

Algorithm HW15

1. Exercises 34.4-7

Let 2-CNF-SAT be the set of satisfiable Boolean formula in CNF with exactly 2 literals per clause. Show that 2-CNF-SAT \in P. Make your algorithm as efficient as possible. (*Hint*: Observe that $x \vee y$ is equivalent to $\neg x \rightarrow y$. Reduce 2-CNF-SAT to an efficiently solvable problem on a directed graph.)

**** (Note: To show a problem is NP-complete, you have to show the problem is NP first.)**

2. Exercises 34.5-1

The *subgraph-isomorphism problem* takes two undirected graphs G_1 and G_2 , and it asks whether G_1 is isomorphic to a subgraph of G_2 . Show that the subgraph - isomorphism problem is NP-complete.

3. Exercises 34.5-2

Given an integer $m \times n$ matrix A , and an integer m -vector b , the *0-1 integer-programming problem* asks whether there exists an integer n -vector x with elements in the set $\{0, 1\}$ such that $Ax \leq b$. Prove that 0-1 integer programming problem is NP-complete. (*Hint*: Reduce from 3-CNF-SAT.)

4. Exercises 34.5-7

Base on hw14-7, we know that *longest-simple-cycle problem* is an NP-problem. Prove that the problem is an NP-complete.