CSCE 551/MATH 562, Spring 2024, Homework 7
due never

Here are some sample exercises covering the material since Quiz 6. I will post answers to selected problems later.

Textbook Exercise 8.6: Show that any PSPACE-hard language is also NP-hard.

Textbook Problem 8.8: Let $EQ_{\mathsf{REX}} = \{\langle R, S\rangle \mid R \text{ and } S \text{ are equivalent regular expressions}\}$. Show that $EQ_{\mathsf{REX}} \in \mathsf{PSPACE}$.

Textbook Problem 8.11: Show that if every NP-hard language is also PSPACE-hard, then $\mathsf{PSPACE} = \mathsf{NP}$.

Not in textbook 1: Let

$$F_1 := (\exists x_1)(\forall x_2)(\exists x_3)[\ (\overline{x_1} \vee \overline{x_2} \vee \overline{x_3}) \wedge (\overline{x_1} \vee x_2 \vee x_3) \wedge (x_1 \vee x_2) \wedge (x_1 \vee \overline{x_2} \vee \overline{x_3})\ ]\ ,$$
$$F_2 := (\forall x_1)(\exists x_2)(\forall x_3)[\ (\overline{x_1} \vee \overline{x_2} \vee x_3) \wedge (\overline{x_1} \vee x_2 \vee \overline{x_3}) \wedge (x_1 \vee \overline{x_2} \vee x_3)\ ]\ .$$

One of F_1 and F_2 is true and the other is false. (In fact, they are negations of each other.) Which one is true? Prove your answer.

Not in textbook 2: Draw (as a digraph) the instance of GG (Generalized Geography) output by the p-reduction from $TQBF$ described in class and the textbook when applied to F_1 of the previous problem.