



## Tutorial for Program Verification

### Exercise Sheet 1

First carefully read the description of how we organize exercises on the lecture web page. There you will also find a link where you should rank each exercise according to your willingness to present in the next exercise group.

#### Exercise 1: C Programs

2 Points

Consider the following C program<sup>1</sup>. Find all errors of this program.

```
1  int main() {
2      char *p,*q;
3      p = NULL;
4      printf("%s",p);
5      q = (char *)malloc(100);
6      p = q;
7      free(q);
8      *p = 'x';
9      free(p);
10     p = (char *)malloc(100);
11     p = (char *)malloc(100);
12     q = p;
13     strcat(p,q);
14 }
```

#### Exercise 2: Programming language semantics

2 Points

(a) Consider the following piece of code:

```
x := -7 / 5;
y := -7 % 5;
```

What are the values of  $x$  and  $y$  after the execution? Give (at least two) examples for programming languages for which the values differ.

(b) Consider the following piece of code (note that  $1073741824 = 2^{30}$ ):

```
z := 1073741824 * 2;
```

What is the value of  $z$  after the execution? Give (at least two) examples for programming languages/architectures/data types for which the values differ.

---

<sup>1</sup>This example was taken from Michael Schwarzbach's lecture notes on static analysis [http://lara.epfl.ch/dokuwiki/\\_media/sav08:schwarzbach.pdf](http://lara.epfl.ch/dokuwiki/_media/sav08:schwarzbach.pdf)