1. given an empty heap perform the following operations.
   Give the state of the heap (draw the tree) at each step.
   push 1
   push 5
   push 3
   push 4
   push 2
   pop
   pop
   pop
   pop
   pop

   What order do the nodes come out in?
   If I were to do this with n elements, what's the total running time?

2. (a) Give an algorithm to find the sum of all of the elements in a linked list.

(b) Give an algorithm to count the number of nodes in a binary tree.

(c) Give an algorithm to find the smallest number in a linked list.

(d) Give an algorithm to find the smallest number in a binary tree.

3. Use structural induction to prove that:

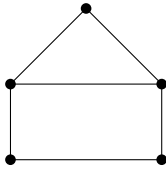   (a) for linked lists: $count(a + b) = count(a) + count(b)$

   (b) for trees: $height(mirror(t)) = height(t)$

4. Given a graph G, we can define a relation $\rightsquigarrow$ where $u \rightsquigarrow v$ if there's a path from u to v in G.
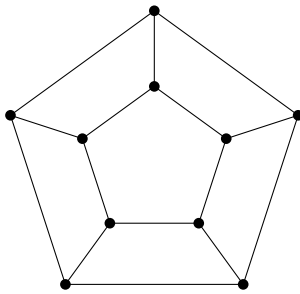
   Show that $\rightsquigarrow$ is an equivalence relation.

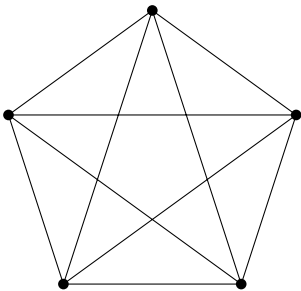5. Give An adjacency list, adjacency matrix, and edge list for the following graphs.

(a)

(b)

(c)

(d)