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Assignment 3
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1. Complete Minimum Spanning Tree.

2. Determining whether or not an arbitrary graph contains a *Hamiltonian Cycle* is *NP-Complete*. Give a polynomial-time algorithm for verifying that a given path is a *Hamiltonian Cycle*. State the complexity of your algorithm with respect to the size of the graph (either in terms of Vertices and / or Edges).

The pseudocode may look something like this (note that there are checks that have been omitted, such as checking for the existence of an edge or vertex):

```
if the first vertex in the path == the last vertex in the path and path.length == num vertices - 1:
        create a visited vertex list.
        slide along the list of vertices in increments of two:
                if the first vertex in the pair already exists in the visited list:
                        there is no valid circuit.
                otherwise, add the vertex to the visited list and move on to the next pair.
        if at the end every vertex has been hit exactly once, the path is a Hamiltonian Cycle.
otherwise, it is not a valid circuit.
```

It's complexity is O(|E|).

3. Weiss Exercise 9.53. Describe a high-level approach to solving this problem (no implementation). If your solution involves applying an algorithm, describe how the data you're given can be made suitable for the algorithm and how the algorithm is used as part of your approach to computing the answer.

a. To find an actor's Bacon number, you have you check and see if Kevin Bacon was in any of the movies they were in. If not, you look at all the *other* actors that were in the same movie said actor was in, look at all of *those* actor's movies, and see if Kevin Bacon was in any of *those*. You must continue along this path until you find are shared movie between an actor and Kevin Bacon.
b. This would take a long time. You start with Kevin Bacon, look at all the actors he has done movies with, look at the actors *those* actors have done movies with, and so on until there are literally no more actors left to look at. The amount of circles you had to expand is the highest Bacon number.
c. You can do this just like you would a shortest path between, except "adjacent nodes" are actors that have worked together in a movie. You'd populate a graph with with the two actor's "adjacent nodes" and see if there is a shortest path. If not, then you continue to populate the graph with the adjacent nodes' adjacent nodes, and determine whether or not there is a shortest path each time.