Homework 4

1. Give an automaton that can recognise the language $L(a^* \cdot b \cdot b^* \cdot (a \cdot a^* \cdot b \cdot b^*)^*)$.

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

$$
\begin{aligned}
rev(\varnothing) &\overset{\text{def}}{=} \varnothing \\
rev(\epsilon) &\overset{\text{def}}{=} \epsilon \\
rev(c) &\overset{\text{def}}{=} c \\
rev(r_1 + r_2) &\overset{\text{def}}{=} rev(r_1) + rev(r_2) \\
rev(r_1 \cdot r_2) &\overset{\text{def}}{=} rev(r_2) \cdot rev(r_1) \\
rev(r^*) &\overset{\text{def}}{=} rev(r)^*
\end{aligned}
$$

and the set

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

prove whether

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

holds.

3. Palindromes

4. (Optional) The tokenizer in `regexp3.scala` takes as argument a string and a list of rules. The result is a list of tokens. Improve this tokenizer so that it filters out all comments and whitespace from the result.

5. (Optional) Modify the tokenizer in `regexp2.scala` so that it implements the `findAll` function. This function takes a regular expressions and a string, and returns all substrings in this string that match the regular expression.