The Theory of Computation

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Solution Manual

Chapter 6, Problem 6.22

The main thing that it would show is that logarithmic space and polynomial time are not the same resources when it comes to many-one reductions within NP. This would translate into a simple proof of $\mathrm{L} \neq \mathrm{P}$, thereby solving an important open problem. Since the answer is negative, we cannot translate it into answers for the equivalent problems higher in the hierarchy (such as PSPACE *vs.* EXP). (In contrast, a proof of $\mathrm{L} = \mathrm{P}$ would yield, through padding, a proof of PSPACE = EXP and similar results at various levels of the hierarchy. But we can have $\mathrm{L} \neq \mathrm{P}$ and still have PSPACE = EXP.) Since NC^1 is (more or less) built from L, it would also show $\mathrm{NC}^1 \neq \mathrm{P}$. It would not resolve the question of NL vs. P, however.