

COT 4210 Homework #9: Sections 7.1 - 7.3

Assigned: 3/23/2021

Due Date/Time: On Webcourses

- 1) Let $\text{Prime} = \{ x \mid x \text{ is represented in unary} \}$. Prove that $\text{Prime} \in P$.
- 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 $\text{CONNECTED} = \{ G \mid G \text{ is a connected undirected graph} \}$. Prove that $\text{CONNECTED} \in P$.
- 4) Let $\text{MODEXP} = \{ \langle a, b, c, p \rangle \mid a, b, c, \text{ and } p \text{ are binary integers such that } a^b \equiv c \pmod{p} \}$. Prove that $\text{MODEXP} \in P$.
- 5) Let $\text{LCS} = \{ \langle a, b, c \rangle \mid a, b \text{ are strings and } c \text{ (represented in binary) is a non-negative integer such that the longest common subsequence between } a \text{ and } b \text{ is of length } c. \}$ Prove that $\text{LCS} \in P$.