Homework 8 Solution

Problem 2

Proof Given an arbitrary H input (encoding of a program P and an input X for P), construct an L input (encoding of a program P’ and an input X’ which is 0) such that P halts on input X if and only if P’ halts and return Yes (means it accepts 0).

The code for P’ is following:

1. let X’ be the input of P’;
2. call program P on input X;
3. if P halts on input X then return Yes (i.e., accepts 0).

What is the behavior of P’?

First note that the behavior is the same, no matter what the input X’ is. If P halts on X, then P’ halts and outputs YES, i.e., accepts X’ (including 0). If P does not halt on X, then P’ also goes into an infinite loop, and does not accept X’ (including 0). QED

Problem 4

Proof The property is: “Program accepts the input which is 0”.

1. The property is functional: the property above is about the language accepted by the program (property of the input), and not about the specific code of the program, thus, it is functional.

2. The property is nontrivial: it is obvious that some program may accept 0, some program may not, and it is not a common property for all programs, thus it’s non trivial.

Therefore, according to Rice’s theorem, the property is undecidable. QED