

4. Exercise sheet *Static Program Analysis 2011*

Due Mon, 23. May 2011, *before* the exercise course begins.

Exercise 4.1:

(4 points)

Perform an interval analysis on the following program.

```
x := 0;
y := 100;
while x >= 0 do
  x := x + 1;
  y := x + y;
```

- (a) Apply widening by means of the worklist-adaption.
- (b) Narrow your results from a) using the method presented in the lecture.

Exercise 4.2:

(4 points)

Perform a constant propagation analysis using assertions on the following program:

```
x := 1;
while x <= y do
  if x = y then
    x := x · y;
  else
    y := y + 1;
```

Exercise 4.3:

(2+2 points)

Consider the interval analysis equipped with assertions. Restrict the boolean expressions to the following:

$b := t \mid x_1 = x_2 \mid x_1 < x_2$ with $x_1, x_2 \in Var_c$

- (a) Give an evaluation function for statements $assert(b)$, $b \in BExpr$ computing accurate intervals for each $x \in Var_c$.
- (b) Extend the boolean expressions by the disjunction. Give a “precise”, but “safe” approximation of the resulting intervals. Are your resulting intervals optimal? If not, can you think of further improvements (informally!)?