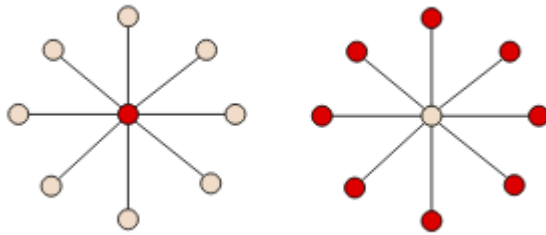


CSE 3500 – Algorithms and Complexity
Homework 9

Question 1(60 points)

An Independent Set problem:

Given a graph $G = (V, E)$, we want to find subset of vertices in a graph, no two of which are adjacent. That is a set S of vertices such that for every two vertices in S , there is no edge connecting the two, and the $|S|$ is maximized.



Example:

Two independent sets for the star graph (the right being maximum).

prove **Independent Set** is NP-complete. Use VERTEX-COVER **VC** problem that proven to be NP-Complete and reduces it to the **Independent Set** problem.

To remind you of VERTEX-COVER problem: Given a graph $G = (V, E)$, we want to find subset of vertices C , such that all edges in G are covered by nodes in C , and the $|C|$ is minimized

1. (30 Points) Prove that Independent Set is NP
2. (30 points) proof that Independent Set is NP-Hard (Use **VC** problem)

Question 2(40 points)

Let's proof of NP-completeness to the Independent Set problem again, but this time, let's utilize the Clique problem for this purpose. You don't need to reiterate the NP proof for the Independent Set problem; instead, begin by establishing that Independent Set is NP-hard through the polynomial reduction of the Clique problem to Independent Set.

3. (40 points) proof that Independent Set is NP-Hard (Use **Clique** problem)