HOMEWORK 3

Question 1. Let A and B be any sets. Prove that

$$(A \cup B) \smallsetminus (A \cap B) = (A \smallsetminus B) \cup (B \smallsetminus A).$$

Question 2. For each of the following statements, give either give a proof or give a counterexample.

(a) Let A, B and C be any sets. Then

$$A \cup (B \smallsetminus C) = (A \cup B) \smallsetminus (A \cup C).$$

(a) Let A, B and C be any sets. Then

$$A \cap (B \smallsetminus C) = (A \cap B) \smallsetminus (A \cap C).$$

Question 3.   (a) For each $q \in \mathbb{Q}^+$, let $D_q = (1/2 - q, 1/2 + q)$. Find

$$\bigcup_{q \in \mathbb{Q}} D_q \quad \text{and} \quad \bigcap_{q \in \mathbb{Q}} D_q.$$

(b) For each $q \in \mathbb{Q}$, let $K_q = \mathbb{R} \smallsetminus \{q\}$. Find

$$\bigcup_{q \in \mathbb{Q}} K_q \quad \text{and} \quad \bigcap_{q \in \mathbb{Q}} K_q.$$

Question 4. Let A and B be any sets. Prove that

$$\mathcal{P}(A) \cup \mathcal{P}(B) \subseteq \mathcal{P}(A \cup B).$$