



Bromberger/Möhle/Schwarz/Weidenbach

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Tutorials for “Automated Reasoning WS22/23”
Exercise sheet 5

Exercise 5.1:

Eliminate first x_1 and then x_2 via FM from the formula

$$\phi = x_1 \geq 0 \wedge x_1 + 2x_2 \leq 6 \wedge x_1 + x_2 > 2 \wedge x_1 - x_2 \geq 3 \wedge x_2 \geq 0 \wedge -2x_1 - x_2 < 4$$

and figure out that way whether $\exists x_1, x_2 \phi$ is true.

Exercise 5.2:

Check via FM whether the following formula is true/false:

$$\forall x. \exists y. [(2x + y > 7 \wedge x + y < 6)]$$

Exercise 5.3:

Consider the below set of inequations and apply the simplex algorithm to it:

$$\begin{aligned} x &\geq 0 \\ x + y &\geq 1 \\ x + 2y &\geq 1 \\ x - y &\geq 2 \end{aligned}$$

Exercise* 5.4:

FM does not work as a quantifier elimination procedure over the integers, even if all coefficients are from the integers. Try to figure out why and to think about what is missing. For example, think of eliminating x out of the two inequations $3x > 4$ and $2x < 3$ where x ranges over the integers.

It is not encouraged to prepare joint solutions, because we do not support joint exams.