Mathematisches Institut
der Universität München
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Wintersemester 2004/2005
Sheet 1

Exercises to the Scheme Course

Exercise 1. What does the Scheme interpreter return when evaluating the following expressions?

```
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(+ 4 7 9)

(- 8 2)

(/ 8 4)

(* (+ 3 1) (- 6 2))

(define a 3)

(define b (+ a 1))

(+ a b (* a b))

(= a b)

(if (and (> a b) (< b (* a b)))
    b
    a)

(cond ((= a 4) 6)
      ((= b 4) (+ 6 7 a))
      (else 25))

(+ 2 (if (> b a) b a))
```

Exercise 2. Write a Scheme-program that for three given natural numbers returns the sum of the squares of the two biggest given numbers.

Exercise 3. Describe the differences (if there are any) between the build-in `if` and the following program defining `new-if`:

```
(define (new-if test consequent alternative)
  (cond (test consequent)
        (else alternative)))
```

Exercise 4. Describe how the following program works and explain its output.

```
(define (apply-to f x) (f x))

(apply-to (lambda (x)
            (display "world !")
            (display x)
            (newline))
          (display "hello "))
```

You can use `(trace apply-to)` in order to see the execution trace.

Exercise 5. Give a recursive *and* an iterative program for the function defined as follows:

$$\begin{aligned} & f(0) = f(1) = f(2) = 1 \\ & f(n) = f(n-1) + 2f(n-2) + 3f(n-3) \quad (n \geq 3) \end{aligned}$$

Again, use `(trace f)` to see the execution trace.

Deadline. Hand in the exercises on Tuesday, October 5th, at the beginning of the lecture or via email to `urban@mathematik.uni-muenchen.de`.