

MA0301
ELEMENTARY DISCRETE MATHEMATICS
NTNU, SPRING 2022

SET 3

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