

CL Tutorial 6

Exercise 1

a)

		cd			
		00	01	11	10
ab	00	1	0	0	1
	01	1	0	0	1
11	0	0	1	1	
10	0	0	1	1	

$$\equiv (\neg d \wedge \neg a) \vee (a \wedge c)$$

b)

		ab			
		00	01	11	10
cd	00	1	0	0	1
	01	1	0	0	1
11	0	0	1	1	
10	0	0	1	1	

$$\begin{aligned} &\equiv \neg[(d \wedge \neg a) \vee (a \wedge \neg c)] \\ &\equiv \neg(d \wedge \neg a) \wedge \neg(a \wedge \neg c) \\ &\equiv (\neg d \vee a) \wedge (\neg a \vee c) \end{aligned}$$

Exercise 2

a	b	$a \rightarrow b$	$b \vee \neg a$
0	0	1	1
1	0	0	0
0	1	1	1
1	1	1	1

		ab			
r	ab	00	01	11	10
0	0	0	0	0	1
1	1	1	1	1	0

$$\equiv (\neg r \wedge a \wedge \neg b) \vee (\neg a \wedge r) \vee (b \wedge r)$$

Exercise 3

a)

a	b	d	$a \vee \neg b$	$\neg a \vee \neg d$
0	0	0	1	1
1	0	0	1	1
0	1	0	0	1
1	1	0	1	1
0	0	1	1	1
1	0	1	1	0
0	1	1	0	1
1	1	1	1	0

		cd			
		00	01	11	10
ab	00	1	1	1	1
	01	1	1	0	0
	11	1	1	0	0
	10	0	0	0	0

b)

$$\begin{aligned}
 & \neg[(\neg c \wedge a \wedge \neg b) \vee (c \wedge a \wedge \neg b) \vee (d \wedge b)] \\
 & \equiv \neg[(a \wedge \neg b) \vee (b \wedge d)] \\
 & \equiv \neg(a \wedge \neg b) \wedge \neg(b \wedge d) \\
 & \equiv (\neg a \vee b) \wedge (\neg b \vee \neg d)
 \end{aligned}$$