1) Let Prime = { x | x is represented in unary }. Prove that Prime ∈ P.

2) Consider the problem in #1, where the input x, is represented in binary. Now, consider the standard trial division algorithm to check for primality, where we try to divide x by each integer in between 2 and x – 1, inclusive. Why would this algorithm NOT run in polynomial time in the size of the input?

3) Let CONNECTED = {G | G is a connected undirected graph}. Prove that CONNECTED ∈ P.

4) Let MODEXP = { <a,b,c,p> | a, b, c, and p are binary integers such that $a^b \equiv c \pmod{p}$ }. Prove that MODEXP ∈ P.

5) Let LCS = { <a, b, c> | a, b are strings and c (represented in binary) is a non-negative integer such that the longest common subsequence between a and b is of length c. } Prove that LCS ∈ P.