Theory of Computation

homework 3
Due: 11/3/2015

Problem 1 Denote $L(M)$ as the language L accepted by the Turing machine
(TM) M. Determine if the following languages are decidable and explain.

(a) $L_1 = \{M | M$ is a TM and there exists an input on which M halts within $|M|$ steps$\}$.

(b) $L_2 = \{M | M$ is a TM and $L(M)$ is uncountable$\}$.

Problem 2 Given

$$L_3 = \{M \, ; \, x \, ; \, y \mid M(x) = y\}.$$

where M is a Turing machine (TM), x and y are strings. Use reduction to
show that L_3 is undecidable. (You are not allowed to cite Rice's theorem.)