EE2000 Logic Circuit Design

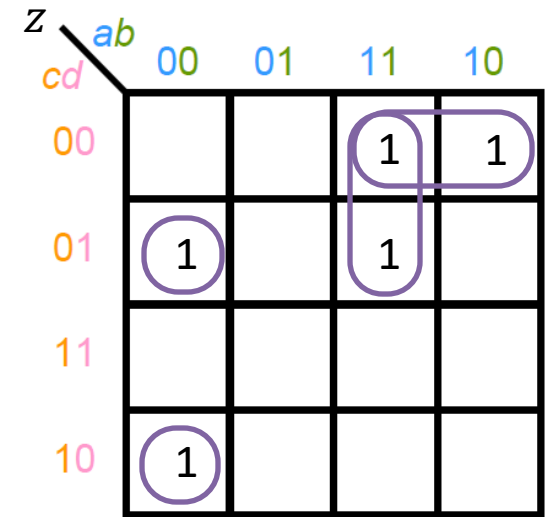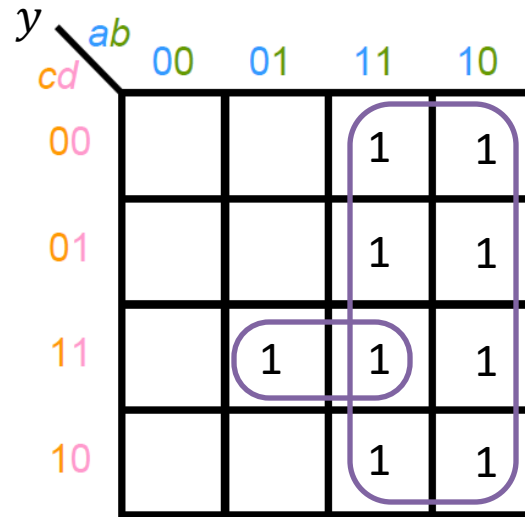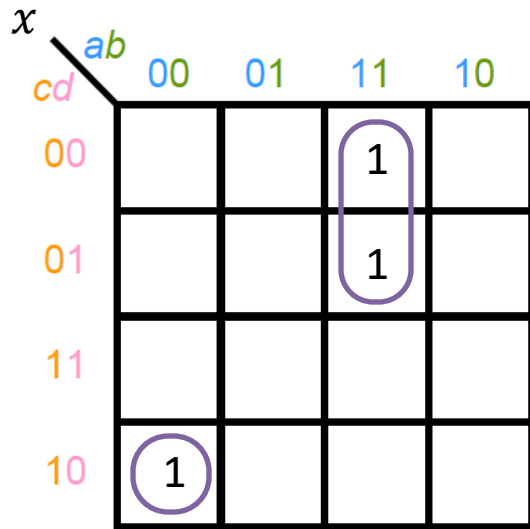## Lecture 6 – Programmable Logic Devices

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Exercise

Implement the following functions with a PAL

$$x(a, b, c, d) = abc' + a'b'cd'$$

$$y(a, b, c, d) = a + bcd$$
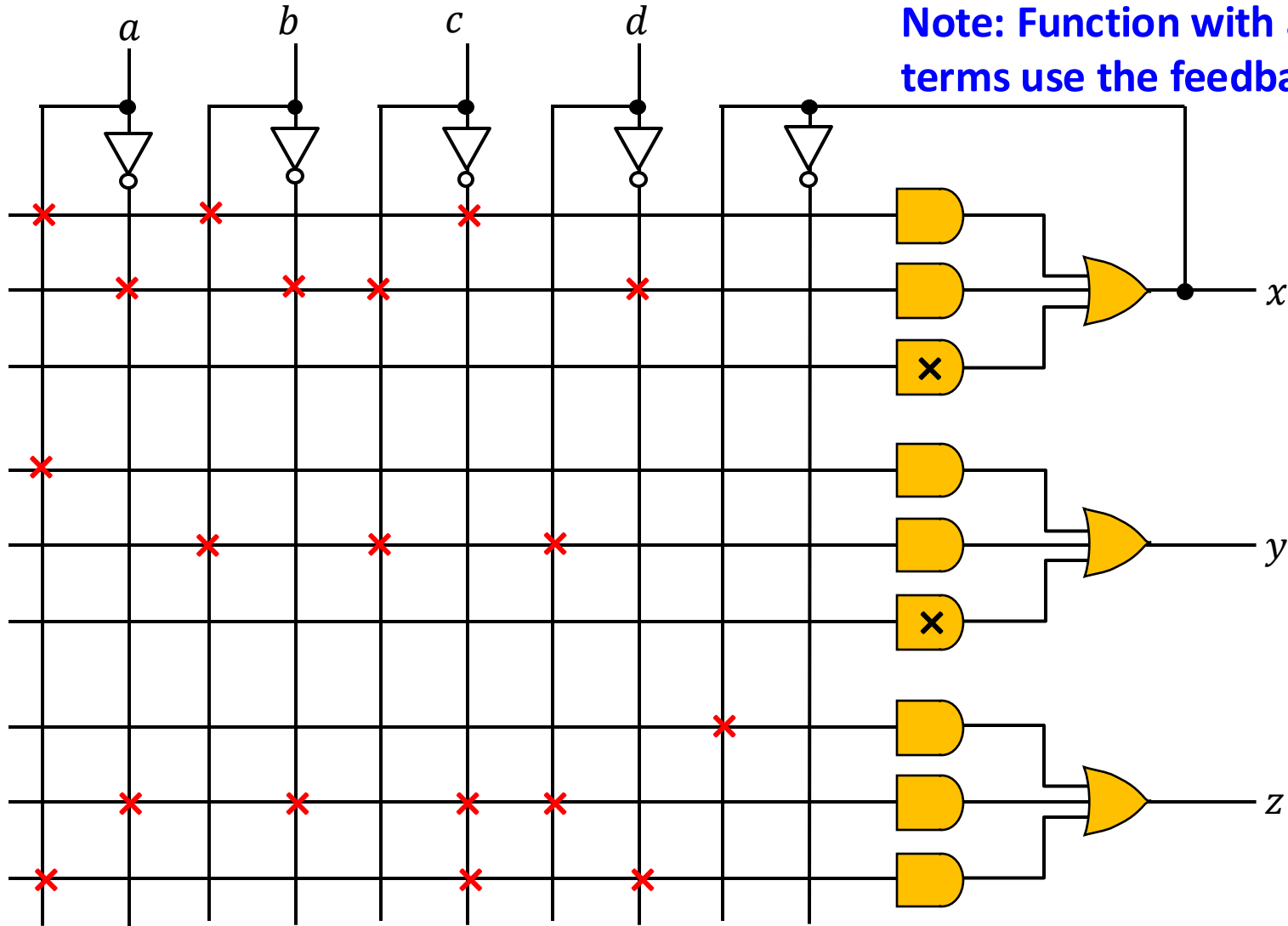
$$z(a, b, c, d) = abc' + a'b'cd' + a'b'c'd + ac'd'$$

Exercise

$$x(a, b, c, d) = abc' + a'b'cd'$$
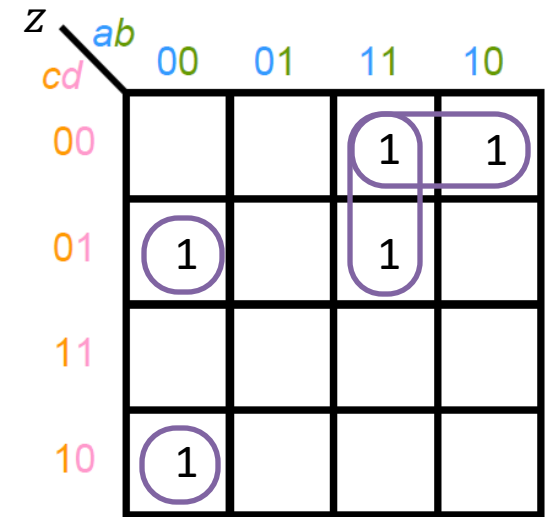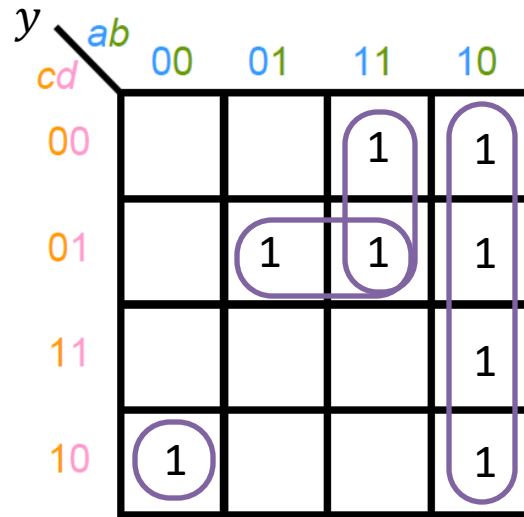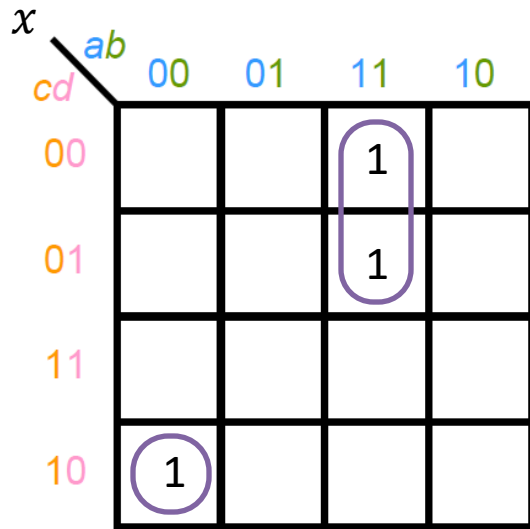
$$y(a, b, c, d) = a + bcd$$

$$z(a, b, c, d) = abc' + a'b'cd' + a'b'c'd + ac'd'$$

Note: Function with all common terms use the feedback loop

Exercise

Implement the following functions with a PAL

$$x(a, b, c, d) = a'b'cd' + abc'$$

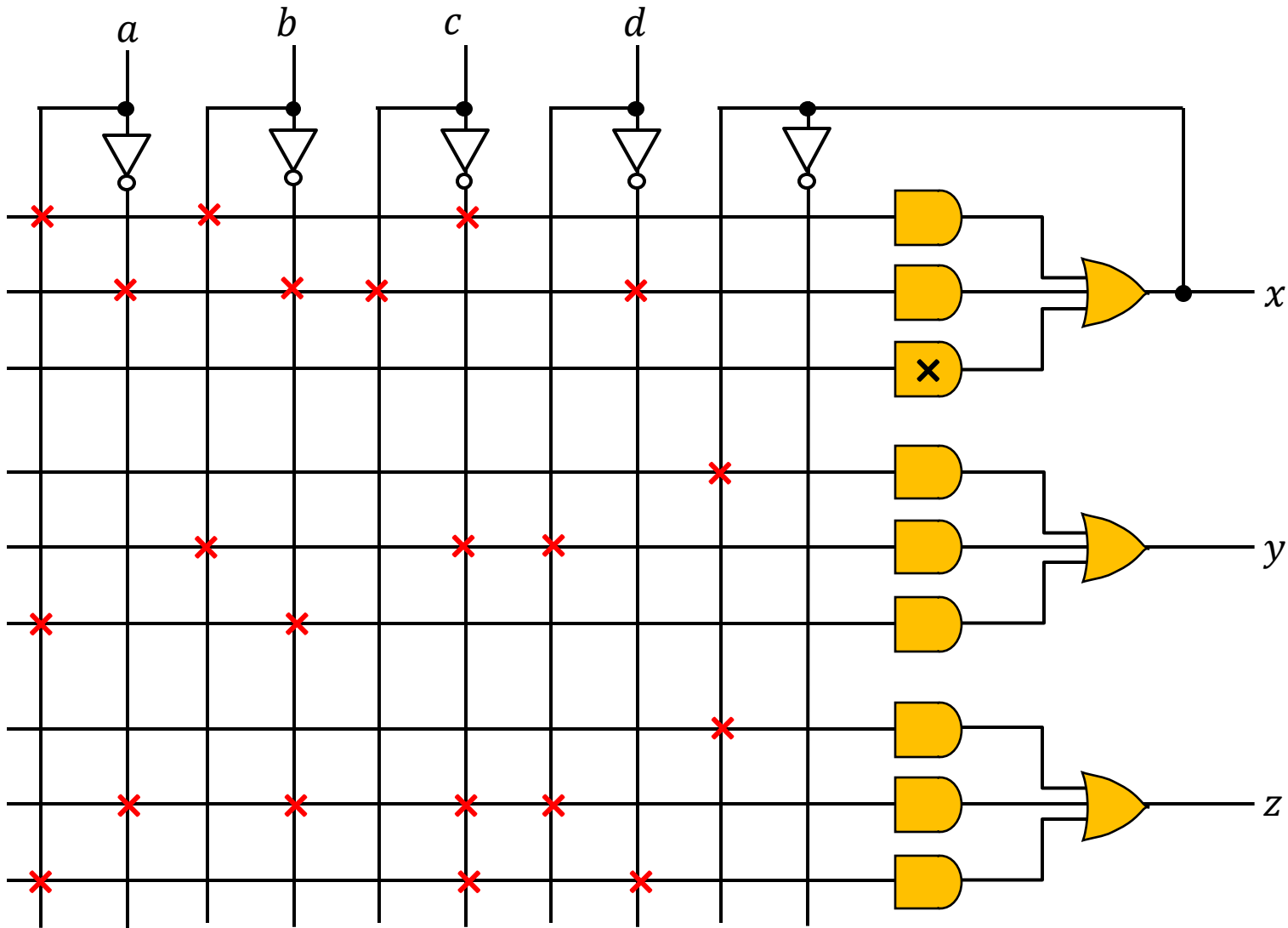$$y(a, b, c, d) = a'b'cd' + abc' + bc'd + ab'$$

$$z(a, b, c, d) = a'b'cd' + abc' + a'b'c'd + ac'd'$$

Exercise

$$x(a, b, c, d) = a'b'cd' + abc'$$

$$y(a, b, c, d) = a'b'cd' + abc' + bc'd + ab'$$

$$z(a, b, c, d) = a'b'cd' + abc' + a'b'c'd + bc'd'$$

Exercise

$$f_1(a, b, c) = \sum m(0, 2, 3, 6)$$
$$f_2(a, b, c) = \sum m(3, 6, 7)$$

$$f_1(a, b, c) = a'c' + bc' + a'bc$$
$$f_2(a, b, c) = ab + a'bc$$

Four distinct product term

Exercise

$$f_1(a, b, c) = \sum m(0, 2, 3, 6)$$
$$f_2(a, b, c) = \sum m(3, 6, 7)$$

c \ ab	00	01	11	10
0	m_0	m_2	m_6	m_4
1	m_1	m_3	m_7	m_5

f_1

c \ ab	00	01	11	10
0	1	1	1	
1		1		

f_2

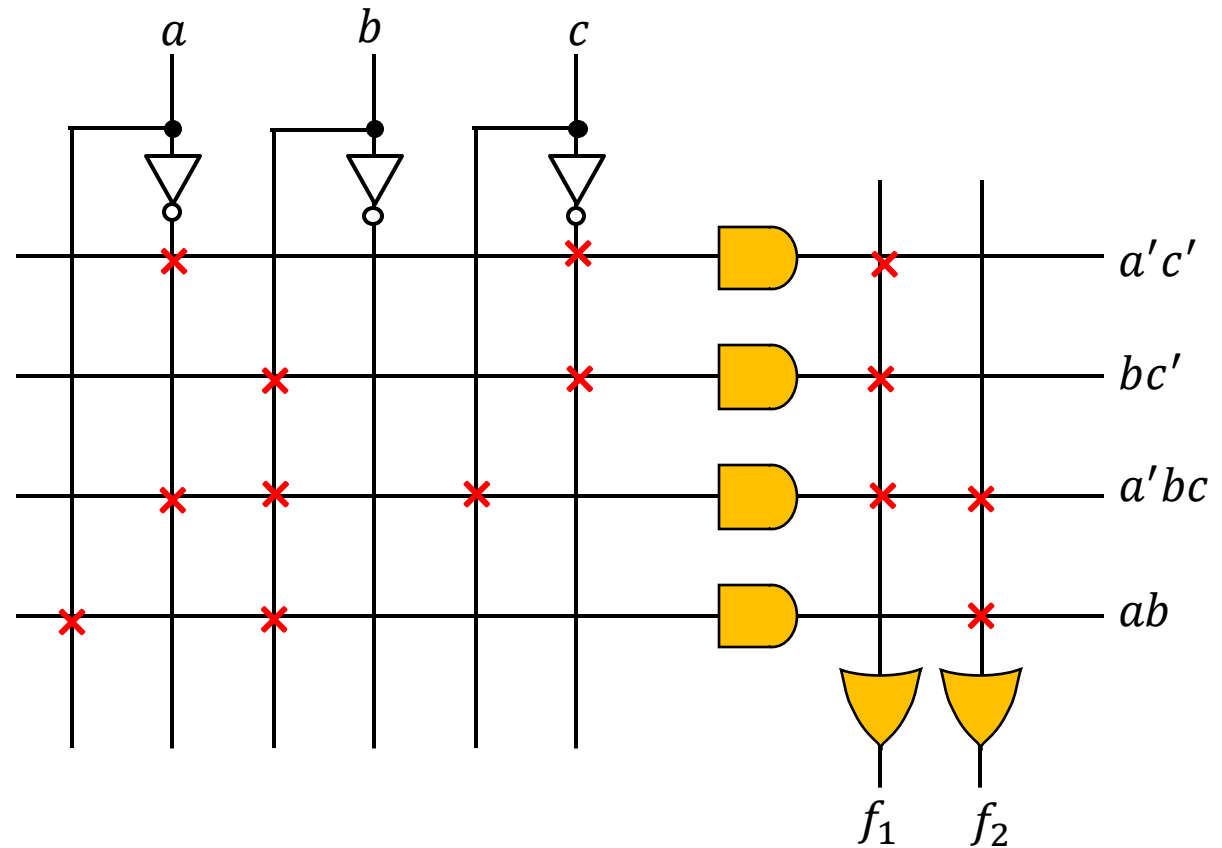| c \ ab	00	01	11	10
0			1	
1		1	1	

$$f_1(a, b, c) = a'c' + a'b + abc'$$
$$f_2(a, b, c) = bc + abc'$$

Four distinct
product term

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Exercise

$$f_1(a, b, c) = a'c' + bc' + a'bc$$
$$f_2(a, b, c) = ab + a'bc$$

Exercise

Simplify the following functions and their complements.

$$f_1(a, b, c, d) = \sum m(0, 2, 3, 5, 7, 8, 10, 12, 13, 15)$$
$$f_2(a, b, c, d) = \sum m(0, 4, 6, 7, 8, 10, 14, 15)$$

$$f_1(a, b, c, d) = a'b'c + abc' + bd + b'd'$$
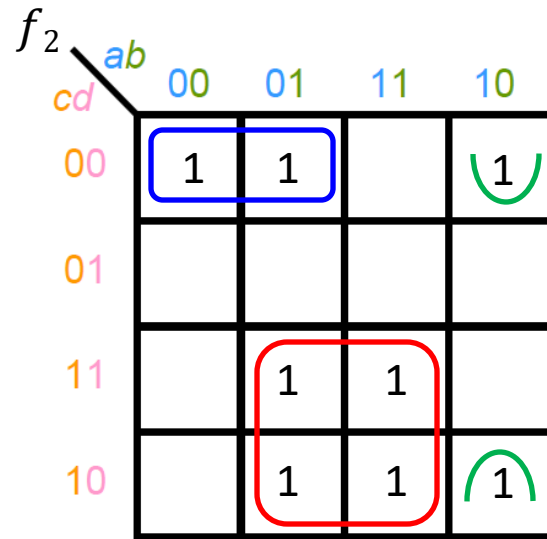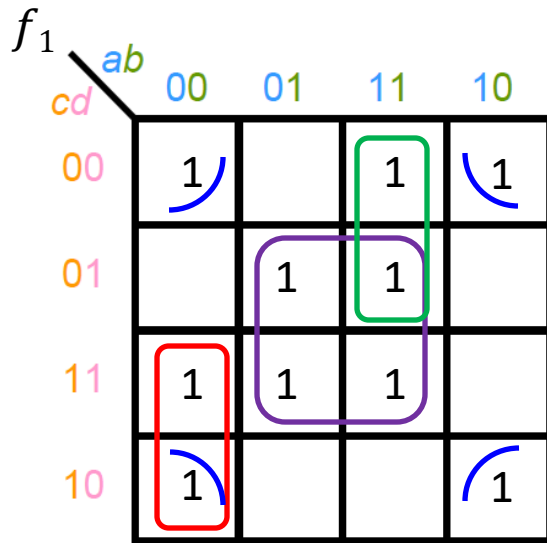$$f_2(a, b, c, d) = a'c'd' + bc + ab'd'$$

Exercise

Simplify the following functions and their complements.

$$f_1(a, b, c, d) = \sum m(0, 2, 3, 5, 7, 8, 10, 12, 13, 15)$$
$$f_2(a, b, c, d) = \sum m(0, 4, 6, 7, 8, 10, 14, 15)$$

$$f_1'(a, b, c, d) = bcd' + b'c'd + ab'd + a'bd'$$
$$f_2'(a, b, c, d) = a'b'c + abc' + ab'd + c'd$$

Exercise

Simplify the following functions and their complements.

$$f_1(a, b, c, d) = \sum m(0, 2, 3, 5, 7, 10, 12, 13, 15)$$
$$f_2(a, b, c, d) = \sum m(0, 4, 6, 7, 8, 10, 14, 15)$$

Look for common terms!!!

$$f_1(a, b, c, d) = a'b'c + abc' + bd + b'd'$$
$$f_2'(a, b, c, d) = a'b'c + abc' + ab'd + c'd$$

Exercise

$$f_1(a,b,c,d) = a'b'c + abc' + bd + b'd'$$
$$f_2'(a,b,c,d) = a'b'c + abc' + ab'd + c'd$$