

CSci 4651 Assignment 1

Due Wednesday, February 1 in class

Problem 1 (6 points). Exercise 2.1 p.16.

Problem 2 (6 points). Exercise 2.2 p.17. The phrasing of this problem is a bit confusing. To clarify: suppose you are given a black-box function $Halt_\emptyset$ that, given any program p that does not take any input, returns “true” if the p halts and “false” otherwise. “Black-box” here means that you don’t know how it works, but you can call it with any input p , and it will return the result as specified.

Can you use this black-box function to construct another function to solve the halting program? This new function should work exactly as $Q(P, x)$ defined on p. 15: it should take a one-input program P (different from p above since p takes no input!) and its input x and returns the output that tells whether $P(x)$ terminates.

Please justify your answer precisely: if you can solve the halting problem using $Halt_\emptyset$ then explain how, otherwise explain why it is not possible. Note that if your answer is that you **can** solve the halting problem using $Halt_\emptyset$, this implies that $Halt_\emptyset$ doesn’t exist since we have already proven that the halting problem is undecidable.