

Most of Home Assignments 1 for Programming Theory (TDDA 43)

To be completed. Corrections possible.
Deadline: Wednesday week 17 (22 April 2009) at noon.

Provide explanations to justify how and why your solutions work. Put your solutions, addressed to Jonas Wallgren, in the “Post till IDA” slot at Café Java. Keep a copy of your solutions for the homework reporting session (Friday week 17).

The numbers in parentheses refer to the old version of our textbook.

A. Exercise 1.14 (1.13) from the textbook. (The meaning of an expression obtained from a by means of a textual substitution expressed as the meaning of a in an updated state.)

Hints: Make sure you understand the section on textual substitutions (p.18 (16) of the textbook). Use structural induction.

B. Extend the language **While** with the statements

```
repeat  $S$  until  $b$   
...
```

Assume their meaning is as in Pascal¹.

1. Define natural and structural operational semantics for the **repeat** statement. (It is not allowed to rely on the existence of a **while** statement in the language.)

C. (Optional!) Modify the proof of Theorem 2.26 and Lemmas 2.28, 2.27 (equivalence of the natural and structural semantics of **While**) so that it applies to **While** extended with the **repeat** statement.

E. Exercise 3.15 (2.45) from the book. (Add call by value arguments to the language **Proc**; modify its natural operational semantics to describe this extension.) Hints: answer the following questions.

¹ In Ada they correspond, respectively, to `loop S exit when b ; end loop;`
...

1. In which environment should the arguments a_1, a_2 be evaluated?
2. In which environment should the procedure body S be executed? What should be the store at the beginning of this execution?
3. How should the formal parameters x_1, x_2 be treated in this environment?

It may be convenient to begin with call by reference (by variable) arguments.

Your answers may be in Swedish or English. It is allowed to discuss the exercises with others, but you are supposed to solve each exercise individually. It is absolutely not allowed to copy solutions from others.