

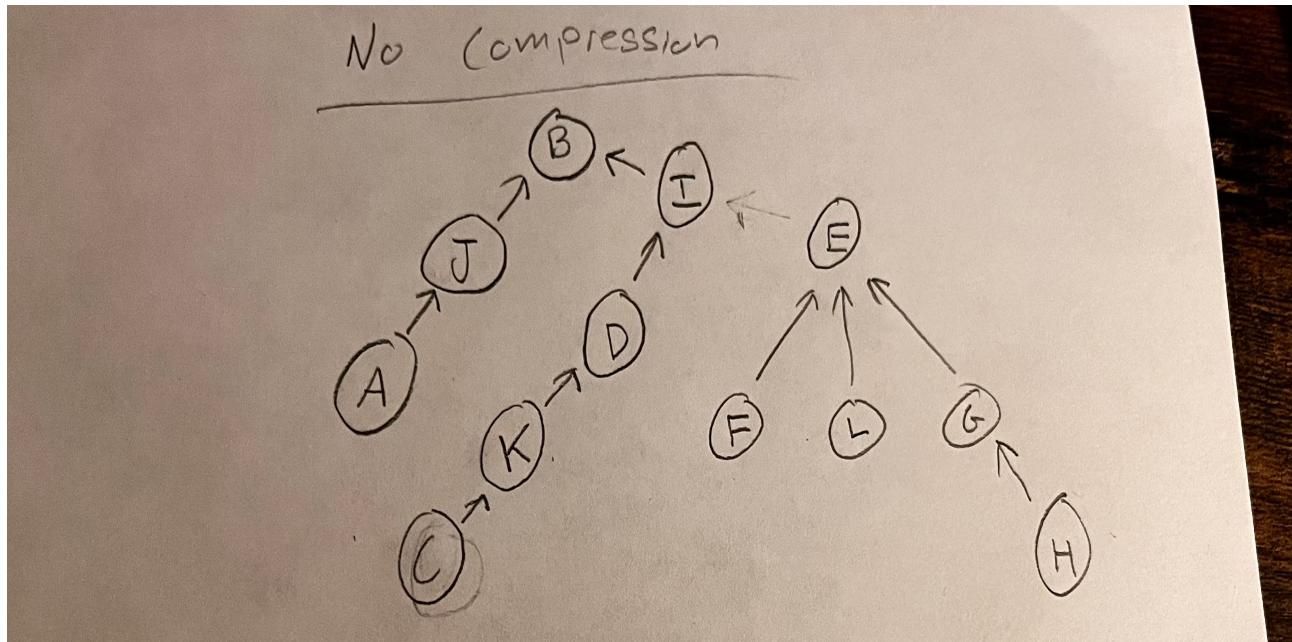
Homework 3

Question 1. Without path compression, what is the runtime of the union and find operation? (10 points)

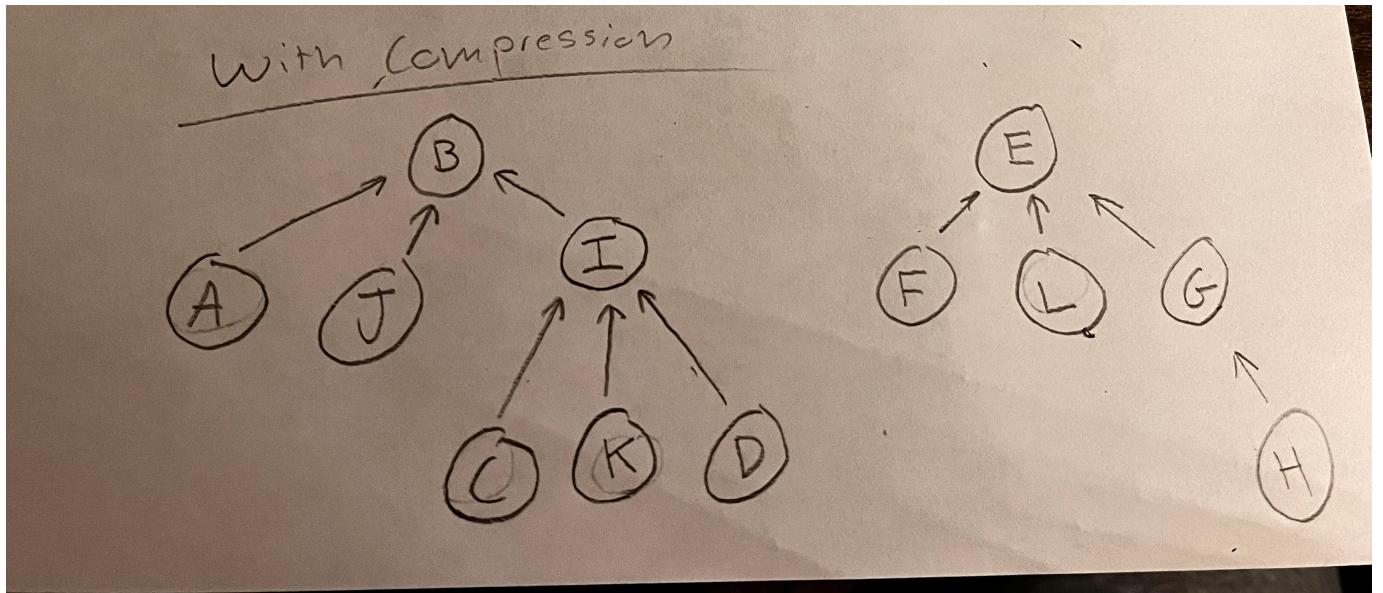
$O(\log n)$

Question 2. Draw out the tree structure and array values (for that type of implementation) of disjoint-set/union-find without path compression after the following operations. (10 points)
makeset(A..L) (shorthand for running on each node A to L)

Union(C,K)
Union(F,E)
Union(A,J)
Union(A,B)
Union(C,D)
Union(D,I)
Union(L,F)
Union(C,A)
Union(A,B)
Union(H,G)
Union(H,F)



Question 3. Do the same with path compression. (10 points)



Question 4. What abstract data structure does Prim's algorithm use and name at least two implementations of that abstract data structure. (10 points)

Prim's algorithm is backed by a priority queue. A priority queue can have many implementations but a binary heap and fibonacci heap are two common implementations.

Question 5. Implement the DisjointSet class in homework2.py with path compression. (30 points)

Question 6. Implement Kruskal's algorithm using your union-find/disjoint set functions and draw the minimum spanning tree using networkx. (30 points)