Com S 311, Final Exam

Name	Recitation Time

- **When asked to give an algorithm, write pseudo code. Please do not write Java/C program.** Your pseudo code need not handle "array/index out of bounds cases".
- **For any (sub) problem, if you write *"Do not grade"* (and nothing else), you will receive 20% credit, unless stated otherwise.**
- You may use the following algorithms and their time bounds that were discussed in the lecture as a black box unless you are told otherwise: (You need not write code for these algorithms, or analyze run time): *In-order, pre-order and post-order traversals of trees. Add/Delete/Search in BST, hash tables, arrays, and linked lists. Constructing min/max heaps and all heap operations, selecting k-th smallest/largest element of an array, Merge Algorithm, Sorting algorithms, BFS, DFS, Topological Sorting, reversing a graph, SCC*
- You are not allowed to use Master Theorem to derive recurrence relations.
- If your solutions require the use of any other algorithms discussed in lecture, or variants of above algorithms/data structures, then you must write pseudo code and derive run time.
- **For all algorithm design problems, part of the grade depends on the efficiency.**
- For every graph $G = (V, E)$, the vertex set is $V = \{1, 2, \cdots, n\}$. Graphs are represented in adjacency list format. For graphs n denote number edges and m denote number of vertices. Run-time for graph algorithms are expressed as function of n and m.
- When asked to **derive** run-time, you must formally derive the run-time. When asked to **state** the run-time, you may simply write the run-time and not derive.
- Useful equalities
  - $\sum_{i=1}^{n} i = n(n+1)/2$
  - $\sum_{i=1}^{n} i^2 = n(n+1)(2n+1)/6$
  - $1 + 1/a + 1/a^2 + 1/a^3 + \cdots = \frac{1}{1-1/a}$ (when $a > 1$).