Int 201: Decision Computation and Language
Tutorial 11

Dr. Chunchuan Lyu

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Question 1. Show if $A \leq_m B$ and B is co-Turing-recognizable, then A is co-Turing-recognizable.

Question 2. Show L_{tm} is not mapping reducible to $E_{TM} = \{\langle M \rangle | M$ is TM and $L(M) = \emptyset\}$ Hint: Is E_{TM} co-Turing recognizable?

Question 3. Show $EQ_{TM} = \{\langle M_1, M_2 \rangle | M_1, M_2$ are TMs and $L(M_1) = L(M_2)\}$ is undecidable. Hint: reduction from the emptiness problem E_{TM}.

Question 4. Show the two property conditions for the Rice's theorem are equivalent.

1. for any two TMs M_1 and M_2 with $L(M_1) = L(M_2)$, $\langle M_1 \rangle \in P \iff \langle M_2 \rangle \in P$.

2. $\exists p : \{L(M) | M$ is a TM$\} \to \{0, 1\}$ such that $\langle M \rangle \in P \iff p(L(M)) = 1$

Question 5. Show $FINITE_{TM} = \{\langle M \rangle | M$ is a TM and $\exists n \in \mathcal{N}, |L(M)| = n\}$ is undecidable by using the Rice's theorem.

Question 6 (Optional).   • https://github.com/ND-CSE-30151/spring-2024/blob/main/notes/25-reducibility.ipynb

• https://github.com/ND-CSE-30151/spring-2024/blob/main/notes/26-rice.ipynb