MA0301
ELEMENTARY DISCRETE MATHEMATICS
NTNU, SPRING 2022

SET 3

Deadline: Deadline: Monday 07.02.2022, 11:59 pm

Exercise 1. *Write the following logical statement in prenex normal form:*

$$\neg\forall x(P(x) \Rightarrow \exists y Q(x,y))$$

Exercise 2. *What is the power set of* $A := \{\{a\},\{b,c\},\{c,d,\{e,f\}\}\}$

Exercise 3. *In the universe of real numbers, let* $A = \{x|1 \leq x \leq 5\}$ *and* $B = \{x|3 \leq x \leq 7\}$.

a) What is the intersection $A \cap B$*?*

b) Let $A \triangle B = \{x|x \in A \cup B \wedge x \notin A \cap B\}$*. This is also called the symmetric difference of* A *and* B*. Find sets* C *and* D *such that* $A \triangle B = C \cup D$*.*

Exercise 4. *Let* X *and* Y *be two sets. Prove that* $\overline{X - Y} = \overline{X} \cup Y$*.*

Exercise 5. *For two sets* X *and* Y *prove that*

a) $(\overline{X} \cup Y) \cap (X \cup Y) = Y$

b) $(\overline{X} \cap Y) \cup (X \cap Y) = Y$

Exercise 6. *Prove that the following three statements are equivalent:*

$$i)\ \overline{Y} - X = \overline{Y}, \quad ii)\ X \subseteq Y \quad iii)\ X \cap Y = X$$

Exercise 7. *Lewis, Zax: Exercise 5.4*

Exercise 8. *Lewis, Zax: Exercise 5.5*

Date: January 28, 2022.