

# Summary of Topics for Midterm

# Asymptotics

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

$$\begin{array}{ccc} O, \Omega, \Theta & & \\ f = O(g) & \approx & f \leq cg \\ \Omega & & \geq c \\ \Theta & & = c \end{array}$$

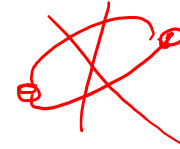
# Basic Proof Ideas

- Direct Proofs
- Proof by Contradiction
- Pigeon hole principle
- Induction / Strong Induction



Trees try induction  
Divide and Conquer try induction  
HW4-P4

# Graphs



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

# Greedy Algorithms

*Greedy stays ahead  
Structural proofs  
Exchange arg*

- Interval Scheduling
- Interval Partitioning
- Minimum Spanning Trees and Cycle/Cut Properties
- Shortest Path Algorithms (Dijkstra)
- Union Find Data Structure

# Divide and Conquer Algorithms

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