Math 437: Homework Section 0

1. (0.0.0)
   Prove $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

   Proof. Proof. Let $x \in A \cap (B \cup C)$. Then $x \in A$ and $x \in B \cup C$, so $x \in B$ or $x \in C$. Without loss of generality, suppose $x \in B$. Then $x \in A \cap B$. Therefore $x \in (A \cap B) \cup (A \cap C)$, and hence, $A \cap (B \cup C) \subseteq (A \cap B) \cup (A \cap C)$. On the other hand, let $x \in (A \cap B) \cup (A \cap C)$. Then $x \in A \cap B$ or $x \in A \cap C$. Without loss of generality, suppose $x \in A$ and $x \in C$. Thus, $x \in B \cup C$. Therefore $x \in A \cap (B \cup C)$, and hence, $(A \cap B) \cup (A \cap C) \subseteq A \cap (B \cup C)$. $\square$ $\square$