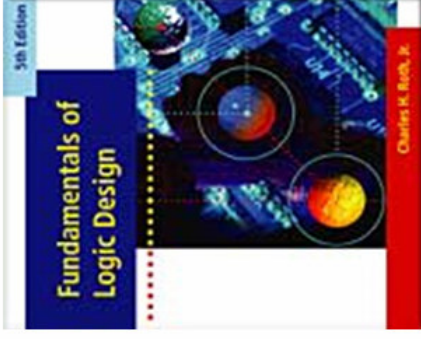


FIGURES FOR CHAPTER 3

BOOLEAN ALGEBRA (continued)



This chapter in the book includes:

- Objectives
- Study Guide
- 3.1 Multiplying Out and Factoring Expressions
- 3.2 Exclusive-OR and Equivalence Operations
- 3.3 The Consensus Theorem
- 3.4 Algebraic Simplification of Switching Expressions
- 3.5 Proving the Validity of an Equation
- Programmed Exercises
- Problems

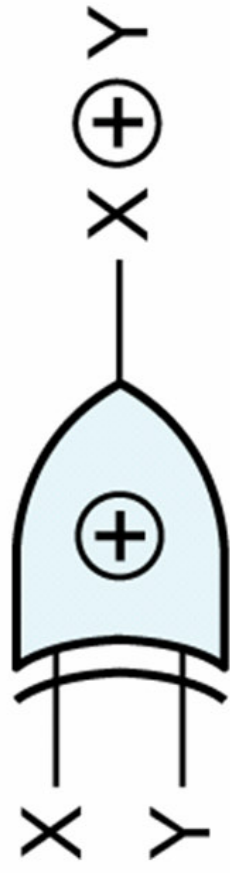
**Click the mouse to move to the next page.
Use the ESC key to exit this chapter.**

EXAMPLE:

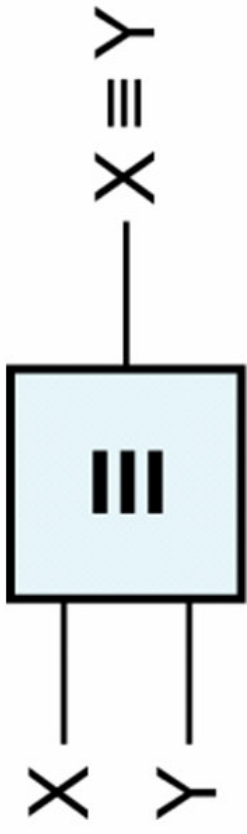
$$\begin{aligned} & (A + B + C')(A + B + D)(A + B + E)(A + D' + E)(A' + C) \\ &= (A + B + C'D)(A + B + E)[AC + A'(D' + E)] \\ &= (A + B + C'DE)(AC + A'D' + A'E) \\ &= AC + ABC + A'BD' + A'BE + A'C'DE \end{aligned}$$

Example (3-4), p. 59





Section 3.2, p. 61



Section 3.2, p. 62



Section 3.2, p. 62

The consensus theorem can be stated as follows:

$$XY + X'Z + YZ = XY + X'Z$$

Proof:

$$\begin{aligned} XY + X'Z + YZ &= XY + X'Z + (X + X')YZ \\ &= (XY + X'YZ) + (X'Z + X'YZ) \\ &= XY(1 + Z) + X'Z(1 + Y) = XY + X'Z \end{aligned}$$

Example (3-20), p 63

$$\begin{aligned}
& \underbrace{A'B'C'D' + A'BC'D'}_{\textcircled{1} A'C'D'} + A'BD + A'BC'D + ABCD + ACD' + B'CD' \\
&= A'C'D' + BD(A' + AC) + ACD' + B'CD' \\
&= A'C'D' + A'BD + \underbrace{BCD + ACD'}_{\textcircled{3}} + B'CD' \\
&\quad + \underbrace{ABC}_{\textcircled{4}} \quad \text{consensus } ACD' \\
&= \underbrace{A'C'D' + A'BD + BCD + ACD' + B'CD' + ABC}_{\text{consensus } BCD} \\
&= A'C'D' + A'BD + B'CD' + ABC
\end{aligned}$$

What theorems were used in steps 1, 2, 3, and 4?

Example (3-28), p 65

$$A'BD' + BCD + ABC' + AB'D = BC'D' + AD + A'BC$$

$$\begin{aligned}
 & A'BD' + BCD + ABC' + AB'D \\
 &= A'BD' + BCD + ABC' + AB'D + BC'D' + A'BC + ABD \\
 &\quad \text{(add consensus of } A'BD' \text{ and } ABC') \\
 &\quad \text{(add consensus of } A'BD' \text{ and } BCD) \\
 &\quad \text{(add consensus of } BCD \text{ and } ABC') \\
 &= AD + A'BD' + BCD + ABC' + BC'D' + A'BC = BC'D' + AD + A'BC \\
 &\quad \text{(eliminate consensus of } BC'D' \text{ and } AD) \\
 &\quad \text{(eliminate consensus of } AD \text{ and } A'BC) \\
 &\quad \text{(eliminate consensus of } BC'D' \text{ and } A'BC)
 \end{aligned}$$

Example 1, p 66