Technische Universität München — *Summer 2011*
Fakultät für Informatik — *Kalmer Apinis*
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Virtual Machines

Exercise Sheet 1

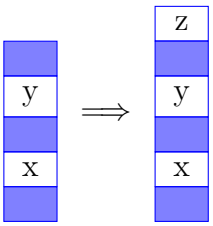
Deadline: 17. May 2011, 14:00

Exercise 1: *CMa Calculator* — *4 Points*

Generate CMa instructions that calculate the following formula:

$$z = \frac{4x^2 + 3x + 1}{y - 26}$$

The variables x and y are on the stack at indexes $\rho(x)$ and $\rho(y)$, respectively.



Exercise 2: *Assembly programming* — *10 Points*

Write a CMa program, that begins with "`loadc n`" (where $n \in \mathbb{N}$), that calculates the n-th Fibonacci number. You may only use the following instructions: `loadc`, `load`, `jumpz`, `jump`, `store`, `pop`, `dup`, `add`, `sub` and `halt`.

Exercise 3: *Comma Operator* — *2 Points*

Give the CMa translation scheme for the comma operator

$$code_R\ (e', e)\ \rho = \ldots.$$

Note that both expressions must be evaluated (first e', then e) and the value of the expression (e', e) is the value of its right component (e).

Exercise 4: *Short circuit evaluation* — *2 Points*

Short circuit evaluation of expressions means that the second argument of the or-operator (`||`) is not evaluated if the evaluation of the first argument is nonzero. Give the CMa translation scheme for $code_R\ (e_1\ \texttt{||}\ e_2)\ \rho$, which applies *short circuit evaluation*.

Exercise 5: *Conditional Expressions* — *2 Points*

For the expressions b, e_1 and e_2, a conditional *expression* in C has the form $b\ ?\ e_1\ :\ e_2$ and its *value* is e_1 if $b \neq 0$ and e_2 if $b = 0$. Give the CMa translation scheme for $code_R\ (b\ ?\ e_1\ :\ e_2)\ \rho$.