

Summary of Topics for Midterm

Asymptotics

- Relationship between polynomial, exponential, logarithmic time
- Big-Oh notation

Basic Proof Ideas

- Direct Proofs, e.g., HW2-P3, HW2-P4, HW3-P2
- Proof by Contradiction e.g., HW2-P2
- Pigeon hole principle e.g., HW3-P3
- Induction / Strong Induction e.g., HW1-P3, HW2-P1, HW2-P2, HW3-P1

Graphs

- Relationship between degree and number of edges
- Cycles, trees, properties of trees
- Graph search (BFS, DFS), properties of BFS, DFS tree
- Algorithms for finding Connected Components
- Algorithm for coloring (bipartite graphs)
- Directed graphs (topological sort), DFS on directed graphs

Greedy Algorithms

Techniques:

- Greedy stays ahead
- Exchange arguments
- Structural

Problems

- Interval Scheduling
- Interval Partitioning
- Minimum Spanning Trees and Cycle/Cut Properties
- Union Find Data Structure

Divide and Conquer Algorithms

- Recurrences (Master Theorem)
- Binary Search, Merge-sort
- Approximation the Root of a Function
- Finding Closest Points
- Integer Multiplication
- Midpoint

Proofs are usually by (strong) induction