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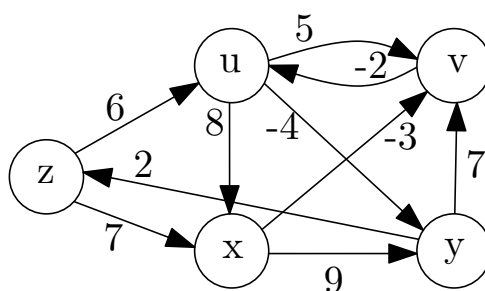
# Algorithms

WS 2014/15

## Exercise 2

### 1. Bellman-Ford (Niveau I)

Use the Bellman-Ford algorithm (see lecture script) to determine the shortest path from source  $z$  to any other node in the graph.



### 2. Bellman-Ford (Niveau II)

Let  $D = (V, A), n = |V|$  be a directed graph. Prove that  $D$  contains a circuit of negative length reachable from  $s$  if and only if  $f_n(v) \neq f_{n-1}(v)$ , for some  $v \in V$ , where  $f_k(v) = \min\{l(P) \mid P \text{ is an } s - v \text{ walk traversing at most } k \text{ arcs}\}$

### 3. Longest Common Subsequence (Niveau I)

Compute the longest common subsequence (LCS) for the two sequences  $a = \text{piece}$  and  $b = \text{price}$  by first modelling this problem as a graph and then using Dijkstra's algorithm to compute the shortest path.

### 4. Network Flow (Niveau I)

Assume a flow network with edge and additional vertex capacities. Each vertex  $v$  has a limit on the flow that can pass through it. Explain how to transform this flow network into an equivalent flow network without vertex capacities.