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.

Exam will cover chapters: 1-4. Suggestion: carefully review all lab problems and class notes. Reread relevant sections in text.

1. Proof by induction
2. Chapter 1-2: Asymptotic Notation $\Omega(g(n))$, $\omega(g(n))$, $O(g(n))$, $o(g(n))$
   - Know the definitions of $\Omega, \Theta, \omega, O$ and o.
   - Know properties, e.g. transitivity, reflexivity, symmetry
   - Know how to use the definitions in a proof.
   - Know how basic functions such as $f(n) = n, n^k, e^n, \lg n, n!$, etc compare.
   - Know properties of basic functions, e.g. identities of exponentials and logs.
3. Chapter 3: Summations
   - Know how to sum arithmetic series and geometric series
   - Know that the infinite harmonic series blows up. Know the bounds for the finite harmonic series.
   - Know methods for summing: integration, differentiation, shifting terms.
   - Know how to find bounds on sums, e.g. integrating, differentiating, ratio of consecutive terms
4. Chapter 4: Master Equations and Recurrences
   - Substitution method (guess and check with induction)
   - Change of variables
   - Subtracting a lower order term (e.g. see p. 56)
   - Iteration method and recursion trees.
   - Know how to use the Master Equation to prove bounds on recurrences. Know when the Master Equation will not work.
   - Recurrence with full history
   - How to handle floors and ceilings.