Assignment 3 on the video lectures of "Week 2"

1. Give regular expressions for the following languages:

   (a) the set of all strings over alphabet $\{a, b, c\}$ that contain an even number of as,

   (b) the set of all binary numbers divisible by 4 (with no prefixes consisting of needless digits 0),

   (c) the set of all strings over $\{a, b, c\}$ *not* containing the substring baa.

2. Give a DFA accepting the language specified by $a^*b(ca^*b)^*d^+e$.

3. Consider the language of all strings that are specified as follows: An underscore (_) or one or more as, followed by at most one b.

   (a) Give a regular expression for this language.

   (b) Construct from the regular expression an NFA (allowing ϵ-transitions). Use the algorithm from the proof showing equivalence between regular expressions and NFAs with ϵ-transitions.

   (c) Construct from this NFA an equivalent DFA. Note that, in particular, the ϵ-transitions have to be removed.

4. Construct (according to the algorithm presented in the video lecture) the regular expression for the DFA with start state 1, accepting state 2 and transitions:

$$
\begin{aligned}
\delta(1, a) &= 2 \\
\delta(1, b) &= 3 \\
\delta(2, a) &= \delta(2, b) &= 2 \\
\delta(3, a) &= \delta(3, b) &= 3
\end{aligned}
$$