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Tutorials for "Automated Reasoning II"
Exercise sheet 1

Exercise 1.1:
Use the congruence closure algorithm to check whether the equational clause

$$\forall x, y \; f(f(x)) \not\approx x \lor f(x) \not\approx y \lor f(f(y)) \not\approx g(y) \lor x \approx y \lor h(x, y) \approx h(x, g(y))$$

is valid.

Exercise 1.2:
On page 4 of the lecture notes we have sketched a flattening operation for sets of equations. Formalize it using an appropriate transition system in such a way that any two different D-equations have always different left-hand sides.

Exercise 1.3:
The Fourier-Motzkin algorithm would be unsound if we omitted the non-triviality axioms from the definition of ODAGs. Where do we need non-triviality?

Exercise 1.4:
Describe the rules for virtual substitution for the test points in the set T' that is defined on page 13 of the lecture notes.

Exercise 1.5:
Use the Loos-Weispfenning algorithm to eliminate $\exists x$ from the formula

$$\exists x \; \big((2x - y > 0 \lor x \geq 2) \land (y - x \geq -1 \lor x < 1) \land \neg\,(x \geq 3y)\big)$$

Simplify the result as much as possible.

Bring your solution (or solution attempt) to the tutorial on April 30.