

Homework 9

Please submit your solutions via email. Please submit only ASCII text or PDFs. Every solution should be preceded by the corresponding question text, like:

Qⁿ: ...a difficult question from me...
A: ...an answer from you ...
Q^{n + 1}: ...another difficult question...
A: ...another brilliant answer from you...

Solutions will only be accepted until 20th December! Please send only one homework per email.

1. Describe what is meant by *eliminating tail recursion*? When can this optimization be applied and why is it of benefit?
2. A programming language has arithmetic expression. For an arithmetic expression the compiler of this language produces the following snippet of JVM code.

```
ldc 1  
ldc 2  
ldc 3  
imul  
ldc 4  
ldc 3  
isub  
iadd  
iadd
```

Give the arithmetic expression that produced this code. Make sure you give all necessary parentheses.

3. Describe what the following three JVM instructions do!

```
iload 3  
istore 1  
ifeq label
```

4. Early in the module, we saw that the regular expression matchers in Java, Python and Ruby are very slow with some (basic) regular expressions. What is the main reason for this inefficient computation?
5. **(Optional)** This question is for you to provide regular feedback to me: for example what were the most interesting, least interesting, or confusing parts in this lecture? Any problems with my Scala code? Please feel free to share any other questions or concerns.