HW 7.2-assigned:

Prove:

$$(x+y)(y+z)(z+x') = (x+y)(z+x')$$

Prove : $(x+y)(y+z)(z+x') = (x+y)(z+x') \rightarrow$

L.S : $(xy + xz + y + yz)(z+x')$

$$xyz + \underbrace{xyx'}_{0} + x\underbrace{zz}_{z} + \underbrace{xzx'}_{0} + yz + yx' + y\underbrace{zz}_{z} + yzx'$$

$$\underbrace{xyz + xz}_{xz} + \underbrace{yz + yx'}_{yz} + \underbrace{yz + yxx'}_{yx'}$$

$xz + yz + yx'$

R.S : $(x+y)(z+x')$

$$xz + \underbrace{xx'}_{0} + yz + yx'$$

$xz + yz + yx'$

HW 7.3-assigned (4 exercises):

2–2. *Prove the identity of each of the following Boolean equations, using algebraic manipulation:

(a) $\overline{X}\,\overline{Y} + \overline{X}Y + XY = \overline{X} + Y$

(b) $\overline{A}B + \overline{B}\,\overline{C} + AB + \overline{B}C = 1$

(c) $Y + \overline{X}Z + X\overline{Y} = X + Y + Z$

(d) $\overline{X}\,\overline{Y} + \overline{Y}Z + XZ + XY + Y\overline{Z} = \overline{X}\,\overline{Y} + XZ + Y\overline{Z}$

Absorptions

a) $x'y' + x'y + xy = x'\overbrace{(y'+y)}^{1} + xy = x' + xy = \boxed{x' + y}$

b) $\bar{a}b + \bar{b}\bar{c} + ab + \bar{b}c = b(\bar{a} + a) + \bar{b}(\bar{c} + c) = b + \bar{b} = \boxed{1}$

c) $\overbrace{y + \bar{x}z + x\bar{y}}^{\text{absorption}} = y + \overbrace{\bar{x}z + x}^{\text{absorption}} = \boxed{y + z + x}$

d) $\bar{x}\bar{y} + \bar{y}z + xz + xy + yz = \bar{x}\bar{y} + xz + yz + yz + xy = \boxed{xy + xz + yz}$

2–4. +Given that $A \cdot B = 0$ and $A + B = 1$, use algebraic manipulation to prove that

$$(A+C)\cdot(\bar{A}+B)\cdot(B+C) = B\cdot C$$

$\boxed{*A = \bar{B} \quad B = \bar{A}}$

$(A\bar{A} + \underbrace{AB}_{0} + C\bar{A} + BC)(B+C) = BC$

$A\bar{A}B + \bar{A}AC + C\bar{A}B + C\bar{A}C + BCB + BCC = BC$

$BC = BC$

idempotent law: $A * A = A$

$A + A = A$

associative law: $(A * B) * C = A * (B * C)$

$(A+B)+C = A+(B+C)$

commutative law: $A * B = B * A$

$A + B = B + A$

distributive law: $A * (B+C) = A * B + A * C$

$A + (B * C) = (A+B) * (A+C)$

identity law: $A * 0 = 0$

$A * 1 = A$

$A + 1 = 1$

$A + 0 = A$

2–8. Using DeMorgan's theorem, express the function

$$F = A\overline{B}C + \overline{A}\,\overline{C} + AB$$

(a) with only OR and complement operations
(b) with only AND and complement operations.

demorgans law

a) $((x \cdot y)')' = (x' + y')'$

b) $x + y = ((x + y)')' = (x' + y')'$

Complement law: $A * \sim A = 0$

$A + \sim A = 1$

Involution law: $\sim(\sim A) = A$

Demorgans law: $\sim(A * B) = \sim A + \sim B$

$\sim(A + B) = \sim A * \sim B$

Absorption law: $A + (A * B) = A$

$A * (A + B) = A$

$(A * B) + (A * \sim B) = A$

$(A + B) * (A + \sim B) = A$

$A + (\sim A * B) = A + B$

$A * (\sim A + B) = A * B$

2–9. *Find the complement of the following expressions:

(a) $A\bar{B} + \bar{A}B$

(b) $(\bar{V}W + X)Y + \bar{Z}$

(c) $WX(\bar{Y}Z + Y\bar{Z}) + \bar{W}\bar{X}(\bar{Y} + Z)(Y + \bar{Z})$

(d) $(A + \bar{B} + C)(\bar{A}\bar{B} + C)(A + \bar{B}\bar{C})$

a) $A\bar{B} + \bar{A}B$

$(A\bar{B} + \bar{A}B)$

$(AB \cdot AB)$

$(\bar{A} + B)(A + \bar{B})$

$AB + \bar{A}\bar{B}$

Each law is described by 2 parts that are duals of each other. The principle of duality is

- interchanging the + (OR) and * (AND) operators of the expression
- interchanging the 0 and 1 elements of the expression
- not changing the form of the variables