



Assignment 1, Complexity Theory, WS 13/14

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<http://www-cc.cs.uni-saarland.de/course/42/>

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Exercise 1.1 Let $f, g : \{0, 1\}^* \rightarrow \{0, 1\}^*$ be two log-space computable functions. Show that their composition $f \circ g$ is also a log-space computable function.

Exercise 1.2 A directed graph D is *strongly connected* if for all pairs of vertices a and b , there is a directed path from a to b , and, there is a directed path from b to a . Let

$$\text{StrConn} = \{D \mid D \text{ is strongly connected}\}.$$

Show that StrConn is NL-complete (under logarithmic space many-one reductions).

Exercise 1.3 Complete the proof of Immerman-Szelepcsényi Theorem, i.e., prove that

$$\text{NSpace}(\log) = \text{co-NSpace}(\log)$$

implies

$$\text{NSpace}(s) = \text{co-NSpace}(s)$$

for all space constructible $s(n) \geq \log n$.