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Tutorials for “Automated Reasoning WS20/21”  
Exercise sheet 5

**Exercise 5.1:**

Consider the below sets of inequations and check whether there is a solution by the simplex algorithm, respectively.

$$(i) \quad \begin{aligned} x &\geq 0 \\ x + y &\geq 1 \\ x + 2y &\leq -1 \\ x - y &\geq 0 \end{aligned}$$

$$(ii) \quad \begin{aligned} x &\geq 0 \\ x + y &\geq 1 \\ x + 2y &\leq -1 \\ x - y &> 0 \\ y &< 1 \end{aligned}$$

$$(iii) \quad \begin{aligned} 2x + 5y &\leq -17 \\ 3x + 7y &\leq -24 \\ 2x + 5y &\geq -17 \\ 3x + 7y &\geq -24 \end{aligned}$$

**Exercise 5.2:**

Consider the theory of linear rational arithmetic and the clauses  $3x_1 + 4x_2 - 1 \geq 0$ ,  $-x_1 + x_2 + 1 \geq 0$ ,  $2x_2 - x_3 \approx 0$ ,  $x_3 - x_1 \leq 2 \vee x_2 \geq 1$  and check via CDCL(LA) whether this clause set is satisfiable.

**Exercise\* 5.3:**

Provide an example where the simplex algorithm does not terminate, if FailBounds is not preferred over EstablishBounds.

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