



Bromberger/Möhle/Schwarz/Weidenbach

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**Tutorials for “Automated Reasoning WS22/23”
Exercise sheet 10**

Exercise 10.1:

Refute the following set of clauses via SCL and a regular run. Choose \prec_β and β appropriately.

$$N = \{P(a) \vee P(b), \neg P(x) \vee \neg P(f(x)) \vee Q(f(a)), \neg P(x) \vee P(f(x)), \\ Q(a), \neg Q(f(x)) \vee \neg Q(x), Q(f(x)) \vee \neg P(x)\}$$

Exercise 10.2:

Prove by congruence closure that the following ground equations are unsatisfiable:

$$f(a, g(a)) \approx f(b, g(b)), \quad g(a) \approx h(c), \quad h(d) \approx g(b), \quad d \approx c, \\ f(a, h(d)) \approx f(h(d), a), \quad f(b, g(b)) \not\approx f(h(c), a).$$

Exercise 10.3:

Apply Nelson-Oppen to the LRA, EUF combination and the formula

$$f(x_1, 0) \geq x_3 \wedge f(x_2, 0) \leq x_3 \wedge x_1 \approx x_2 \wedge x_3 - f(x_1, 0) \geq 1$$

where I assume appropriate sorts for the variables and function declarations.

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