Software-Modellierung und Verifikation
Informatik 2
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6. Exercise sheet *Static Program Analysis 2011*

Due Mon, 6. June 2011, *before* the exercise course begins.

Exercise 6.1:   (3 points)

For a single integer, modulo abstraction is defined by the mapping $\mathbb{Z} \to \{0, \ldots, n-1\} : z \mapsto z \mod n$ for some fixed $n \geq 1$. Give the definition of the corresponding abstraction and concretization functions operating on sets of integers, and show that they form a Galois connection.

Exercise 6.2:   (2 + 2 points)

Let (α, γ) be a Galois connection with $\alpha : L \to M$ and $\gamma : M \to L$.

(a) Show that $\alpha(\bot_L) = \bot_M$ and $\gamma(\bot_M) = \bot_L$ (where $\bot_K$ is the least element of lattice K).

(b) Show that $\alpha \circ \gamma \circ \alpha = \alpha$ and $\gamma \circ \alpha \circ \gamma = \gamma$.

Exercise 6.3:   (3 points)

Give a concrete execution of the following WHILE program from any initial state $\sigma \in \Sigma$ with $\sigma(x) = 5$:

```
y := 3;
z := 0;
while   x >= y   do
    x := x − y;
    z := z + 1;
```