

Homework 9

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1 Problem 13

1.1 $M \rightarrow N$

Let $N = M$, $b = 1$.

Since M accepts x if $x \in L$ in time $T(|x|)$, N will accept x in time $1 * T(|x|)$.

1.2 $N \rightarrow M$

To construct M from N , increase the alphabet size of M by a factor of b . Reconstruct M to be able to accept these larger alphabet symbols.

Construct a mapping of permutations of symbols of length 1 to b in N to the alphabet in M .

Begin at the start state of N

Search using a DFS to a depth of $k * b$

Pause at this point and create a transition from the parent state $((k - 1) * b)$ to the current state using the single alphabet symbol mapped by the path used to get there.

If the DFS gets to a depth $\neq k * b$ and cannot go farther, create a transition from the parent state to the current state using the single alphabet symbol mapped by the path used to get there.

M is a "sped up" version of N , since N 's transitions are traversed b -at-a-time.

Since there exists a mapping of $M \rightarrow N$ and $N \rightarrow M$, the two definitions are equivalent.