GROUP HOMEWORK 7, CPSC 421/501, FALL 2021

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Please note:

(1) You must justify all answers; no credit is given for a correct answer without justification.
(2) Proofs should be written out formally.
(3) Homework that is difficult to read may not be graded.
(4) You may work together on homework in groups of up to four, **but you must submit a single homework as a group submission under Gradescope.**

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(1) Let $\Sigma = \{0, 1, \#\}$, and let L be the language over Σ given as
$$L = \{s\#s \mid s \in \{0,1\}^*\};$$
for example, $\#$, $10\#10$, and $000\#000$ are elements of L, but $10\#0$, $\#\#$, and $110\#111$ are not. Give a 1-tape Turing machine that decides L, and explain how it works.

(2) Let Σ, L be as in Problem 1. Give a 2-tape Turing machine that decides L in linear time, i.e., that if given an input that is a string of length n, halts in time $O(n)$ (i.e., for sufficiently large n, halts in time at most Cn for some constant C independent of n). Explain how your machine works.

(3) Problem 3.11 of [Sip] (regarding doubly-infinite taped TM's).

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