## Midterm 1 Study Guide

This midterm covers chapters 1 through 4. Here is a list of the main ideas:

- 1. What constitutes an algorithm?
- 2. What questions might the *analysis* of an algorithm entail?
- 3. Be able to explain what stable and in-place sorting is, and which of the sorting algorithms we have seen have those properties.
- 4. Describe the two different ways of representing graphs.
- 5. Be able to compare the following functions in terms of their order of growth:  $\log_2 n$ ,  $\log_{10} n$ , n,  $n^2$ , 2n,  $n \log n$ , 1000n,  $2^n$ ,  $10^n$ , n!
- 6. Explain the main ideas behind O,  $\Theta$  and  $\Omega$ .
- 7. Be able to determine the time efficiency for non-recursive algorithms by setting up a sum formula and then computing it.
- 8. Be able to determine the time efficiency for recursive algorithms by setting up a recursive relation and then solving it.
- 9. For each of the following algorithms be able to write pseudocode, identify the basic operation and input size, determine best-case and worst-case complexity, and completely carry out a small-size example:
  - Counting sort
  - Selection sort
  - Bubble sort
  - Insertion sort
  - Brute-force traveling salesman
  - Depth-first search
  - Breadth-first search
  - Topological sort
  - Binary search