

**Information about for the Midterm**  
**THIS DOCUMENT IS TWO PAGES LONG**

1. DFA's, NFA's, regular expressions and all the equivalences.
2. Examples of regular languages.
3. Closure properties of Regular Languages.
4. Decidability of WS1S, Presburger
5. Undecidability of Hilberts 10th problem (not the proof which I did not give you). Decidability of the case of one variable.
6. Proving languages are not regular.
7. Proving that a language needs a large number of states for a DFA
8. Proving that a language needs a small number of states for an NFA (the  $\{a^i \mid i \neq 1000\}$  stuff).

**Thing to know about the exam**

1. Exam is Tuesday March 12 12:30-1:45
2. You can bring in an 8.5 by 11 sheet of paper and write on both sides. I have been asked the following questions in the past:
  - (a) Can I bring a magnifying glass and write really small? Yes but if you try to memorize our way through the exam you will surely do badly.
  - (b) Can I use my friends cheat sheet? Yes but if you have a separate copy. Note that this is a terrible idea since making up the cheat sheet is valuable in itself as a study aid.
  - (c) What should be on the cheat sheet? (This is actually a fine question.) Anything that you have a hard time remembering. Two things I will tell you that I thought of BEFORE writing the exam (so they may or may not come up).
    - (1) Full statement of the extended pumping lemma- all those quantifiers give me a headache.

(2) Full statement of that theorem you need from number theory for the small NFA problems:

If  $x, y$  are relatively prime then (1) every number  $\geq xy - y - y$  CAN be written as a sum of  $x$ 's and  $y$ 's, and (2)  $xy - x - y$  CANNOT be written as a sum of  $x$ 's and  $y$ 's.

3. If you get extra time or other considerations remind me ASAP.
4. ADVICE: Try to understand things, not memorize things.
5. ADVICE: Doing older problems (the sample midterm, problems on the web or from a book, problems on my old HWs) is fine BUT you should seek to understand them.
6. ADVICE: If you are looking at an old exam of mine and something looks unfamiliar do not panic (student have panicked). It is likely I didn't cover it this term. The course changes over time.