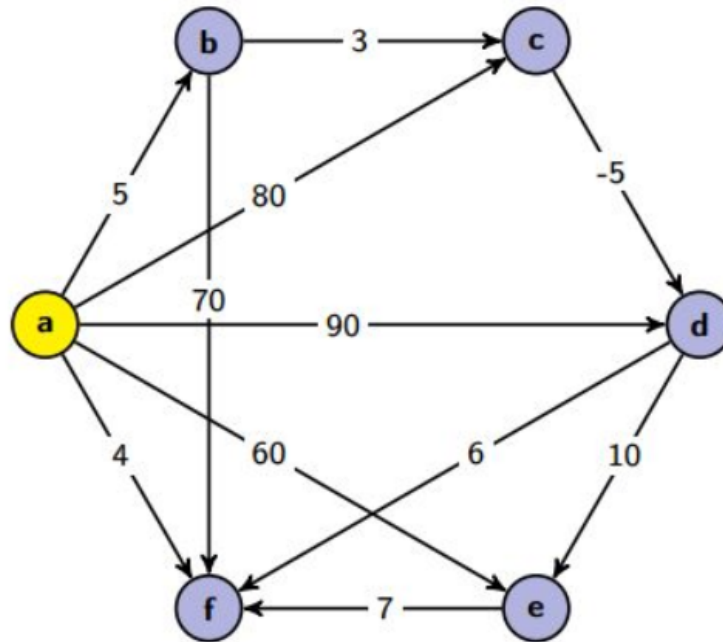


CSE 373 Section 7 Handout

Graphs

1. Consider the following graph:



- Use Dijkstra's algorithm to find the costs of the shortest paths from vertex **a** to each of the other vertices. Show your work at every step
- Are any of the costs you computed using Dijkstra's algorithm in part (a) incorrect? Why or why not?
- Explain how you can use Dijkstra's algorithm to recover the actual paths from **A** to each of the vertices (rather than just the costs)

2. Suppose you have social network data for some people (including yourself and a famous person). Write pseudocode to find the answers to the following questions:
 - a. How would you represent this social network with a graph?
 - b. Given two people, how would you determine if they were friends
 - c. Find the person with the most friends in the data
 - d. Find the length of the shortest path from yourself to the famous person
 - e. Find the number of people who do not know anyone you know (or anyone they know, etc).

3. Suppose you are given a graph G . Explain how you would figure out if it has a cycle.
 - a. If the graph is undirected?

 - b. If the graph is directed?

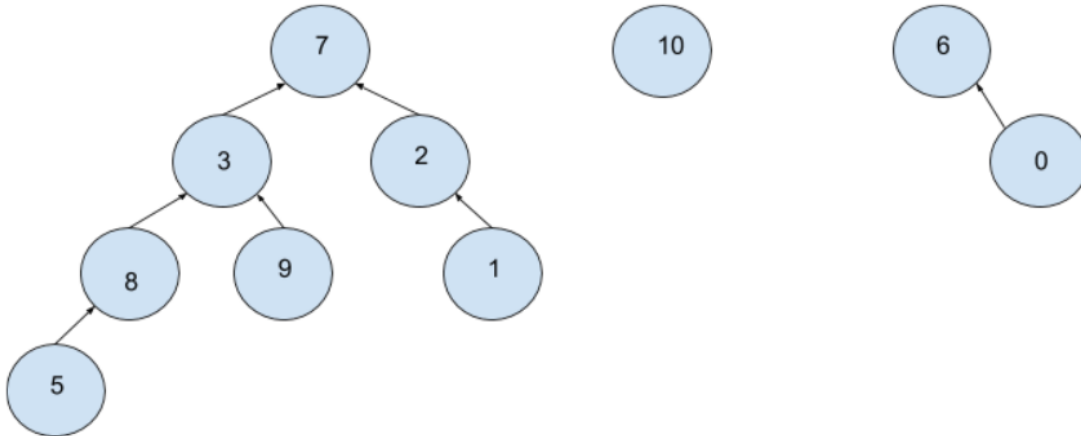
Disjoint Sets

Reminder: A disjoint sets data structure keeps track of multiple sets that do not share any elements.

UnionFind ADT:

- **find(x)** -> Returns a number representing the set that x is in
 - **union(x, y)** -> Updates the sets so whatever sets x and y were in are now considered the same sets
4. How can the Union-Find ADT be used to check whether an undirected graph contains cycle or not? Assume that the graph does not contain any self-loops

5. Given the following trees from our implementation of disjoint sets seen in lecture, answer the following questions (assuming both weighted-unions and path compression):



- a. Draw the resulting trees after calling `find(5)` on the above disjoint sets. Also indicate what value will be returned by this call

- b. Draw the final result of calling `union(2,6)` on the result of part (a)