Exercise Sheet 1

Exercise 1. *Give a regexp over the alphabet $\Sigma = \{a, b, c\}$ for the set of words in which "a" occurs precisely twice.*

Exercise 2. *Build a partial DFA that checks whether a string is equal to "`Goo....gle`" with arbitrarily many o's following the initial two.*

**Exercise 3.** *Design partial DFAs for the following regular expressions:*

1. `(a|b)c`

2. `ab|bc`

3. `ab|ac` *(Careful! Remember that from any state there must be at most* one *transition labelled with a particular letter.)*

4. `c(a|b)*c`

Exercise 4. *An online shop requires users to provide a password during registration. Every password is a string of lowercase letters and digits. It must contain at least one letter and at least one digit, and it must be at least three characters long. Give a regular expression for passwords. You can use* `[a-z]`, *which matches any lowercase letter, and* `[0-9]`, *which matches any digit.*

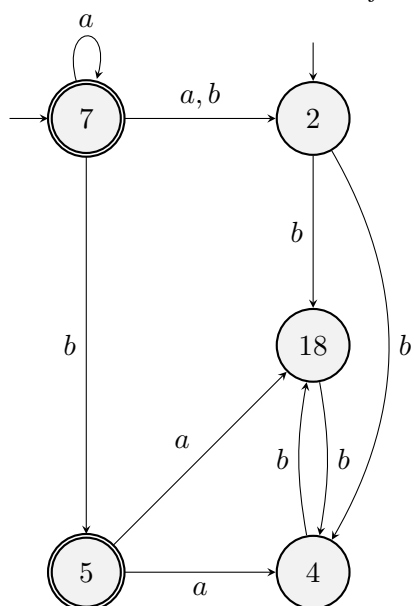**Exercise 5.** *Let Automaton A be the following total DFA:*
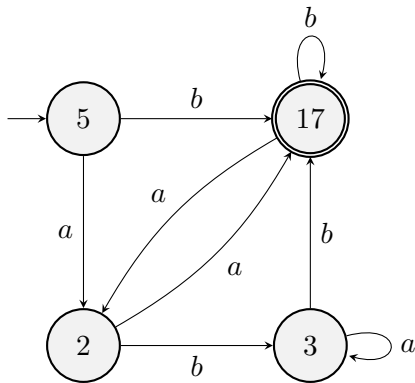
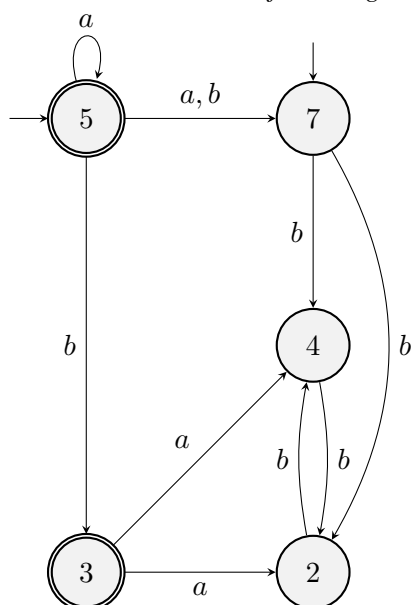*Let Automaton B be the following total DFA:*
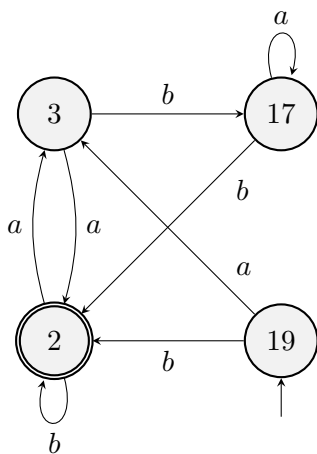
Give an isomorphism between these automata.

Exercise 6. *Let Automaton A be the following NFA.*

Let Automaton B be the following NFA.

Give two isomorphisms between these automata.

Exercise 7. *Determinize the following NFA.*