

CS 482 Summer 2003
NP Complete Problems You Are Responsible For

Tom Wexler

Alexa Sharp

Suggested Review Questions

The following are the NP-Complete problems you are responsible for knowing for the final. They are problems we have either covered in class or assigned on homeworks. You don't necessarily have to know the reductions used to show these are hard, but you should understand the definition of each problem, especially what the inputs and outputs are.

3-SAT Given a set of clauses C_1, \dots, C_k , each of length 3, over a set of variables $\{x_1, \dots, x_n\}$, does there exist a satisfying truth assignment?

3-COLOURING Given a graph G , does a 3-colouring exist?

4-COLOURING Given a graph G , does a 4-colouring exist?

VERTEX COVER Given a graph G and a number k , does G contain a vertex cover of size at most k ?

INDEPENDENT SET Given a graph G and a number k , does G contain an independent set of size at least k ?

DOMINATING SET Given a graph G and a number k , does G contain a dominating set of size at most k ?

HAMILTONIAN PATH Given a directed (or undirected) graph G , does it contain a Hamiltonian path?

HAMILTONIAN CYCLE Given a directed (or undirected) graph G , does it contain a Hamiltonian cycle?

LONGEST PATH Given a directed (or undirected) graph G and a number k , does there exist a simple path of length at least k ?

TRAVELING SALESMAN Given a set of distances on n cities, and a bound D , is there a tour of length at most D ?

SET COVER Given a set U of n elements, a collection S_1, \dots, S_m of subsets of U , and a number k , does there exist a collection of $\leq k$ of these sets whose union is equal to all of U ?

STEINER TREE Given a graph $G = (V, E)$, a subset $T \subseteq V$ of terminals, and a value C , does there exist a Steiner tree of cost at most C ?

KNAPSACK/SUBSET SUM Given natural numbers w_1, \dots, w_n and a target number W , is there a subset of $\{w_1, \dots, w_n\}$ that adds up to precisely W ?

3D-MATCHING Given disjoint sets X, Y , and Z , each of size n ; and given a set $T \subseteq X \times Y \times Z$ of ordered triples, does there exist a set of n triples in T so that each element of $X \cup Y \cup Z$ is contained in exactly one of these triples?