

Homework 10

Reference for all solutions on this problem sheet: Melvin Wolf and Aadil Kumar.

Exercise 1

Solution:

Wrong: $L \in NP$.

Why? There are $2^c + 2^{c-1} + 2^{c-2} \dots + 2^1$ different possible solutions of length l , which is not polynomial.

Exercise 2

Solution:

Wrong! TM copy copies its input tape to the output tape.

Clearly, this is $TIME(n)$ where $n = \text{input size}$, but needs to internal memory is $SPACE(0) \subset SPACE(1)$.

$\implies SPACE(1) \neq TIME(1)$

Exercise 3

Solution:

We create G such that each $v \in V$ is a set in C , and each pair of disjoint sets is connected by an edge. Then, we only need to do $CLIQUE$ to find if there are disjoint=connected sets.

If we sort the sets, the comparison to know whether we need an edge can be done in linear time.

For n sets, we need $\frac{n(n-1)}{2}$ comparisons.

\implies The reduction can be performed in linear time.