**Problem 1** Let $A = \{1, 3, 4, 7, 8\}$ and $B = \{2, 4, 3, 6, 9\}$. Find $A \cup B,\ A \cap B, B \setminus A$.

**Problem 2** Show: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

**Problem 3** Show: If $A \cup B = B$, then $A \subseteq B$.

**Problem 4** 1. Show: $(A \cap B)^c = A^c \cup B^c$.

2. State the corresponding result in propositional logic.

**Problem 5** Find $\bigcap_{n\in\mathbb{N}} \left[0, 1 + \frac{1}{n}\right] = [0, 2] \cap \left[0, 1 + \frac{1}{2}\right] \cap \left[0, 1 + \frac{1}{3}\right] \cap \ldots$.

**Problem 6** Find $\bigcap_{n\in\mathbb{N}} \left[1, 1 + \frac{1}{n}\right]$.

**Problem 7** Find $\bigcap_{n\in\mathbb{N}} \left(1, 1 + \frac{1}{n}\right)$.

**Problem 8** 1. Show $\bigcup_{n\in\mathbb{N}} (A_n)^c \subseteq \left(\bigcap_{n\in\mathbb{N}} A_n\right)^c$.

2. Show $\left(\bigcap_{n\in\mathbb{N}} A_n\right)^c \subseteq \bigcup_{n\in\mathbb{N}} (A_n)^c$.