COSC 545, Spring 2020: Problem Set #4

Due: Tue 4/14, submit electronically using Canvas by the beginning of class.
Covers: Lectures 20 to 22.
Collaboration: You must work alone on the problem set and not consult outside sources. See the syllabus for details on the academic integrity policy for problem sets.

Problems

1. The following two questions concern the proof of Savitch’s Theorem we studied in class:
   (a) How did we show that the height of the recursion tree explored by CANYIELD is \(O(f(n))\)?
   (b) What breaks in this proof if we remove the constraint that \(f(n) \geq n\) from the theorem statement?

2. This problem contains two parts that concern the language \(EQ_{NFA} = \{\langle N_1, N_2 \rangle \mid N_1 \text{ and } N_2 \text{ are NFAs and } L(N_1) = L(N_2)\}\).
   (a) Prove that \(EQ_{NFA} \in \text{NPSPACE}\).
   (b) Use the result from Part (a) to prove that \(EQ_{NFA} \in \text{PSPACE}\).

3. Let \(ANA = \{\langle w_1, w_2 \rangle \mid w_1 \text{ and } w_2 \text{ are anagrams}\}\). Assume I am able to prove TQBF \(\leq_p ANA\). Show that this implies \(\text{PSPACE} = \text{P}\).