Set Identities

Identity	$A \cup \emptyset = A$	$A \cap \mathcal{U} = A$
Domination	$A \cap \emptyset = \emptyset$	$A \cup \mathcal{U} = \mathcal{U}$
Idempotent	$A \cap A = A$	$A \cup A = A$
Involution	$\overline{(\overline{A})} = A$	
Complement	$A \cup \overline{A} = \mathcal{U}$	$A \cap \overline{A} = \emptyset$
Commutative	$A \cup B = B \cup A$	$A \cap B = B \cap A$
Associative	$(A \cup B) \cup C = A \cup (B \cup C)$	$(A \cap B) \cap C = A \cap (B \cap C)$
Distributive	$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
DeMorgan	$\overline{(A \cup B)} = \overline{A} \cap \overline{B}$	$\overline{(A \cap B)} = \overline{A} \cup \overline{B}$
Absorption	$A \cup (A \cap B) = A$	$A \cap (A \cup B) = A$

Proving set identities

To show two sets X and Y are equal, show that $X \subseteq Y$ and $Y \subseteq X$. For example, consider the first absorption law. If $x \in A \cup (A \cap B)$, then either $x \in A$ or $x \in A \cap B$. In both cases, $x \in A$, and so $A \cup (A \cap B) \subseteq A$. On the other hand, if $x \in A$, then it is trivial to say that $x \in A$ ***or*** $x \in A \cap B$; thus $x \in A \cup (A \cap B)$ and $A \subseteq A \cup (A \cap B)$. Therefore $A \cup (A \cap B) = A$.