

MA0301
ELEMENTARY DISCRETE MATHEMATICS
NTNU, SPRING 2019

EXERCISE SET 12

NOTE: Problems marked with a \star are mandatory. Their solutions must be included to get the set approved.

- \star **Exercise 1.** (Grimaldi, 5. ed., Exercises 11.3, page 537) Exercise 1
- \star **Exercise 2.** (Grimaldi, 5. ed., Exercises 11.3, page 537) Exercise 14
- \star **Exercise 3.** (Grimaldi, 5. ed., Exercises 11.3, page 537) Exercise 20
- \star **Exercise 4.** (Grimaldi, 5. ed., Exercises 11.4, page 553) Exercise 4
- \star **Exercise 5.** (Grimaldi, 5. ed., Exercises 11.4, page 553) Exercise 16
- \star **Exercise 6.** (Grimaldi, 5. ed., Exercises 11.4, page 553) Exercise 18
- \star **Exercise 7.** (Grimaldi, 5. ed., Exercises 11.4, page 553) Exercise 21
- \star **Exercise 8.** (Grimaldi, 5. ed., Exercises 12.2, page 603) Exercise 5
- \star **Exercise 9.** Let $\Sigma := \{a, b, c, d\}$ be an alphabet. Find regular expressions that correspond to the following regular languages.
 - a) $\{ab, abab, ababab, abababab, \dots\}$
 - b) $\{ab, abb, aab, aabb\}$
- \star **Exercise 10.** (Grimaldi, 5. ed., Exercises 6.2, page 324) Exercise 3
- \star **Exercise 11.** a) Draw the state diagram $D(M)$ of the automaton M with states $S := \{s_0, s_1, s_2\}$, accepting states $Y := \{s_0, s_3\}$, input alphabet $I := \{a, b\}$, described in the state table $T(M)$ on top of the next page.

	ν
	$a \quad b$
s_0	$s_1 \quad s_0$
s_1	$s_2 \quad s_0$
s_2	$s_2 \quad s_1$

★ **Exercise 12.** a) Draw the state diagram $D(M)$ of the automaton M with states $S := \{s_0, s_1, s_2\}$, accepting states $Y := \{s_0\}$, input alphabet $I := \{a, b\}$, described in the state table $T(M)$:

	ν	
	a	b
s_0	s_0	s_1
s_1	s_0	s_2
s_2	s_2	s_2

★ **Exercise 13.** Find an automaton M that accepts the regular language given by the regular expression $aa^*bb^*cc^*$.