

## Math 163 – Laws of Logic

Law	Logic	Sets	Boolean Algebra
Identity	$p \wedge 1 \Leftrightarrow p$	$A \cap U = A$	$A \cdot 1 = A$
	$p \vee 1 \Leftrightarrow 1$	$A \cup U = U$	$A + 1 = 1$
	$p \wedge 0 \Leftrightarrow 0$	$A \cap \emptyset = \emptyset$	$A \cdot 0 = 0$
	$p \vee 0 \Leftrightarrow p$	$A \cup \emptyset = A$	$A + 0 = A$
Idempotent	$p \wedge p \Leftrightarrow p$	$A \cap A = A$	$AA = A$
	$p \vee p \Leftrightarrow p$	$A \cup A = A$	$A+A = A$
Complement	$\overline{\overline{p}} \Leftrightarrow p$	$\overline{\overline{A}} = A$	$\overline{\overline{A}} = A$
	$p \wedge \overline{p} \Leftrightarrow 0$	$A \cap \overline{A} = \emptyset$	$A \overline{A} = 0$
	$p \vee \overline{p} \Leftrightarrow 1$	$A \cup \overline{A} = U$	$A + \overline{A} = 1$
Commutative	$p \wedge q \Leftrightarrow q \wedge p$	$A \cap B = B \cap A$	$AB = BA$
	$p \vee q \Leftrightarrow q \vee p$	$A \cup B = B \cup A$	$A + B = B + A$
Associative	$(p \wedge q) \wedge r \Leftrightarrow p \wedge (q \wedge r)$	$(A \cap B) \cap C = A \cap (B \cap C)$	$(AB)C = A(BC)$
	$(p \vee q) \vee r \Leftrightarrow p \vee (q \vee r)$	$(A \cup B) \cup C = A \cup (B \cup C)$	$(A+B)+C = A+(B+C)$
De Morgan's	$\overline{p \wedge q} \Leftrightarrow \overline{p} \vee \overline{q}$	$\overline{A \cap B} = \overline{A} \cup \overline{B}$	$\overline{AB} = \overline{A} + \overline{B}$
	$\overline{p \vee q} \Leftrightarrow \overline{p} \wedge \overline{q}$	$\overline{A \cup B} = \overline{A} \cap \overline{B}$	$\overline{A+B} = \overline{A} \overline{B}$
Distributive	$p \wedge (q \vee r) \Leftrightarrow (p \wedge q) \vee (p \wedge r)$	$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	$A(B+C) = AB + AC$
	$p \vee (q \wedge r) \Leftrightarrow (p \vee q) \wedge (p \vee r)$	$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$	$A + BC = (A+B)(A+C)$
Absorption	$p \wedge (p \vee q) \Leftrightarrow p$	$A \cap (A \cup B) = A$	$A(A+B) = A$
	$p \wedge (\overline{p} \vee q) \Leftrightarrow p \wedge q$	$A \cap (\overline{A} \cup B) = A \cap B$	$A(\overline{A} + B) = AB$
	$p \vee (p \wedge q) \Leftrightarrow p$	$A \cup (A \cap B) = A$	$A + \overline{A}B = A$
	$p \vee (\overline{p} \wedge q) \Leftrightarrow p \vee q$	$A \cup (\overline{A} \cap B) = A \cup B$	$A + \overline{A}B = A + B$