Extra Homework
Chapter 3 & 5 Solutions

Chapter 3 #6

b.

Y Z \ W X	00	01	11	10
00		1*		
01		1		
11		1	1	1
10	1	1*		1

f

Y Z \ W X	00	01	11	10
00	1*		1	1
01	1		1*	1
11	1*			
10			1*	

f'

$f = W'X + WYZ + X'YZ'$ $\quad f' = X'Y' + WY' + W'X'Z + WXZ'$

$f = (X + Y)(W' + Y)(W + X + Z')(W' + X' + Z)$

d.

c d \ a b	00	01	11	10
00	1*	1	1	
01			1	1*
11		1*	1	1*
10	1*	1	1	

f

c d \ a b	00	01	11	10
00	1	1	1	
01			1	1
11		1	1	1
10	1	1	1	

f

cd \ a b	00	01	11	10
00				1*
01	1	1*		
11	1*			
0				1*

f'

$f_1 = a'd' + ad + bc + ab$ $\quad f_3' = ab'd' + a'c'd + a'b'd$

$f_2 = a'd' + ad + bc + bd'$ $\quad f_3 = (a' + b + d)(a + c + d')(a + b + d')$

j.

c d \ a b	00	01	11	10
00	1*			
01	1	X		
11	X	X	1	X
10		1*	X	

c d \ a b	00	01	11	10
00		1*	1	1
01		X	1	1
11	X	X		X
10	1*		X	1

c d \ a b	00	01	11	10
00		1	1	1
01		X	1	1
11	X	X		X
10	1		X	1

$f_1 = a'b'c' + bc$ $\quad f_2' = bc' + b'c + ac'$

$f_3' = bc' + b'c + ab'$

$f_2 = (b' + c)(b + c')(a' + c)$

$f_3 = (b' + c)(b + c')(a' + b)$

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Chapter 5 #5

5. A truth table for the product is shown below

a	b	c	d	w	x	y	z
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	1
0	1	1	0	0	0	1	0
0	1	1	1	0	0	1	1
1	0	0	0	0	0	0	0
1	0	0	1	0	0	1	0
1	0	1	0	0	1	0	0
1	0	1	1	0	1	1	0
1	1	0	0	0	0	0	0
1	1	0	1	0	0	1	1
1	1	1	0	0	1	1	0
1	1	1	1	1	0	0	1

There is no need to map w; it is a b c d. The other maps are

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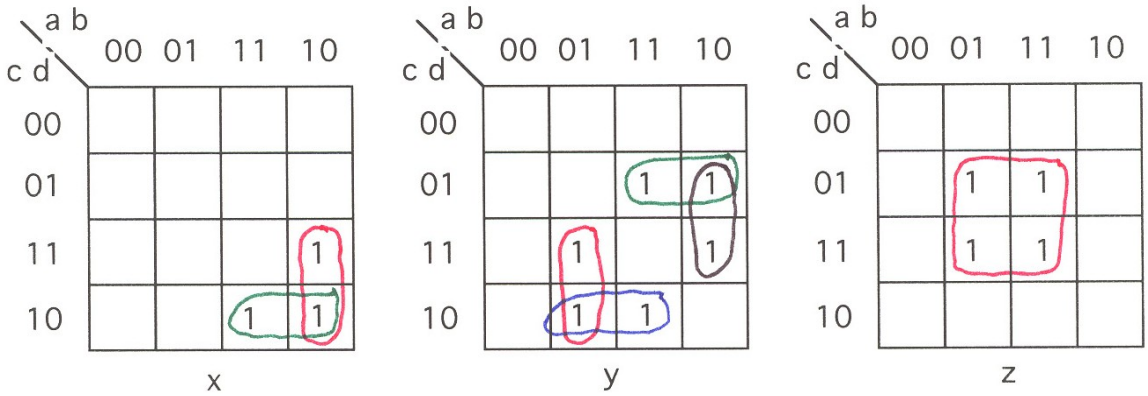

w = a b c d
x = a b' c + a c d'
y = a' b c + a c' d + b c d' + a b' d
z = b d

We could save one gate by sharing in x and y in either of two ways:

x = a b' c + a b c d'
y = a' b c + a c' d + a b c d' + a b' d

or

x = a b' c d + a c d'
y = a' b c + a c' d + b c d' + a b' c d