EIDMA. PROBLEM SET 4 PART 1

1. Prove that the sentence $((A \subseteq B) \wedge (C \subseteq D)) \Rightarrow ((A \setminus D) \subseteq (B \setminus C))$ is true for all sets A, B, C, D. Beside the formal proof you may also present a less formal explanation what this sequence actually means and how it can be justified in simple words.

2. Let $k\mathbb{N}$ denote the set of all natural numbers divisible by k (including 0). Draw a picture describing correctly all the possible inclusion relations between the sets $A = 4\mathbb{N}, B = 6\mathbb{N}, C = 16\mathbb{N}, D = 24\mathbb{N}$ and their intersections. Eg. if the sets $A \cap B$ and D are equal, that fact has to be visible in the picture; if they aren't, we have to see that they aren't. The sets should preferably be represented as ovals or polygons on the plane.

3. Decide which of the below equalities are identities true for all possible sets A, B, C:

   i) $A \cup (B \setminus C) = ((A \cup B) \setminus C) \cup (A \cap C)$

   ii) $(A \cup B) \setminus B = (A \cup C) \setminus C$

   iii) $(A \div B) \div C = A \div (B \div C)$

   iv) $(A \cup B) \div C = (A \div C) \cup (B \div C)$

   v) $(A \cap B) \div C = (A \div C) \cap (B \div C)$

   Remark. The symbol $A \div B$ denotes here the symmetric difference of the sets A and B, ie. $A \div B = (A \setminus B) \cup (B \setminus A)$. There seeems to be no fixed notation; the symbols $A \triangle B, A \ominus B$ and probably many others are also used.