Set Identities

Let all sets referred to below be subsets of a universal set U.

1. *Commutative Laws*: For all sets A and B,
$$\text{(a) } A \cup B = B \cup A \text{ and (b) } A \cap B = B \cap A$$

2. *Associative Laws*: For all sets A, B, and C,
$$\text{(a) } (A \cup B) \cup C = A \cup (B \cup C) \text{ and (b) } (A \cap B) \cap C = A \cap (B \cap C)$$

3. *Distributive Laws*: For all sets A, B,and C,
$$\text{(a) } A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \text{ and (b) } A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

4. *Identity Laws*: For all sets A,
$$\text{(a) } A \cup \emptyset = A \text{ and (b) } A \cap U = A$$

5. *Complement Laws*: For all sets A,
$$\text{(a) } A \cup A^C = U \text{ and (b) } A \cap A^C = \emptyset$$

6. *Double Complement Law*: For all sets A,
$$(A^C)^C = A$$

7. *Idempotent Laws*: For all sets A,
$$\text{(a) } A \cup A = A \text{ and (b) } A \cap A = A$$

8. *Universal Bound Laws*: For all sets A,
$$\text{(a) } A \cup U = U \text{ and (b) } A \cap \emptyset = \emptyset$$

9. *De Morgan's Laws*: For all sets A and B,
$$\text{(a) } (A \cup B)^C = A^C \cap B^C \text{ and (b) } (A \cap B)^C = A^c \cup B^C$$

10. *Absorption Laws*: For all sets A and B,
$$\text{(a) } A \cup (A \cap B) = A \text{ and (b) } A \cap (A \cup B) = A$$

11. *Complements of U and $\emptyset$*:
$$\text{(a) } U^C = \emptyset \text{ and (b) } \emptyset^C = U$$

12. *Set Difference Law*: For all sets A and B,
$$A \setminus B = A \cap B^C$$