

Homework Assignment #6
Due: November 10, 2025 at 5:00 p.m.

1. Show the complement of 2SAT is in $\text{NSPACE}(\log n)$.

For this problem, we should be more precise about how formulas are represented as an input string using the input alphabet $\{ (,), x, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, \vee, \wedge, \neg \}$. A variable is written as the character x followed by a decimal number. So the following are examples of 2CNF formulas.

- $(x1 \vee x4) \wedge (\neg x4 \vee x7) \wedge (x13 \vee \neg x8)$.
- $(x826389127803671292107461291 \vee x72323106912316239146213)$

Your answer should be quite detailed to explain how your algorithm can be implemented on a non-deterministic Turing machine that uses $O(\log n)$ space, where n is the length of the input string.

Depending on how you design your algorithm, there may be some details of the implementation that are a little tricky. In particular, notice that variable names may be too long to represent in $O(\log n)$ space. How can you represent a reference to a variable in $O(\log n)$ space?