

2003 Paper 13 Question 12

Complexity Theory

- (a) For each k , the k -clique problem is defined as the following decision problem:

Given a graph G , does it contain a clique with at least k vertices?

Show that k -clique is in P for each k . [6 marks]

- (b) The problem Clique is defined as the following decision problem:

Given a graph G and an integer k , does G contain a clique with at least k vertices?

Show that Clique is NP-complete, using the assumption that 3-SAT is NP-complete. [10 marks]

- (c) Explain why, if $P=NP$ then there is a polynomial time algorithm for factorising numbers. [4 marks]