Homework 3

1. What is a regular language?

2. Assume you have an alphabet consisting of the letters a, b and c only. (1) Find a regular expression that recognises the two strings ab and ac. (2) Find a regular expression that matches all strings *except* these two strings. Note, you can only use regular expressions of the form

$$r ::= \varnothing \mid \epsilon \mid c \mid r_1 + r_2 \mid r_1 \cdot r_2 \mid r^*$$

3. Define the function $zeroable$ which takes a regular expression as argument and returns a boolean. The function should satisfy the following property:

$$zeroable(r) \text{ if and only if } L(r) = \varnothing$$

4. 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.