Summary of Topics for Midterm

Asymptotics

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

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$f = O(g(n))$

$f \leq c \cdot g$ if n is big enough

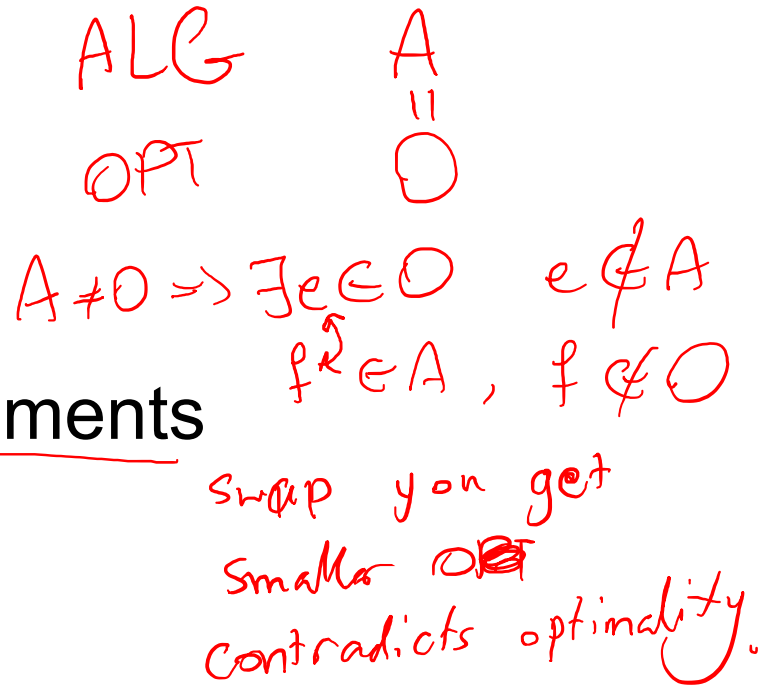
Basic Proof Ideas

- Direct Proofs
- Proof by Contradiction (stable matching)
- Pigeon hole principle
- Induction / Strong Induction

Graphs

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

Greedy Algorithms



Techniques:

Greedy stays ahead, structural, exchange arguments

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