COMP4141 Homework 5

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Exercise 1 Let N be an enumerator, and suppose that the language L enumerated by N is an infinite subset of the set of all encodings $\langle M \rangle$ of Turing machines M. Moreover, assume that for all $\langle M \rangle \in L$, the machine M is a decider of a language with alphabet $\{0, 1\}$. Show that there exists a decidable language L' that is not decided by any machine in L.

Exercise 2 Prove that there exists an undecidable language that is a subset of $\{1\}^*$.

Exercise 3 Suppose that $A \leq_m L$ where L is a context-free language. Prove or disprove (e.g., by means of a counter-example) each of the following:

1. It follows that A is context-free.
2. It follows that A is decidable.