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)