Automated Reasoning Exercises (326.094, WS 2013)

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Equational Reasoning

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Download and install Waldmeister from the prover's Web page:
`http://www.mpi-inf.mpg.de/~hillen/waldmeister/`
Study its syntax, options, how to run.

Problem 1: Using Waldmeister, prove $i(i(x)) \approx f(i(a), f(b, a))$ from the equalities

$$f(x, e) \approx x$$
$$f(x, i(x)) \approx e$$
$$f(x, f(y, z)) \approx f(f(x, y), z)$$
$$f(x, y) \approx f(y, x)$$

Run the system

(a) With default options. Study the output.

(b) With the option `--details`. Compare the output with the previous one.

(c) With the option `--pcl`. Explain the steps.

Problem 2: Given the set of group theory axioms

$$f(x, e) \approx x$$
$$f(x, i(x)) \approx e$$
$$f(x, f(y, z)) \approx f(f(x, y), z)$$

Run Waldmeister in completion mode to complete the equations. Use

(a) default options. Study the output.

(b) the option `--details`. Compare the output with the previous one.

(c) the option `--pcl`. Explain the steps.

Problem 3: Run Waldmeister on the problem RNG009-5.pr (can be found in TPTP241.WMdir/RNG.WMdir/RNG009-5.pr of Waldmeister distribution). Analyze the output.

Change the ordering from KBO to LPO with the same precedence as it is in the problem specification `additive_inverse > add > multiply > additive_identity > b > a` and see what happens.