CS 5804 Homework 0

Homework must be submitted electronically following the instructions on the course homepage.

Written Problems

1. Order the following functions of $n$ by their asymptotic growth rates:
   (a) $2^n$, (b) $\log_2 n$, (c) $\binom{n}{2}$, (d) $n$, (e) $5n$, (f) 5.0, (g) $n^2$

2. List the basic operations and behaviors for the following data structures:
   (a) lists, (b) queues, (c) stacks, (d) priority queues.

3. Consider the following tree:

   a
   / | \
   b  c  d
   / \  |
   e  f  g

   (a) Starting from node a as a root, what is the level-order traversal of this tree?
   (b) Treating the tree as a graph, what is a breadth-first search order starting from node d?

4. Describe or name (if it has a famous name) an algorithm to solve the following problems in polynomial time, or indicate that it is NP-Hard. If it has a polynomial time algorithm, what is its asymptotic running time?

   (a) Finding the shortest path between any two nodes in a graph
   (b) Finding the shortest path between all pairs of nodes in a graph
   (c) Finding the shortest path through a graph that visits all nodes