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February 2, 2024

**Tutorials for “Automated Reasoning”**  
**Exercise sheet 12**

**Exercise 12.1:**

Find a Knuth–Bendix ordering  $\succ$  such that the set of clauses

$$P(f(x, y), y) \vee P(g(y), g(x)) \quad (1)$$

$$\neg P(f(b, y), y) \vee \neg Q(y, y) \quad (2)$$

$$Q(g(x), g(y)) \vee \neg Q(x, h(y)) \quad (3)$$

is saturated under  $Res_{sel}^>$ , where  $sel$  does not select any literals.

**Exercise 12.2:**

Apply the Knuth–Bendix procedure to the set of equations

$$f(f(x)) \approx g(x) \quad (1)$$

$$f(b) \approx c \quad (2)$$

and transform it into a finite convergent term rewrite system; use the Knuth–Bendix ordering with weight 1 for all function symbols and variables and the precedence  $g > f > b > c$ .

**Exercise 12.3:**

Apply the Knuth–Bendix procedure to the set of equations

$$f(0, f(x, f(y, z))) \approx f(f(0, x), f(y, z)) \quad (1)$$

$$f(0, x) \approx 0 \quad (2)$$

$$f(x, 1) \approx x \quad (3)$$

and transform it into a finite convergent term rewrite system; use the Knuth–Bendix ordering with weight 1 for all function symbols and variables and the precedence  $f > 1 > 0$ . Start by orienting the first equation.

Bring your solution to the tutorial on February 7 or 9 and compare it with the solution that is discussed there. If you are still unsure afterwards whether your solution is correct or not, feel free to ask the instructor after the tutorial. Your solution will not be graded.