

# Language Based Security

*Summer Semester 2006*

*4. Homework*

*07 June 2006*

## Exercise 1:

Consider the class definition

```
public class FactRec {
    public static int fact (int n) {
        if (n==0) return 1; else return n * (fact (n-1));
    }
}
```

The bytecode corresponding to the function fact is below.

```
public static int fact(int); 3 stack slots, 1 register
0:   iload_0
1:   ifne 6
4:   iconst_1
5:   ireturn
6:   iload_0
7:   iload_0
8:   iconst_1
9:   isub
10:  invokestatic    #2; //Method FactRec.fact.int(int)
13:  imul
14:  ireturn
```

- a) Give type level abstract interpretation rules for the instructions `ifne`, `isub` and `imul`.
- b) Apply the bytecode verification discussed in the lecture on this code.