

CS 1511 Homework 12

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21. part b

EXACT INDSET = $\{ \langle G, k \rangle \mid \text{the largest independent set in } G \text{ has size exactly } k \}$.

To show EXACT INDSET $\in \pi_2^p$, we need to demonstrate two things.

$\forall x \forall y \forall z \ T(x, y, z)$ runs in time $|x|^k$

$\forall x \exists y \ T(x, y, z)$ accepts iff $x \in \text{EXACT INDSET}$

Our language will now become $\forall x$, with x being an independent set of G , $\exists w$ where w is the largest independent set of size exactly k .

To solve this in poly-time, we will need 3 read-only tapes and 1 work tape, which is based on a simple scaling from our 2 read-only 1 work tape model with π_1^p .

Basically, it reads on the second tape the set of vertices. It goes through the tape and checks each vertex in the set and marks it on the graph (on the first tape). When it does this, it makes sure adjacent vertices are not touching to ensure it is an independent set.

Then, it checks the third tape, which is another set. It just needs to validate that this set is also a independent set and that it is larger or equal to in size to the set on the 2nd tape.

21. part c