COMP4141 Tutorial 5
Diagonalisation, Decidability, Reductions

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March 2019

Exercise 1 An *infinite word* over Σ is an infinite sequence $\rho = a_0 a_1 a_2 \ldots$ such that $a_i \in \Sigma$ for all i. Show that the set of infinite words over $\{0, 1\}$ is uncountable.

Exercise 2 Show that the language $\{\langle M \rangle \mid M$ is a Turing machine with $L(M) \neq \emptyset \}$ is Turing-recognisable.

Exercise 3 Show that $\leq_m$ is transitive, i.e., if $A \leq_m B$ and $B \leq_m C$ then $A \leq_m C$.

Exercise 4 Show that the language $\{\langle M \rangle \mid M$ is a Turing machine such that $L(M)$ is an infinite language$\}$ is undecidable.