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Problem Set 1

due: April 23, 2018

Exercise 1

Characterize all connected undirected graphs that

(a) admit a closed walk being both an Euler tour and a Hamiltonian circuit,

(b) admit a walk being both an Euler walk and a Hamiltonian path.

Exercise 2

Let G = (V, E) be an undirected graph, equipped with a length function $\ell : E \to \mathbb{R}$. Further let $s, t \in V$ be distinct vertices. Show that the following decision problems are NP-hard by reducing the Hamilton path problem:

(a) (Longest s-t-path) Given a real number L, is there a path from s to t of length $\geq L$?

(b) (Shortest s-t-path) Given a real number L, is there a path from s to t of length $\leq L$?

Exercise 3

Consider the Berlin U-Bahn network (computer-readable data is on the website):



The graph is undirected. The labels indicate the distance in kilometers.

(a) Find the shortest path from Hönow to Krumme Lanke and compute its length.

(b) Find the longest path in the network and its length. Remember that a path is not allowed to visit a vertex or an edge more than once.

If you solve this by programming (recommended for (b)), then submit your code. Otherwise, explain in detail why your method is correct.

5 points

5 points

10 points