## Homework 4

- 1. If a regular expression *r* does not contain any occurrence of Ø, is it possible for *L*(*r*) to be empty?
- 2. Define the tokens and regular expressions for a language consisting of numbers, left-parenthesis (, right-parenthesis ), identifiers and the operations +, and \*. Can the following strings in this language be lexed?
  - (a+3) \* b
  - )() + + − 33
  - (*a*/3) \* 3

In case they can, can you give the corresponding token sequences.

3. Assume that  $s^{-1}$  stands for the operation of reversing a string *s*. Given the following *reversing* function on regular expressions

$$rev(\varnothing) \stackrel{\text{def}}{=} \varnothing$$

$$rev(\varepsilon) \stackrel{\text{def}}{=} \varepsilon$$

$$rev(c) \stackrel{\text{def}}{=} c$$

$$rev(r_1 + r_2) \stackrel{\text{def}}{=} rev(r_1) + rev(r_2)$$

$$rev(r_1 \cdot r_2) \stackrel{\text{def}}{=} rev(r_2) \cdot rev(r_1)$$

$$rev(r^*) \stackrel{\text{def}}{=} rev(r)^*$$

and the set

$$Rev A \stackrel{\text{def}}{=} \{ s^{-1} \mid s \in A \}$$

prove whether

$$L(rev(r)) = Rev(L(r))$$

holds.

4. Assume the delimiters for comments are /\* and \*/. Give a regular expression that can recognise comments of the form

/\* ... \*/

where the three dots stand for arbitrary characters, but not comment delimiters. (Hint: You can assume you are already given a regular expression written ALL, that can recognise any character, and a regular expression NOT that recognises the complement of a regular expression.)