Review for Midterm

The exam will be closed notes, closed book, and no calculators. Exam may include true/false, multiple choice, short answer, and short proofs. When doing proofs, you must explain all of your steps.

Suggestion: carefully review all lab problems and class notes. Reread relevant sections in text.

1. Proof by induction - review homework problems.
2. Asymptotic Notation
   - Experimental calculation of complexity. How do you measure the complexity?
   - Know the definitions of $\Omega, \Theta, \omega, O$ and o.
   - Know how to use the definitions in a proof.
   - Know how to use limits to determine complexity of a function.
   - Know how basic functions such as $f(n) = n, n^k, e^n, \lg n, n!$, etc compare. Be able to use L'Hopital's Rule.
   - Know how to do basic manipulation of exponentials and logs.
   - Know how to sum arithmetic series and geometric series.
3. Recurrences
   - Substitution method (guess and check with induction)
   - Iteration method and telescoping.
4. Binary Trees
   - What is a binary tree. How is it constructed. How do you implement the basic operations using recursion? (getHeight, printSorted, insert, remove, etc).
   - What is an AVL tree? Why use one?
5. Heapsort and Priority Queues
   - What are the trade-offs of the various ways of implementing a priority queue?
   - What is a heap, how is it stored, what is its height?
   - What is the heap property?
   - What do the methods *heapify, build-heap*, and *heapsort* do? What are their complexity?

6. Hashing

    - What is hashing?
    - What are examples of hash functions?
    - What is a collision detection strategy? What are some examples? (e.g. chaining, linear probing, rehashing, open addressing, random hashing)