Exam III Review: Material

- NP-Completeness
  - From Cormen, chapter 34.1–34.3
  - Understand the formalism:
    - Formal language notion
    - Complexity class definitions
    - Reducability / reduction functions
  - Understand basic set theory concepts:
    - Operators such as complement, Kleene star, concatenation, union, intersection, etc.
    - The mathematical concept of closure, i.e., what it means for a set to be closed under some operator, etc.:

      Let A be a set and f be an operation on set elements. If $b = f(a \in A) \Rightarrow b \in A$, then we say that A is "closed" under f. For example: the set of real numbers is closed under arithmetic operators, but is not closed under square root (the square root of -1 is imaginary).

- Advanced problem solving methods
  - Dynamic Programming, Backtracking, Branch & Bound, Greedy algorithms
  - Dynamic Programming and Greed Algorithms from Cormen, the rest is from class notes
  - Guest lecture slides available on-line from "Course Schedule" page
  - Understand how the algorithms work, be able to demonstrate them on a given problem.
  - Understand the advantages and disadvantages of the methods on various problems.
  - Good exercise: Take example problems in lecture notes and explore how each method would be used to solve it. What are the advantages and disadvantages to various approaches, etc.

- Randomized Algorithms
  - Part from Cormen, Chapter 5.1-5.3
  - Additional material from class notes (slides available on-line)
  - Cormen, section 5.4 contains some information relating indirectly to the coupon collectors problem (section 5.4.2, "Balls and bins")
  - Understand the differences between probabilistic analysis and randomized algorithms, and how RAs can be used in design and analysis.
  - Understand how to use some of the analytical tools we discussed, such as indicator variables
  - Understand the basic difference between Las Vegas and Monte Carlo RAs
  - Understand the abstract problems we discussed: Occupancy and Coupon collectors problems
  - Wont be expected to know specific distribution facts, but you may be required to do some basic probability *given* those facts

Exam III Review: Structure & Miscellany

- 3 part exam (NPC, Adv. methods, & RAs)
- Each part will have 3 or 4 questions
- Questions will range from easy to hard

  > Some of the homework problems were very difficult, while some were relatively easy. You can expect the hardest of the problems on the exam to be somewhere in the middle.

- The exam is Wednesday, 12/11/2002 at 7:30pm in Robinson A, room 248
- You will have two hours and 45 minutes to complete the exam
- You may bring a crib sheet, where the usual rules apply:
  - On an $8\frac{1}{2} \times 11$ sheet of paper
  - Single side
  - Write it by hand (use no computers or photocopiers, etc.)
  - Put your name on it
  - Hand it in with the test
- You will *not* be permitted to use a calculator