

4.5 Fundamental Properties of Set Operations

Thm 4.19 For sets A, B , and C ,

(1) Commutative Laws

$$\begin{aligned} \text{(a)} \quad & A \cup B = B \cup A \\ \text{(b)} \quad & A \cap B = B \cap A \end{aligned}$$

(2) Associative Laws

$$\begin{aligned} \text{(a)} \quad & A \cup (B \cap C) = (A \cup B) \cap C \\ \text{(b)} \quad & A \cap (B \cup C) = (A \cap B) \cup C \end{aligned}$$

(3) Distributive Laws

$$\begin{aligned} \text{(a)} \quad & A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \\ \text{(b)} \quad & A \cap (B \cup C) = (A \cap B) \cup (A \cap C) \end{aligned}$$

(4) DeMorgan's Laws

$$\begin{aligned} \text{(a)} \quad & \overline{A \cup B} = \overline{A} \cap \overline{B} \\ \text{(b)} \quad & \overline{A \cap B} = \overline{A} \cup \overline{B} \end{aligned}$$

Read proofs of Thm 4.19 (1a)(3a)(4a) in p.79.

Ex4.28 Prove: $\overline{\overline{A \cap B}} = \overline{A} \cup \overline{B}$.

(Pf):

(4.5 cont)

Ex4.27 Prove: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
(Pf):