

Complexity Theory

VU 181.142, SS 2014

Homework Assignment 4

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Maximum credits: 10

Exercise 1 (5 credits) Recall the definition of the following variants of the **SAT**-problem: **LEX-MINIMAL MODEL SAT** and **WEIGHT-MINIMAL MODEL SAT**.

Give a log-space problem reduction from the **LEX-MINIMAL MODEL SAT** problem to **WEIGHT-MINIMAL MODEL SAT** and prove the correctness of your reduction.

Hint. Choose the weights in such a way that, for every i , the weight of the variable x_i exceeds the total weight of $\{x_{i+1}, \dots, x_n\}$.

Exercise 2 (5 credits) Recall the definition of the following variants of the **SAT**-problem: **CARD-MINIMAL MODEL SAT** and **CARD-MAXIMAL MODEL SAT**.

Give a log-space problem reduction from the **CARD-MINIMAL MODEL SAT** problem to **CARD-MAXIMAL MODEL SAT** and prove the correctness of your reduction.

Hint. Let (φ, z) denote an instance of the **CARD-MINIMAL MODEL SAT** problem and let $X = \{x_1, \dots, x_n\}$ denote the variables occurring in φ . Add additional variables $X' = \{x'_1, \dots, x'_n\}$ and $X'' = \{x''_1, \dots, x''_n\}$ and transform φ into ψ , s.t. the models of ψ are obtained from the models of φ by leaving the truth value of the variables x_i unchanged and by enforcing that the truth value of x'_i and x''_i coincides with the truth value of $\neg x_i$.