Boolean Algebra

Boolean Algebra Basics

- $+$ means OR
- $\cdot$ means AND; $A \cdot B$ is the same as AB
- AND has higher precedence than OR
- Commutative Rules

$$\begin{aligned} A + B &= B + A \\ A \cdot B &= B \cdot A \end{aligned}$$

- Associative Rules

$$\begin{aligned} A + (B + C) &= (A + B) + C \\ A \cdot (B \cdot C) &= (A \cdot B) \cdot C \end{aligned}$$

- Distributive Rules

$$\begin{aligned} A \cdot (B + C) &= (A \cdot B) + (A \cdot C) \\ A + (B \cdot C) &= (A + B) \cdot (A + C) \end{aligned}$$

Boolean Algebra Theorems

$$\begin{aligned} A + AB &= A && (1) \\ A + \overline{A}B &= A + B && (2) \\ AB + \overline{A}C + BC &= AB + \overline{A}C && (3) \\ A(A + B) &= A && (4) \\ A(\overline{A} + B) &= AB && (5) \\ (A + B)(A + \overline{B}) &= A && (6) \\ (A + B)(\overline{A} + C) &= AC + \overline{A}B && (7) \\ (A + B)(\overline{A} + C)(B + C) &= (A + B)(\overline{A} + C) && (8) \end{aligned}$$

DeMorgan's Laws

$$\begin{aligned} \overline{ABC} &= \overline{A} + \overline{B} + \overline{C} && (9) \\ \overline{A + B + C} &= \overline{A} \cdot \overline{B} \cdot \overline{C} && (10) \end{aligned}$$