

# Guide to Exam 1

## Time and Place

Exam 1 will be held in class on Friday, February 10, 2006. The exam is open book: You may use your notes, homeworks, any handouts and solutions we have given you, the textbook (Sipser), and any other paper-based references.

## General Things to Know

- Strings
- Languages: union, intersection, complement, concatenation, star
- Finite automata: DFAs, NFAs (especially state transition diagrams)
- Nondeterminism
- Regular languages
- Closure properties of regular languages: closed under union, intersection, complement, concatenation, star, reverse
- Regular expressions
- Equivalence of DFAs, NFAs, regular expressions, regular languages
- Pumping Lemma

## Specific Things You Should Know How to Do

- Given a simple DFA or NFA, be able to identify what language it recognizes
- Given a simple regular expression, be able to identify what language it describes
- Given a description of a simple regular language, be able to construct:
  - a DFA or NFA that recognizes it
  - a regular expression that describes it
- Given DFAs, be able to construct a DFA for their union, intersection, and complement
- Given NFAs, be able to construct an NFA for their union, concatenation, and star
- Given an NFA, be able to construct an equivalent DFA
- Given a DFA, be able to convert it to a regular expression
- Be able to apply the Pumping Lemma for regular languages to prove a language is non-regular
- Be able to apply the closure properties of regular languages to prove a language is or is not regular

In addition you should understand the basic idea behind the proof of the Pumping Lemma for regular languages: when a DFA processes a sufficiently long string, the computation path it follows must have a loop.