Homework 10

Yaqiao Liu
NUID 001279512

Q1

e)
The temporal cost of function Graph::isClique(), Graph::CliqueExists(), and Graph::getMaxClique() are $O(n^2)$, $O(n^2 * 2^n)$ and $O(n^2*2^n)$, separately.

Because the isClique() function just consists of two loops. The operator in the inner loop is constant. So the cost complexity is $O(n^2)$.

As for CliqueExist() and getMaxClique(), although I used the DFS to find all the subset of the input vector. The cost of this step is $O(n^2)$. The second step is to find the proper K or the MaxClique. The variable i in the outer loop varies from 0 to 2^n - 1, in the inner loop, the isClique() is an n^2 operator. So the total temporal cost is $O(n^2* 2^n)$

Q2

a) NPC class of problem is a set of problems which meets two requirements: firstly, those problems are NP problems; secondly, all the NP problems in this class can be reduced to this NPC problem.
b) The proof process can be divided into two step: firstly, we should prove the unknown problem is a NP problem; Then, prove a existed NPC problem can transform into this unknown problem here.
c) Because if we find a polynomial solution for one NPC question, all the NP question will be solved. In this way, we can prove P = NP. In other word, we can earn 1 million dollar.
d) The graph coloring problem is a classical NPC problem. It is an assignment of labels traditionally called "colors" to elements of a graph subject to certain constraints, which is no two adjacent vertices share the same color. The chromatic number $\chi(G)$ of a graph G is the minimal number of colors for which such an assignment is possible. It is a NPC problem.