Exam 1 Review Outline

Chapter 0

- Big-O Compare $f(n)$ vs $g(n)$ for dominance
- An $f(n)$ algorithm takes $X$ seconds to run on $n$ items. How long will it take to run on $m$ items?
- An algorithm has the following run times for sizes: $(size, time) = [(n, x), (2n, y), (4n, z), ...]$. What is the approximate complexity of the algorithm? Probably one of: $[\log(n), n, n^2, n^3, 2^n]$.

Chapter 2

- Recurrence Relations: $T(n) = a \cdot T(f(n)) + g(n)$
- Solve via Master Theorem if $f(n) = n/b$ and $g(n) = n^d$
- Solve via Substitution otherwise.
- Divide-and-Conquer as an algorithm strategy.
  - Break problem into smaller pieces
  - Solve smaller problems
  - Assemble smaller solutions into larger solution
- Given a problem, create a Divide-and-Conquer algorithm to solve the problem.
- Given a Divide-and-Conquer algorithm, find its complexity.

Chapter 3

- Graphs: undirected, directed, DAG
- explore(G, u)
- dfs(G)
- pre/post numbers
- edge types: [tree, forward, back, cross]
- connected components for undirected graphs
- linearize a DAG
- Strongly Connected Components for directed graphs
- Given graph $G = (V, E)$, run algorithm X on it, show the process and results
- Given a problem with a graph $G = (V, E)$, create a graph algorithm to solve the problem.
- Given a problem, give an algorithm to convert it to a graph, such that a graph algorithm can solve it.
- Given a graph algorithm, find the complexity of the algorithm.