6.045J/18.400J: Automata, Computability and Complexity Prof. Ron Rivest

Handout 3: Quiz 3 Information

30 April 2003 *Matthew Lepinski*

1 General Information on Quiz 3

Quiz 3 will take place during class on Wednesday, April 30. The Quiz will cover chapter 7 of Sipser's Text, as well as the time hierarchy theorem from Section 9.1. You are encouraged to bring a two-sided sheet of handwritten notes with you to class on Wednesday to use during the quiz. You can also bring your copy of Sipser's Text with you to class on Wednesday to use during the quiz.

2 Material You Should Know for the Quiz

The following is a list of important topics and ideas we covered during the Computability portion of this class.

- **Time Complexity and Asymptotic Notation**. You should understand the notation of a complexity class and how we measure the running time of an algorithm. Additionally, you should be comfortable with notation such as: $TIME(t(n))$, $O(t(n))$ and $\Omega(t(n))$.
- **The Time Hierarchy Theorem**. You should be familiar with the statement of the time hierarchy theorem given in class. Additionally, you understand the basic idea of the proof
- **The Class P**. You should know the definition of the complexity class P. You should understand why complexity theorists use P as their model for efficient computation. Additionally, you should be able to use the definition of P, to prove theorems about the complexity class.
- **The Class NP**. You should know both of the definitions of NP that were given in class. You should be able to use these definitions to prove theorems about NP. Additionally, you should be familiar with the class co-NP and you should understand the relationship between the classes P, NP and co-NP. You should also understand the relationship between optimization problems and decision problems.
- **Poly-Time Reducibility**. You should be comfortable with the definition of polynomial-time reducibility. You should be able to use this definition to prove that one language is polynomial time reducible to another language.
- **NP-Completeness**. You should know the definition of NP-Completeness and you should understand how we go about proving languages are NP-Complete. You should be familiar with the main ideas of the proof of the Cook-Levin theorem. Additionally, you should be familiar with the NP-Complete problems which we have discussed in class (SAT, 3SAT, CLIQUE, VERTEX-COVER, HAMPATH, HAMCYCLE, SUBSETSUM, PARTITION).