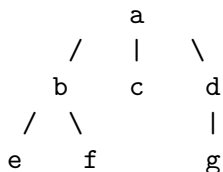# CS 5804 Homework 0

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) $\binom{n}{5}$,   (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 it 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