Directions: You have 30 minutes to complete this quiz. A score of 70% or above will receive full credit.

1. In each of the following cases, state whether $f = O(g)$, $f = \Theta(g)$, or $f = \Omega(g)$.

   (a) $f(n) = \log n \qquad g(n) = \log(n^2)$

   (b) $f(n) = 10\sqrt{n} \qquad g(n) = (\log n)^8$

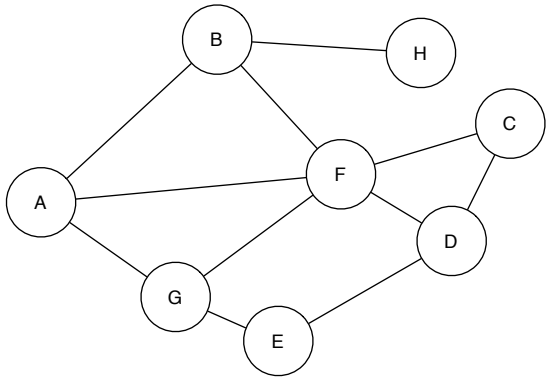
   (c) $f(n) = n! = (n)(n-1)(n-2)\ldots(3)(2)(1) \qquad g(n) = 2^n$

2. Solve the following recurrence relations.

   (a) $T(n) = 8T(n/2) + O(n^2)$ and $T(1) = O(1)$

   (b) $T(n) = T(n-1) + n$ and $T(1) = O(1)$

3. Consider the following graph.



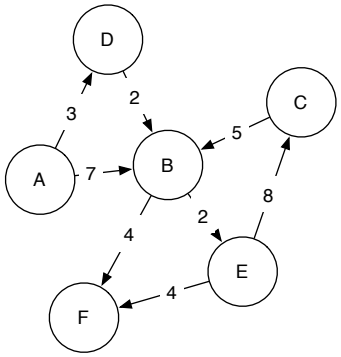
(a) Perform depth-first search from vertex A. When there is a choice of vertices pick the one that is alphabetically first (A, B, C, D, E, F, G, H).

i. List the vertices in the order they are first visited (ie. by pre-order).

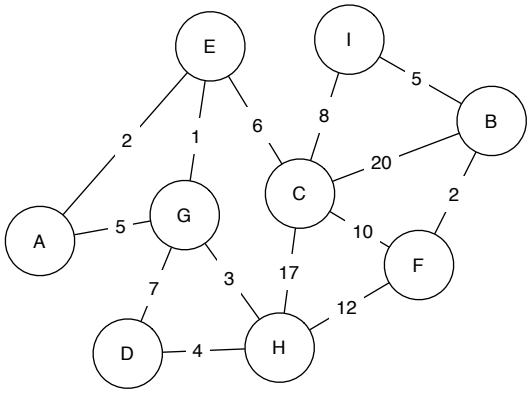
ii. List the vertices in the order they are last visited (ie. by post-order).

(b) Perform breadth-first search starting with vertex A. List the vertices in the order they are visited.

4. Find the shortest path tree of the following graph rooted at the vertex A.



5. Find a minimum spanning tree of the following graph. What is the cost of this tree?



6. Suppose you were going to prove the statement: "In a complete binary tree, the number of leaves is exactly one more than the number of internal nodes." by induction. What would your inductive hypothesis and base case be?