

CSCI 503B:
HOMEWORK 4

Each problem is worth 25 points.

1. Is the following problem NP-complete? Prove your answer either by a reduction or by showing a polynomial time algorithm. The problem: Given a graph G , does it have a simple cycle of length 5?
2. Is the following problem NP-complete? Prove your answer either by a reduction or by showing a polynomial time algorithm. The problem: Given a graph G , does it have a simple cycle of length $n/2$? You can assume that n is the number of vertices.
3. Given a black box for solving Hamiltonian cycle in $T(m)$ time when a graph has m edges (ie, it responds YES or NO, answering whether there is a Hamiltonian cycle nor not), devise an algorithm that uses the black box to actually find the cycle. What is the running time in terms of $T(m)$?
4. Is the following problem NP-complete? Prove your answer either by a reduction or by showing a polynomial time algorithm. The problem: 2 CNF SAT. This is a slightly different version of 3-SAT where each clause is a disjunction of not 3, but 2 literals.