Theorem 6.2.2

Set Identities

Let all sets below be subsets of a universal set $\mathcal{U}$.

① Commutative Laws For all sets A and B,

ⓐ $A \cup B = B \cup A$

ⓑ $A \cap B = B \cap A$

② Associative Laws For all sets A, B, and C,

ⓐ $(A \cup B) \cup C = A \cup (B \cup C)$

ⓑ $(A \cap B) \cap C = A \cap (B \cap C)$

③ Distributive Laws For all sets A, B, and C,

ⓐ $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

ⓑ $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

④ Identity Laws For any set A,

ⓐ $A \cup \emptyset = A$

ⓑ $A \cap \mathcal{U} = A$

⑤ Complement Laws For any set A,

ⓐ $A \cup A^c = \mathcal{U}$

ⓑ $A \cap A^c = \emptyset$

⑥ Double Complement Law For any set A,

$(A^c)^c = A$.

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Theorem 6.2.2 (continued)

Let all sets below be subsets of a universal set $\mathcal{U}$.

⑦ **Idempotent Laws** for any set A,

ⓐ $A \cup A = A$

ⓑ $A \cap A = A$

⑧ **Universal Bound Laws** For any set A,

ⓐ $A \cup \mathcal{U} = \mathcal{U}$

ⓑ $A \cap \emptyset = \emptyset$

⑨ **DeMorgan's Laws** For any sets A and B,

ⓐ $(A \cup B)^c = A^c \cap B^c$

ⓑ $(A \cap B)^c = A^c \cup B^c$

⑩ **Absorptions Laws** For any sets A and B,

ⓐ $A \cup (A \cap B) = A$

ⓑ $A \cap (A \cup B) = A$

⑪ **Complements of $\mathcal{U}$ and $\emptyset$**

ⓐ $\mathcal{U}^c = \emptyset$

ⓑ $\emptyset^c = \mathcal{U}$

⑫ **Set Difference Law** For all sets A and B,

$A - B = A \cap B^c$

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