IMM 2 Sets

2.1 How many different set are there: $\{1,2,3,1,3,2,4\}$, $\{1,3,4,\sqrt{4},2{\cdot}3\}$, $\{\frac{9}{3},2,3,4,(-1)^2,3+1\}$,$\{1,2,3,4\}$.

2.2 Let $p(x), q(x)$ be polynomials, let $r(x) = p^2(x) + q^2(x)$. What inclusions holds between the sets of there zeros.

2.3 Give an example of two different empty sets. ? Is $\emptyset = \{\emptyset\}$?

2.4 Give an example of a two-element set such that every its element is its subset.

2.5 Is it true for $a, A, B, \mathcal{A}$?
a) if $a \in A$ and $A \in \mathcal{A}$ then $a \in \mathcal{A}$?
b) if $a \in A$ and $A = B$ then $a \in B$?
c) if $a \in A$ and $A \neq B$ then $a \notin B$?
d) if $a \notin A$ and $A \neq B$ then $a \in B$?

2.6 What can you say about A and B if:
a) $A \cup B = \emptyset$, b) $A - B = \emptyset$, c) $A - B = B - A$.

2.7 Prove or disprove the following equalities? For the false one find simple relations between occurring sets equivalent to the given equality.
a)$A \setminus [(B \setminus C) \cup (C \setminus B)] = A \cap (B \cup -C) \cap (C \cup -B)$,
b)$(A \setminus C) \cup (B \cap C) = [(A \cup C) \cap B] \cup A$,
c) $A \cup (B - C) = [(A \cup B) - C] \cup (A \cap C)$,
d) $(A \cup B \cup C) - (A \cup B) = C$,
e) $(A - B) \cup B = A \cup B$,
f) $A \cap B - A \cap B \cap C = A \cap B - C$,
g) $[(A \cap B) \cup (C \setminus D)] \cap (D \setminus A) = (C \cap D) \setminus (A \cup B)$.

2.8 Let $A \div B = (A - B) \cup (B - A)$. Prove that
a) $A = B \Leftrightarrow A \div B = \emptyset$,
b) $A \div C \subseteq (A \div B) \cup (B \div C)$,
c) $A \div (B \div C) = (A \div B) \div C$,
d) $(A \div B) \cup (A \cap B) = A \cup B$.

2.9 Prove or disprove the following equalities?
a) $\mathcal{P}(X \cap Y) = \mathcal{P}(X) \cap \mathcal{P}(Y)$,
b) $\mathcal{P}(X \cup Y) = \mathcal{P}(X) \cup \mathcal{P}(Y)$,
c) $A \times (B \cup C) = (A \times B) \cup (A \times C)$,
d) $A \times (B \cap C) = (A \times B) \cap (A \times C)$,
e) $A \times (B - C) = (A \times B) - (A \times C)$,
f) $(A \times Y) \cap (B \times X) = A \times B$ dla $A \subseteq X$, $B \subseteq Y$,
g) $A \times B = B \times A$,
h) $(A \cap B) \times (C \cap D) = (A \cap C) \times (B \cap D)$.