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Tutorials for Decision Procedures Exercise sheet 6

Exercise 1: Quantifier Elimination for $T_{\mathbb{Q}}$ (4 Points)

Apply quantifier elimination to the following $\Sigma_{\mathbb{Q}}$ -formulae:

- (a) $\exists y. (x = 2y \wedge y < x)$
- (b) $\forall y. (25 < x + 2y \vee x + 2y < 25)$
- (c) $\forall x. \exists y. (y > x \wedge -y < x)$
- (d) $\forall x. (x > 0 \leftrightarrow \exists y. (x > y \wedge -x < y))$

Exercise 2: Sufficient Set (4 Points)

For $T_{\mathbb{Q}}$ the algorithm in the lecture examines terms $\frac{s+t}{2}$ for all $s, t \in S$. Suppose we split up S in S_A, S_B, S_C depending on whether the term t comes from an (A) $x < t$, (B) $t < x$, or (C) $x = t$ literal. Based on this distinction, give a smaller set of terms that is still sufficient.

Exercise 3: Implementing Quantifier Elimination for $T_{\mathbb{Q}}$ (6 Bonus Points)

Implement the quantifier elimination algorithm for $T_{\mathbb{Q}}$ from the lecture. SMTInterpol can be started with a special `-script` option giving a different solver file. This way you do not need to take care of parsing and most other technicalities. A template file, which also contains the NNF-conversion and some more hints, and starting instructions are given on the website.