

Problem Set 4

Due by 4:30 p.m. on Monday, March 12

Problem 1 (20 points)

Define a function $\mathbf{diff} \in \{0, 1\}^* \rightarrow \mathbb{Z}$ by: for all $w \in \{0, 1\}^*$,

$\mathbf{diff} w =$ the number of 1's in w $-$ the number of 0's in w .

Let $X = \{w \in \{0, 1\}^* \mid \text{for all substrings } v \text{ of } w, -2 \leq \mathbf{diff} v \leq 2\}$. Find a DFA M such that $L(M) = X$.

Problem 2 (20 points)

Use Forlan to carefully test your solution to Problem 1. (Include a transcript of your Forlan session.)

Problem 3 (60 points)

Use our standard method of proving the correctness of DFAs—involving induction on Λ and proof by contradiction—to prove that $L(M) = X$.