

**MA0301  
ELEMENTARY DISCRETE MATHEMATICS  
NTNU, SPRING 2022**

SET 12

**Deadline: Monday 11.04.2022, 23:59**

**Exercise 1.** Draw the deterministic finite automaton on the alphabet  $\Sigma = \{a, b\}$ , that accepts the language of strings ending with a repetition of the same two letters.

**Exercise 2.** Lewis, Zax: Exercise 19.7. To solve this exercise you might want to revisit the proof of Theorem 19.4 and also Figure 19.6 and the corresponding text might be helpful.

**Exercise 3.** Find all reachable states for the DFA identified in Exercise 2

**Exercise 4.** Find a deterministic finite automaton on the alphabet  $\Sigma = \{a, b\}$  that accepts the language of strings that have  $(ab)$  as their second to last pair of letters (for example  $aababbb$  or  $aababab$  are accepted but  $aabaabb$ ) is not. Use the following strategy:

a) First find a NFA that accepts this language.

b) Use the subset construction to find an associated DFA that accepts the same language.  
(Hint: You may not need consider all transitions. Start in the starting state and build up from there to see which states are reachable.)

**Exercise 5.** Lewis, Zax: Exercise 20.2 a), b)

**Exercise 6.** Lewis, Zax: Exercise 20.9.