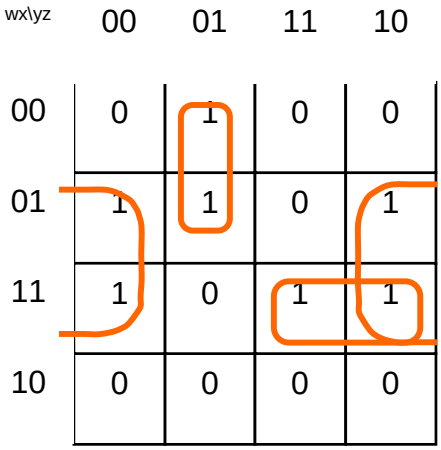
Homework 3 – due 6/2

3-5) Simplify the following Boolean functions, using four-variable maps:

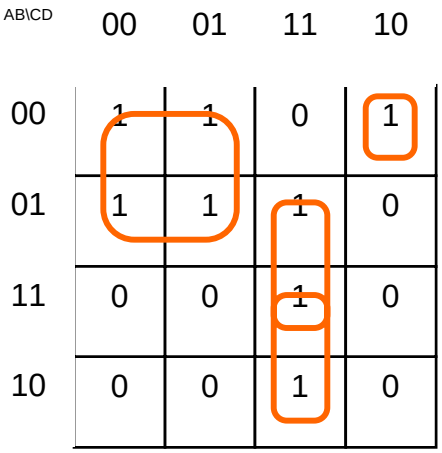
(a) F(w,x,y,z) = Σ(1, 4, 5, 6, 12, 14, 15)
(b) F(A,B,C,D) = Σ(0,1,2,4,5,7,11,15)
(c) F(w,x,y,z) = Σ(2,3,10,11,12,13,14,15)
(d) F(A,B,C,D) = Σ(0,2,4,5,6,7,8,10,13,15)

a)



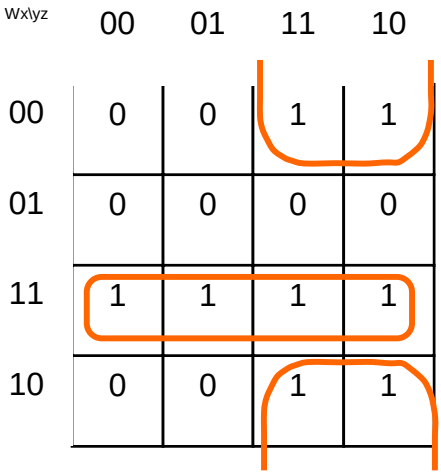
F(w,x,y,z) = w'y'z + xz' + wxy

b)



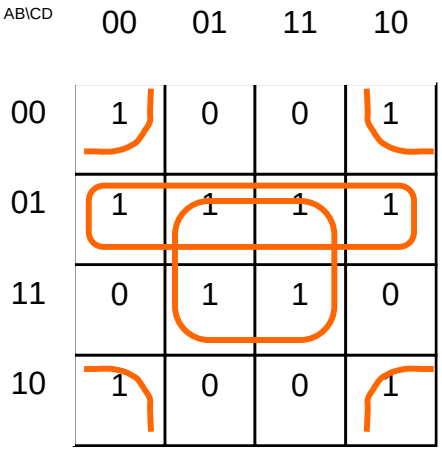
F(A,B,C,D) = A'C' + A'B'D' + BCD + ACD

c)



F(w,x,y,z) = x'y + wx

d)



F(A,B,C,D) = B'D' + A'B + BD

3-7) Simplify the following Boolean expressions, using four-variable maps:

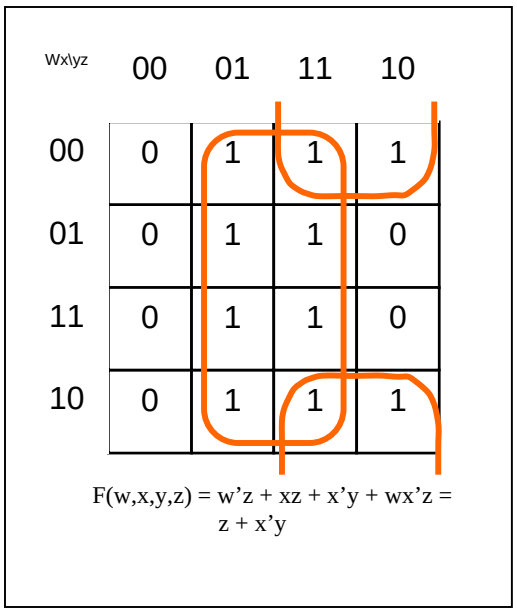
(a) w'z + xz + x'y + wx'z

(b) B'D + A'BC' + AB'C + ABC'

(c) AB'C + B'C'D' + BCD + ACD' + A'B'C + A'BC'D

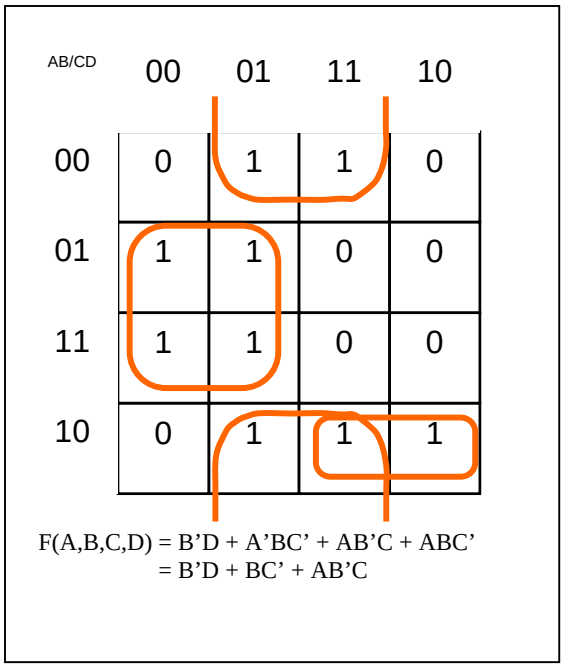
(d) wxy + yz + xy'z' + x'y

a)



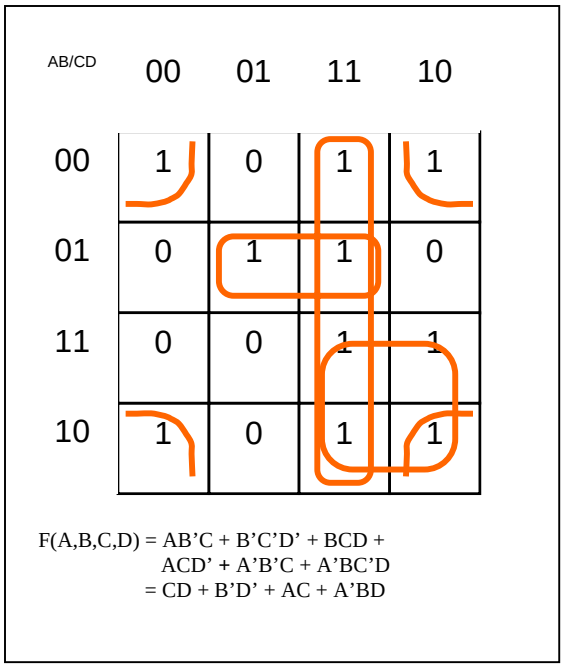
F(w,x,y,z) = w'z + xz + x'y + wx'z =
z + x'y

b)



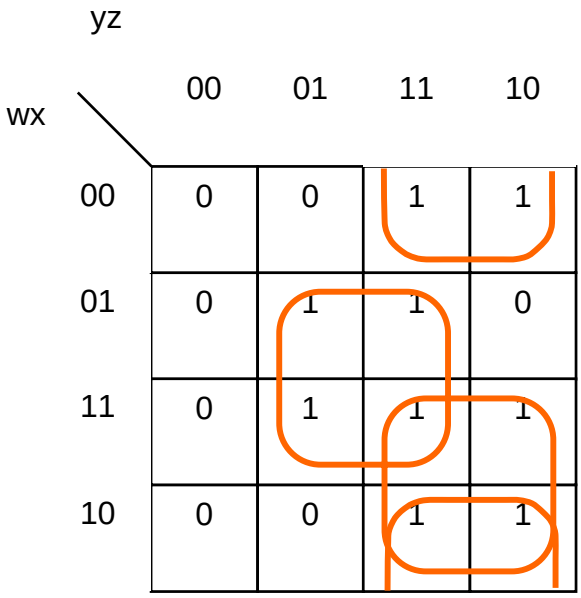
F(A,B,C,D) = B'D + A'BC' + AB'C + ABC'
= B'D + BC' + AB'C

c)



F(A,B,C,D) = AB'C + B'C'D' + BCD +
ACD' + A'B'C + A'BC'D
= CD + B'D' + AC + A'BD

d)

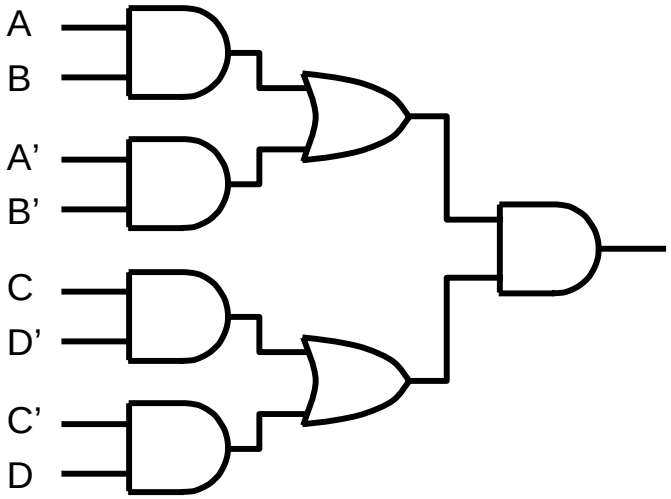


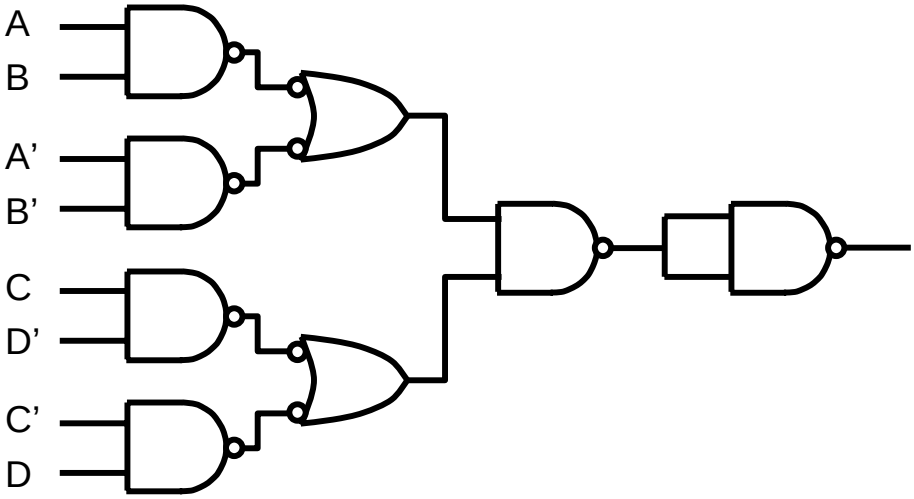
F(w,x,y,z) = wxy + yz + xy'z + x'y =
xz + wy + x'y

3-18) Draw a logic diagram using only two-input NAND gates to implement the following expression:

(AB + A'B')(CD' + C'D)

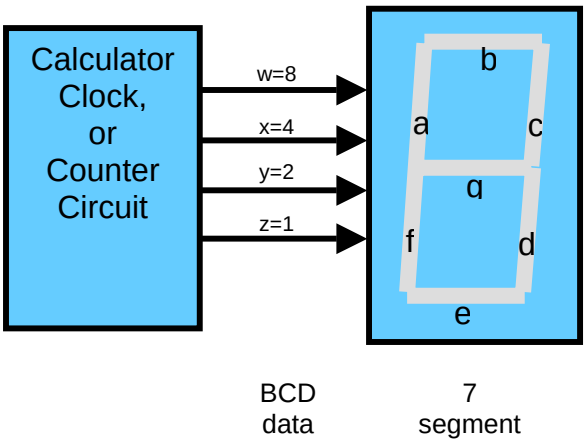
(AB + A'B')(CD' + C'D)

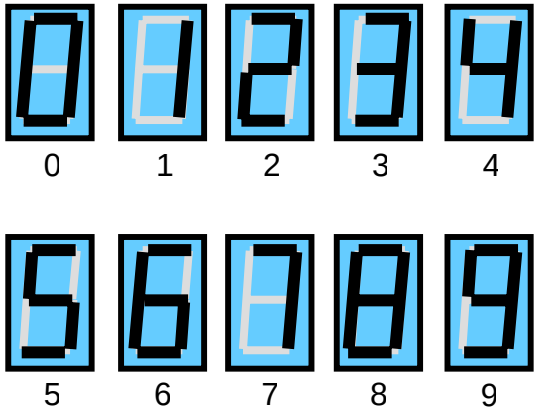




BCD to 7-segment decoder for segments a-f:

a-
b-
c-
d-
e-
f-





a:

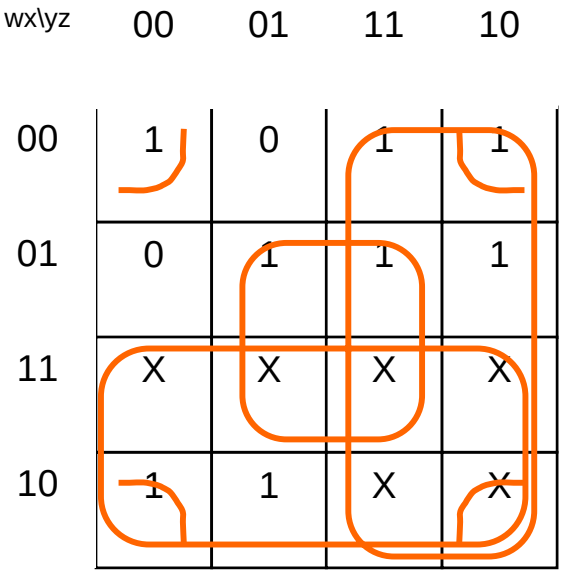
wx\yz	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

$F_a(w,x,y,z) = y'z' + xz' + xy' + w$

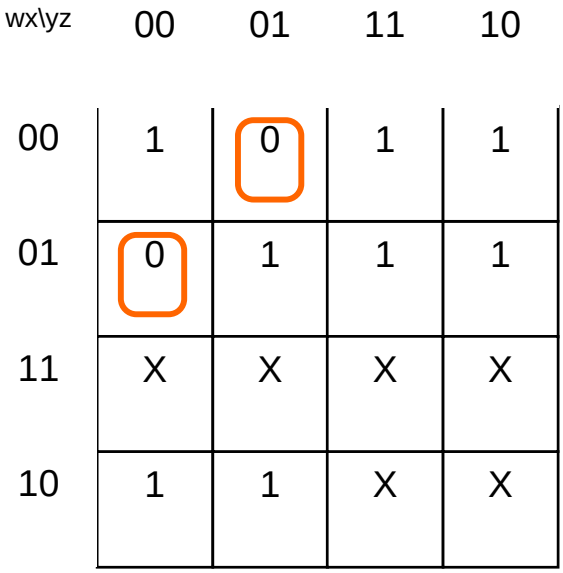
wx\yz	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

$F_a'(w,x,y,z) = w'x'y + w'x'z + yz$

b:

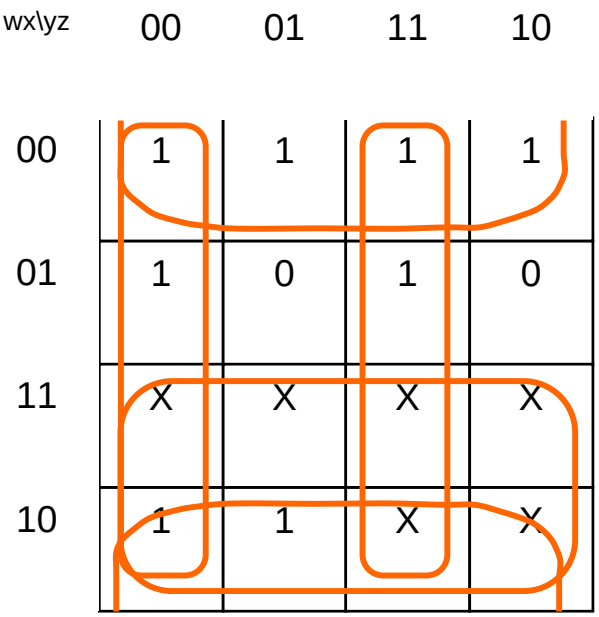


$F_b(w,x,y,z) = y + w + xz + x'z'$

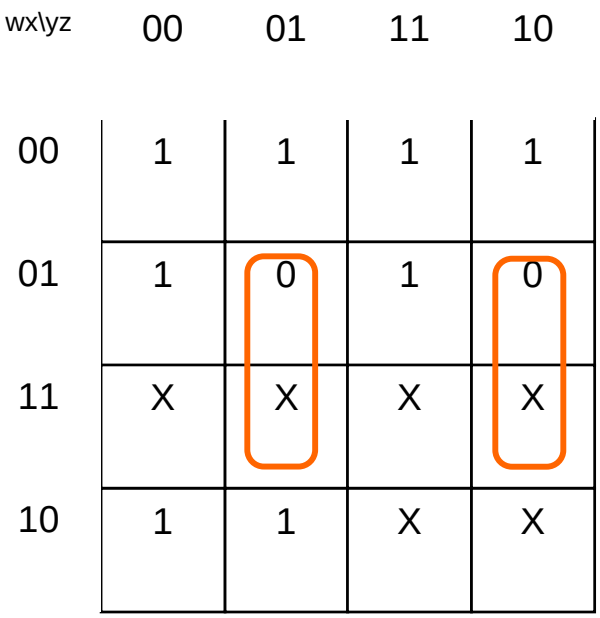


$F_b'(w,x,y,z) = w'x'y'z + w'xy'z'$

c:



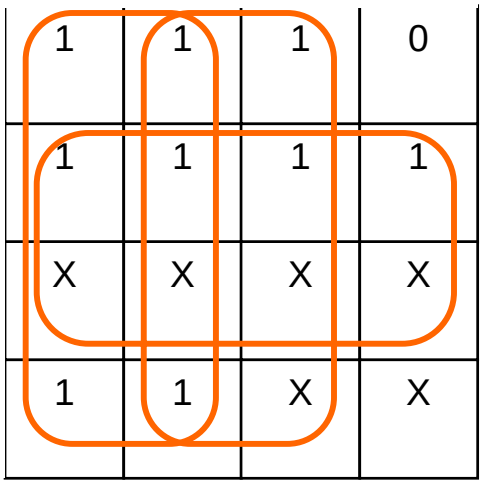
$F_c(w,x,y,z) = x' + w + y'z' + yz$



$F_c'(w,x,y,z) = xy'z + xyz'$

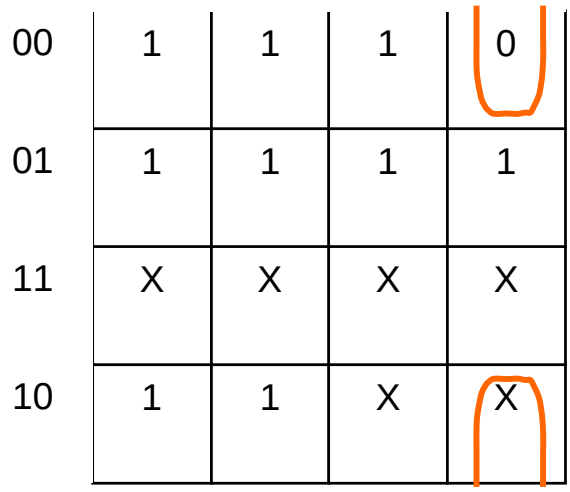
d:

wx\yz	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X



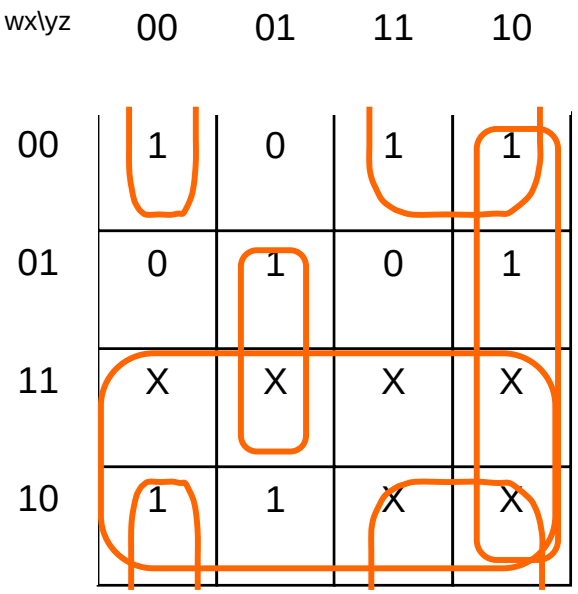
$F_d(w,x,y,z) = x + y' + z$

wx\yz	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

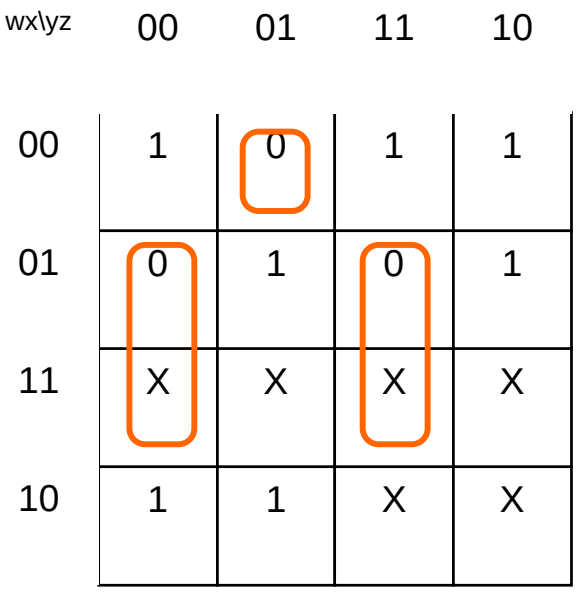


$F_d'(w,x,y,z) = x'yz'$

e:



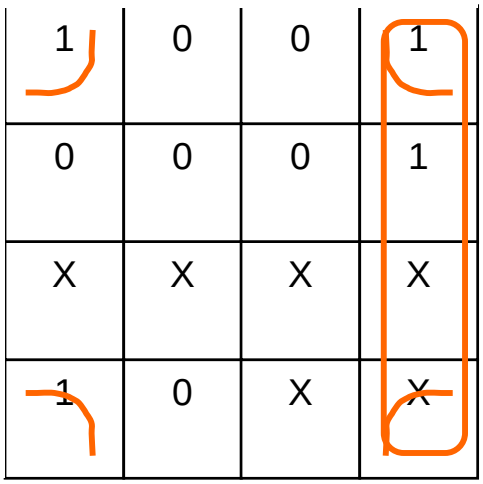
$F_e(w,x,y,z) = w + x'y + yz' + x'y'z' + xy'z$



$F_e'(w,x,y,z) = xy'z' + w'x'y'z + xyz$

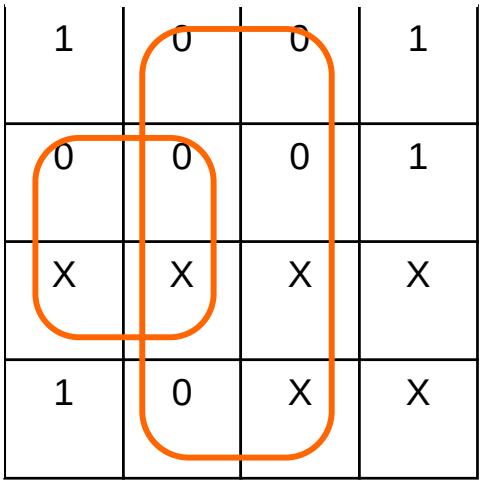
f:

wx\yz	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X



$F_f(w,x,y,z) = x'z' + yz'$

wx\yz	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X



$F_f'(w,x,y,z) = xy' + z$