CS 341, Day Class, Fall 2013 Quiz #2 Prof. M. K. Nakayama

Print Family (i.e., Last) Name: _____

Print Given (i.e., First) Name: _____

Student ID Number: _____

For each question, write the answer next to the question. If you need to use scratch paper, use the back of the quiz. Any scratch work in the answer spaces will be marked wrong and points will be deducted.

During this quiz it is prohibited to:

1. exchange information with any other person in any way, including by talking or exchanging papers or books;
2. use any electronic devices, including calculators and cellphones;
3. use any books or notes;
4. leave the classroom before you complete and turn in your quiz.

I have read and understand all of the instructions above. On my honor, I pledge that I will not violate the provisions of the NJIT Academic Honor Code.

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Signature and Date

1. Recall that

$$\begin{aligned} \mathit{ILP} &= \{\, \langle A, b\rangle \mid \text{matrix } A \text{ and vector } b \text{ satisfy } Ay \leq b \text{ for some integer vector } y \,\}, \\ \mathit{3SAT} &= \{\, \langle \phi \rangle \mid \phi \text{ is a satisfiable 3cnf-function} \,\}. \end{aligned}$$

In this problem, you are to show that ILP is NP-Complete by showing $\mathit{ILP} \in \text{NP}$ and $\mathit{3SAT} \leq_{\text{P}} \mathit{ILP}$. For this question, you must explicitly give the proofs; i.e., do not just cite a theorem without proof.

(a) Show that $\mathit{ILP} \in \text{NP}$.

(b) Give a polynomial-time reduction of *3SAT* to *ILP*. Just give a reduction in this part; you will explain why the reduction takes polynomial time in the next part.

(c) Explain why your reduction from the previous part takes polynomial time.