Set theory Problem

February 19, 2023

1. Union and intersection involving infinite collections of sets are defined as follows:
   Let $\{S_\alpha | \alpha \in A\}$ be a collection of sets, where A is an index set that can be of any size. Then

   $$\bigcup_{\alpha \in A} S_\alpha = \{x | \exists \alpha \in A \text{ s.t. } (x \in S_\alpha)\}$$

   and

   $$\bigcap_{\alpha \in A} S_\alpha = \{x | \forall \alpha \in A, \ x \in S_\alpha\}$$

   Show that the distributed laws holds in the following forms:

   $$\bigcup_{\alpha \in A} (T \cap S_\alpha) = T \cap \left(\bigcup_{\alpha \in A} S_\alpha \right)$$

   $$\bigcap_{\alpha \in A} (T \cup S_\alpha) = T \cup \left(\bigcap_{\alpha \in A} S_\alpha \right)$$

Solution: