

Exercise 1 (Non-Terminating Analyses):

(1.5 + 1.5 Points)

- a) Provide an example program c in the WHILE-language such that the interval analysis using the worklist algorithm without widening does not terminate. Illustrate this by means of a few processing steps of the algorithm and explain briefly why it will not terminate.
- b) Provide another program c' such that the naive (i.e. not the worklist algorithm) fixpoint-based constant propagation analysis terminates but requires more than $|L_{c'}|$ steps to become stable where $L_{c'}$ is the set of labels associated with the program c' .

Exercise 2 (MOP Solution):

(3 Points)

Perform an available expression analysis on the following program using the meet over all paths (MOP) solution.

```
a := b + c;  
if b > c then  
  c := b + 1;  
else  
  b := c + 1;  
c := a + b;
```

Exercise 3 (Monotonicity and Continuity):

(2 + 2 Points)

Reconsider the transfer function φ_l for interval analysis for assertions and let block l be the block `assert b`.

- a) Prove or disprove: φ_l is monotonic.
- b) Prove or disprove: φ_l is Scott-continuous (supremum preserving).