Algorithm Design
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Solution of Exercise C-13.8

To see that INDEPENDENT-SET is in NP, note that we can guess a subset of k vertices in G and confirm that no pair of vertices in this set are adjacent.

To show INDEPENDENT-SET is NP-hard, we will reduce VERTEX-COVER to this problem. Specifically, given an instance G, k to VERTEX-COVER, we note that G has a vertex cover of size k if and only if it has an independent set of size $n - k$, where n is the number of vertices in G.