**CSE208 Practice – Complexity Class**

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**Problem:** Prove that the problem of deciding whether graph G contains a simple path of length at least k from vertex a to vertex b is NP-complete.

**Answer:** As we are generalizing, we will have to consider all possible cases. One scenario of the problem is when k = n – 1. Where n is the number of vertices in the graph. Then to find this path we will have to visit all vertices of the graph that is very similar to Hamiltonian problem.

As we are given that Hamiltonian problem is an NP-complete problem and we can reduce the Hamiltonian problem to the above scenario of our problem in polynomial time, then above problem is also an NP-complete problem. Now, any NP or NP-complete problem can be reduced to the above problem in polynomial time because they can be reduced to Hamiltonian problem by definition.