer	2
Reiter	Fischer	6

- Draw the graph. Is it a tree? Justify your answer.
- The aim is to minimize the total cable length. Determine the minimum spanning tree using the Algorithm of Prim.

Exercise 2 (1 pt)



a) Determine the shortest path between 1 and 10 with Dijkstra's Algorithm.

Exercise 3 (1 pt)

Assume now that the weights of the arcs of Exercise 2 correspond to arc capacities. Compute the maximum flow between vertex 1 and 10 (use the augmenting path algorithm) and identify a minimum cut.

Exercise 4 (1 pt)

A weighted digraph with vertices $V = \{1, 2, 3, 4, 5\}$ is given by the following matrix (each entry denotes the weight (distance) of the arc connecting vertices i and j ; ∞ indicates that the according arc does not exist.)

c_{ij}	1	2	3	4	5
1	0	∞	7	∞	∞
2	4	0	6	10	11
3	∞	5	0	8	3
4	∞	∞	7	0	10
5	∞	∞	∞	9	0

Draw the graph and use the Floyd-Warshall Algorithm (Tripel Algorithmus) to find the shortest distance between all vertices i and $j \in V$.