LAB 2

Question 1

a.

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

A	B	C	ABC	(ABC)'	A'	B'	C'	A'+B'+C'
0	0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	0	1
0	1	0	0	1	1	0	1	1
0	1	1	0	1	1	0	0	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	0	1	0	1
1	1	0	0	1	0	0	1	1
1	1	1	1	0	0	0	0	0

Columns (ABC)' and A'+B'+C' are identical for all input combinations

b. XOR - when odd number of iputs are 1, output is 1.

A	B	C	$D = A \oplus B \oplus C$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Question 2

Q. $A + AB$ Distributive

$A(1+B)$ Dominant

$A(1)$ Identity

A

So $A + AB = A$

b.

$AB + AB'$	Distributive
$A(B + B')$	Compliment
$A(1)$	Identity
A	

So $AB + AB' = A$

c.

$(BC' + A'D)(AB' + CD')$ distributive

$BC' \cdot AB' + BC' \cdot CD' + A'D \cdot AB' + A'D \cdot CD'$

$C'B \cdot B'A = 0$ $(B \cdot B' = 0)$ compliment

$BC' \cdot CD' = 0$ $(C' \cdot C = 0)$ compliment

$DA' \cdot AB = 0$ $(A' \cdot A = 0)$ compliment

$AD \cdot D'C = 0$ $(D \cdot D' = 0)$ compliment

So $(BC' + A'D) + (AB' + CD') =$

$= 0 + 0 + 0 + 0 = 0$

Question 3

a.

$A'BC + AC$	Distributive
$C(A'B + A)$	Absorption
$C(A + B)$	

So $A'BC + AC = C(A + B)$

b.

$A'B + ABC' + ABC$	Distributive
$B(A' + AC' + AC)$	Distributive
$B(A' + A(C' + C))$	Compliment
$B(A' + A(1))$	Identity
$B(A' + A)$	Complimen
$B(1)$	Identity

So $A'B + ABC' + ABC = B$

C.

$AB + A(CD + CD')$ Distributive

$AB + A(C(D + D'))$ Compliment

$AB + A(C(1))$ Identity

$AB + AC$ Distributive

$A(B + C)$

So $AB + A(CD + CD') = A(B + C)$

Question 4

a.

$(A + B)'(A' + B')' = 0$

$(A + B)' = A' \cdot B'$ DeMorgans

$(A'+B')' = (A')' \cdot (B')'$ DeMorgans

$(A')' = A$ Involution

$(B')' = B$ Involution

$A' \cdot B' \cdot A \cdot B = A' \cdot A \cdot B' \cdot B$

$A \cdot A' = 0$, $B' \cdot B = 0$ Complement

$0 \cdot 0 = 0$

So, $(A+B)'(A'+B')' =$ by deMorgans

b.

$A + A'B + A'B' = 1$

$A + A'(B+B')$

$B+B' = (B \cdot B')'$ DeMorgans

$A + A'(B \cdot B')'$

$A \cdot A'(B \cdot B')' = (A' \cdot (A'(B \cdot B')')')'$ DeMor.

$A + (B \cdot B')$

$(A'(A + B \cdot B'))'$ Distribute

$A'A + B \cdot B' = 0 + 0 = 0' = 1$

So $A + A'B + A'B' = 1$

Question 5

$F = X'Y + XYZ'$

a.

$F' = (X'Y + XYZ')'$

$(X'Y + XYZ')' = (X'Y)' \cdot (XYZ')'$

$(X'Y)' = (X')' + Y' = X + Y'$

$(XYZ')' = X' + Y' + (Z')' = X' + Y' + Z$

$F' = (X + Y')(X' + Y' + Z)$

b. $F \cdot F' = 0$

$(X'Y + XYZ')(X+Y')(X'+Y'+Z)$ Distrib

$X'Y(X+Y')(X'+Y'+Z) + XYZ'(X+Y')(X'+Y'+Z)$

$X'Y(X+Y') = X'YX + X'YY' = 0+0=0$

$XYZ'(X+Y') = XYZ'X + XYZ'Y' = XYZ' + 0$

$XYZ'(X'+Y'+Z) = XX'YZ' + XZYY' +$

$+ XYZ'Z = 0+0+0=0$

So, $F \cdot F' = 0$

C. $F + F' = 1$

$(X'Y + XYZ') + (X+Y')(X'+Y'+Z)$

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

Let

$A = X'Y + XY2'$

$B = X + Y'$

$C = X' + Y' + 2$

$F + F' = (X'Y + XY2' + X + Y')(X'Y + XY2' + X' + Y' + 2)$

$X'Y + X = X + Y$

$(X + Y) + Y' = X + 1 + 1$

} first factor = 1

$X'Y + X' = X'$

$X' + Y' + 2 + XY2'$

$Y' + XY2' = Y' + X2'$

$X' + Y' + 2 + X2'$

$X' + X2' = X' + 2'$

$X' + Y' + 2 + 2' = 1$

} second factor = 1

So $F + F' = 1 \cdot 1 = 1$.