Tenth exercise sheet for the lecture

The Algebraic Path Problem

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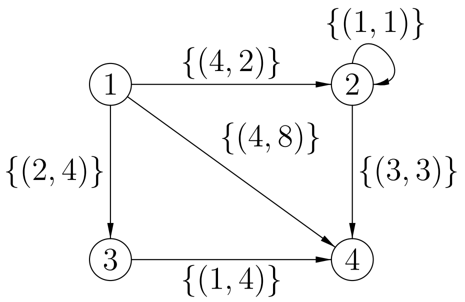
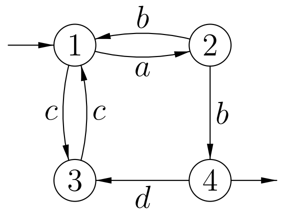
Exercise 34 (Pareto optima, Aho algorithm)
Consider the following $Pareto_2$-weighted graph:



Execute the Aho algorithm. $\diamond$

Exercise 35 (regular expressions)
Consider the following nondeterministic finite state automaton:



Compute the accepted language by executing one of the algebraic path problem algorithms. $\diamond$

Exercise 36 (comparing algorithms)
Which of the Gauss-Jordan, Mahr, Aho algorithms most closely corresponds to the Floyd-Warshall algorithm? $\diamond$

Exercise 26 (induced partial order, "algebraic Dijkstra")
Let $(K, +, \cdot, 0, 1)$ be a semiring.

1. Impose a suitable condition on the semiring allowing the definition of a partial order $\leq$ on K such that for every $a, b \in K$, $a + b$ is the smallest $c \in K$ with $a, b \leq c$.

2. Show that then for every $a, b, c \in K$, $a \leq b$ implies $c \cdot a \leq c \cdot b$ and $a \cdot c \leq b \cdot c$.

3. Which of the relevant semirings from the lecture and earlier exercises fulfill the additional requirements $a + b \in \{a, b\}$ and $a \cdot b \leq a, b$ for every $a, b \in K$? ◇