Technische Universität München
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Lehrstuhl für Effiziente Algorithmen
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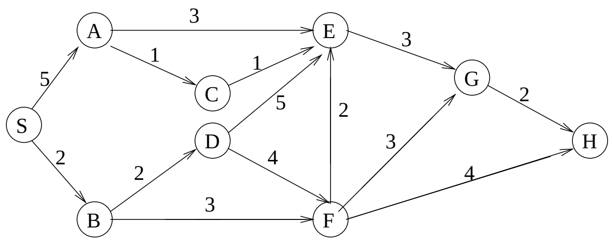
Effiziente Algorithmen und Datenstrukturen I

Aufgabe 1

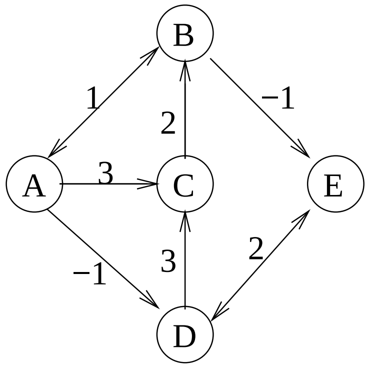
Consider the following graph:



Using s as the start node, use Dijkstra's Algorithm to determine the shortest path from s to each vertex. After each round show the distances assigned to each vertex.

Aufgabe 2

Consider the following graph:



Using the All Pairs Shortest Path (APSP) strategy discussed in the lecture, find the shortest path for all pairs. Show the graph after all five steps in addition to the distance matrix after steps 4 and 5

Aufgabe 3

Consider an arbirtary graph with positive edge costs. Is the shortest path tree (with source s) the same tree as the minimum spanning tree (with root s)? If yes, defend your answer. If no, show a counter-example.

Aufgabe 4

Transitive Hulls

a) Remember from the lecture that we constructed a Transitive Hull by computing an interval for each outgoing edge of a vertex. Argue that we can infact construct a Transitive Hull by computing only one interval per vertex, thus making $\mathit{Reachable}(v, w)$ run in $O(1)$ time.

a) Remember from the lecture that when we apply the tree-based approach for constructing a Transitive Hull to DAGs we may end up with several DFS values per vertex. What are the maximum number of DFS values per vertex?