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: \((size, time) = [(n, x), (2n, y), (4n, z), \ldots]\). 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.