

CS3331 – Assignment 4
due Dec. 6, 2021
2-day no-penalty extension until: Dec. 8, 11:55pm
(SRA's cannot be used to extend further)

1. (70pt) For each of the following languages, prove, without using Rice's Theorem, whether it is (i) in D , (ii) in SD but not in D , or (iii) not in SD .

- (1) $L_1 = \{ \langle M \rangle \mid L(M) \subseteq \{a, aa\} \}$
- (2) $L_2 = \{ \langle M \rangle \mid L(M) \supseteq \{a, aa\} \}$
- (3) $L_3 = \{ \langle M \rangle \mid L(M) = \{a, aa\} \}$
- (4) $L_4 = \{ \langle M \rangle \mid L(M) \in D \}$
- (5) $L_5 = \{ \langle M \rangle \mid \neg L(M) \in D \}$
- (6) $L_6 = \{ \langle M \rangle \mid L(M) \in SD \}$
- (7) $L_7 = \{ \langle M \rangle \mid \neg L(M) \in SD \}$
- (8) $L_8 = \{ \langle M \rangle \mid \text{there exists some input } w \text{ on which } M \text{ performs at least one right move} \}$.
- (9) $L_9 = \{ \langle M \rangle \mid \text{there exists some input } w \text{ which } M \text{ accepts in } |w| \text{ steps or less} \}$.
- (10) $L_{10} = \{ \langle M_1, M_2 \rangle \mid \varepsilon \in L(M_1) \cap L(M_2) \}$.

2. (30pt) For each of the languages in question 1 which is not in D , explain briefly how you would use Rice's Theorem to prove they are not in D .

READ ME! Submit your solution as a single pdf file on `owl.uwo.ca`. Solutions should be typed but high-quality hand-written solutions are acceptable. Make sure you submit everything as a single pdf file.

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