

# Informatik für Mathematiker und Physiker HS14

## Exercise Sheet 3

Submission deadline: 15:15 - Tuesday 7th October, 2014

Course URL: <http://lec.inf.ethz.ch/ifmp/2014/>

### Assignment 1 – Skript-Aufgabe 30 (4 points)

Show that the following sets of functions are complete for the set of binary Boolean functions.

- |  |               |
|--|---------------|
| b) {OR, NOT}   | c) {NAND}     |
| d) {NOR}, where $\text{NOR} := \text{NOT} \circ \text{OR}$ . | e) {XOR, AND} |

You may use the fact that the sets {AND, OR, NOT} and {AND, NOT} both are complete for the set of binary Boolean functions.

### Assignment 2 – Skript-Aufgaben 32-33 (4 points)

- (i)  $x \neq 3 < 2 \ || \ y \ \&\& \ -3 \leq 4 - 2 * 3$
- (ii)  $z > 1 \ \&\& \ !x \neq 2 - 2 == 1 \ \&\& \ y$
- (iii)  $3 * z > z \ || \ 1 / x \neq 0 \ \&\& \ 3 + 4 >= 7$

- a) Parenthesize the above expressions according to operator precedences and associativities.
- b) Evaluate the expressions step-by-step, assuming that  $x$ ,  $y$ , and  $z$  are all of type `int` with  $x==0$ ,  $y==1$ , and  $z==2$ .

### Assignment 3 – Skript-Aufgabe 48 (4 points)

Write a program `cross_sum.cpp` that inputs a natural number  $n$  and outputs the sum of the (decimal) digits of  $n$ . For example, for  $n==10$  the output is 1 and for  $n==112$  the output is 4.

### Assignment 4 – Skript-Aufgabe 50 (4 points)

Write a program `dec2bin2.cpp` that inputs a natural number  $n$  and outputs the binary digits of  $n$  in the *correct* order. For example, for  $n==2$  the output is 10 and for  $n==11$  the output is 1011.

**Hint:** In the exercise classes you saw how to output the binary digits in *reverse* order. Try to adapt that version so that the output is in the correct order.

## **Challenge - Skript-Aufgabe 36 (8 points)**