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Complexity Theory

SS 2016

Class Handout 8

Exercise 1:
Argue that every (non-trivial) language in **NL** would be **NL**-complete when **NL**-completeness would be defined using poly-time reductions.

Exercise 2:
Show that **NL** is closed under the operations union, intersection, and star.

Exercise 3:
Prove Theorem 4.6 from the lecture, that is the generalization of Savitch's theorem. Let $s : \mathbb{N} \to \mathbb{N}$ be a space constructible function with $s(n) \geq \log(n)$ for all $n \in \mathbb{N}$, then

$$\mathbf{NSPACE}\big(s(n)\big) \subseteq \mathbf{DSPACE}\big(s(n)^2\big) \ .$$

Exercise 4:
Show that the following language is in **L**:

$$\text{ADD} = \{(x, y, z) \mid x, y, z > 0 \text{ are binary integers and } x + y = z\}$$