2. Set theory (part one)

Exercise material

Exercise

For each couple of sets A and B, determine the sets union $A \cup B$, intersection $A \cap B$, difference $A \setminus B$ and $B \setminus A$.

(1) $A = \{a, b, c, d\}$, $B = \{b, c, d, f\}$;
(2) $A = \{0, 1, 2, 3, 4\}$, $B = \{2, 3, 4\}$.

Exercise

Let $X = \mathbb{R}$ be the universe set represented by the set of real numbers.

Given the sets

$$A = \{1, 3\} \qquad B = \{x \in \mathbb{R} : 0 \leq x < 2\}$$
$$C = \{x \in \mathbb{R} : x \leq 2\} \quad D = \{x \in \mathbb{R} : 1 < x \leq 4\},$$

find

$$C \setminus A, \quad C(B) \cap D, \quad C(A) \setminus D, \quad (D \setminus A) \setminus C,$$
$$(A \cup D) \cap C, \quad (C \cap D) \cup B, \quad (C \cap B) \setminus D, \quad (C \setminus D) \cap C(B).$$

Exercise

Prove that the following are equivalent.

$$i)\, A \subset B, \qquad ii)\, A \cup B = B, \qquad iii)\, A \cap B = A, \qquad iv)\, A \setminus B = \emptyset.$$