

Algorithm Design
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John Wiley & Sons
Solution of Exercise C-13.7

Suppose the number of vertices in H is r . To show this problem is in NP , we guess a subset of r vertices of G and we also guess a mapping (that is, a matching) of the vertices in H to the chosen vertices in G . Then, in polynomial time we can check that every edge of H has a corresponding edge in G .

To see that SUBGRAPH-ISOMORPHISM is NP -hard, we will reduce the Hamiltonian cycle problem to this one. In particular, given an instance $G = (V, E)$ of the Hamiltonian cycle problem, we define a subgraph H to be a simple cycle of $|V|$ vertices. This graph H is a subgraph of G if and only if G is Hamiltonian. This reduction clearly takes polynomial time.