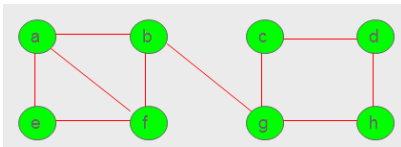
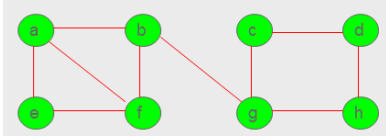


1. A Decrease-by-one algorithm: Interpolation sort.
  - a. What is the basic idea when choosing where in the array to probe?
  - b. What assumption is made concerning the data?
  - c. Worst case running time? How can this happen?
  - d. Average running time?
2. Some “decrease by one” algorithms:
  - a. Insertion sort, Selection Sort
  - b. Depth-first search of a graph, breadth-first search of a graph
  - c. Subset generation, permutation generation
3. Breadth-first search and depth-first search are graph traversal algorithms.
  - a. Depth-first search (DFS) uses a stack to keep track of unvisited nodes; breadth-first (BFS) uses a queue.
  - b. Analogous to pre-order and level-order traversals of a tree.
  - c. DFS goes deep, quickly. BFS searches nearby nodes first.
  - d. In a connected, undirected graph, both generate a tree and “back edges”.
4. For the following undirected graph, do a DFS search (starting at a, and always preferring nodes whose names come earlier alphabetically). Show the stack, and the order of pushes and pops.



5. For the same undirected graph, do a BFS search (starting at a, and always preferring nodes whose names come earlier alphabetically). Show the queue, and the order of enqueues and dequeues.



6. In an *undirected graph*, each edge goes in only one direction. A *dag* is a directed acyclic graph, i.e. a directed graph with no (directed) cycles.
7. **Topological sort:** In a dag, the vertices can be linearly ordered so that every edge's starting vertex is listed before its ending vertex.
8. Two Topological sort algorithms (for a **dag**):
- Based on DFS.
    - Do a DFS, keeping track of the order in which the nodes are popped off the stack.
    - Reverse the order.
  - Source removal algorithm.
    - Repeatedly identify and remove a source node. If there are no cycles, there will always be a source.
9. Application of topological sort: Spreadsheet formula evaluation.
10. (Probably next time) Generate all permutations of the numbers 1, 2, ..., n. Bottom up. Minimal change algorithm.