Xi'an Jiaotong-Liverpool University
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Int 201: Decision Computation and Language
Tutorial 10

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November 25, 2025

Question 1. Show the set $\{(i,j)|i,j \in \mathcal{N}\}$ is countable.

Question 2. Show the Kleene star of any countable set of strings of finite length is countable.

Question 3. Show for any finite set S, $|\mathcal{P}(S)| > |S|$, where $\mathcal{P}(S)$ is the power set, by using the diagonalization method.

Question 4. Show for any set S, $|\mathcal{P}(S)| > |S|$, where $\mathcal{P}(S)$ is the power set, by using the abstract diagonalization method. Hint: now we do not have a table, but for any given $f : S \to \mathcal{P}(S)$, try define an $X(f) \subset S$ such that $X(f) \notin \{f(s)|\forall s \in S\}$. [1]

Question 5. Show $E_{\text{DFA}} = \{< A > |A \text{ is a DFA and } L(A)=\emptyset\}$ is a decidable language.

Question 6. Show $EQ_{\text{DFA}} = \{< A, B > |A \text{ and } B \text{ are DFAs and } L(A)=L(B)\}$ is a decidable language.

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[1]Corollary: power set operations allow construction of set that is larger than the real numbers.