February 13, 2026

* Simplifying Boolean Expressions

Q.1 $A + AB$

$= A(1+B)$

$= A1$

$= A$

Q.2 $AB + A\bar{B}$

$= A(B+\bar{B})$

$= A1$

$= A$

Q.3 $A + \bar{A}B$

$= (A+\bar{A})(A+B)$

$= 1(A+B)$

$= A+B$

$= AA + AB + \bar{A}A + \bar{A}B$ ($\bar{A}A = 0$)

$= A + (A+\bar{A})B$?

Q.4 $ABC + AB\bar{C}$

$= AB(C+\bar{C})$

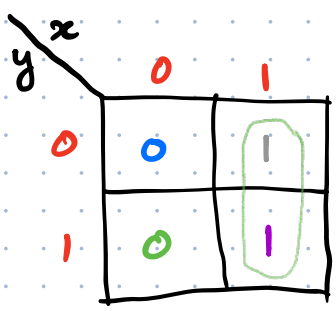
$= AB$

Q.5 $XY + \bar{X}Z + YZ$

* Karnaugh Maps

(i)

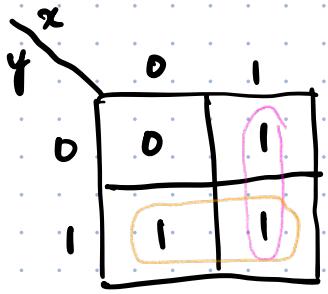
x	y	$xy + xy'$
0	0	0
0	1	0
1	0	1
1	1	1



$xy + xy' = x$

(ii)

x	y	$xy + x'y + xy'$
0	0	0
0	1	1
1	0	1
1	1	1



$$xy + x'y + xy' = x + y$$

(iii) Expressions involving 3 variables: x, y, z

Gray code

0 0
0 1
1 1
1 0

(

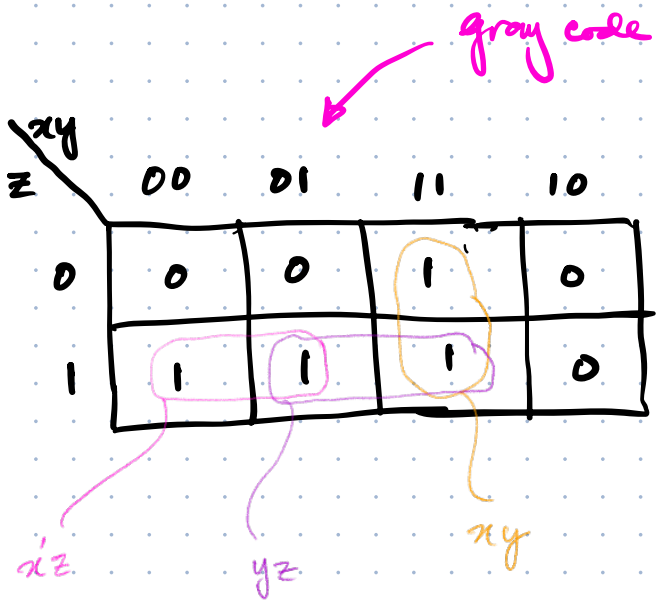
Between any two consecutive numbers (binary patterns) only 1 bit flips.

Gray Code

0 0 0
0 0 1
0 1 1
0 1 0
1 1 0
1 1 1
1 0 1
1 0 0

(iv)

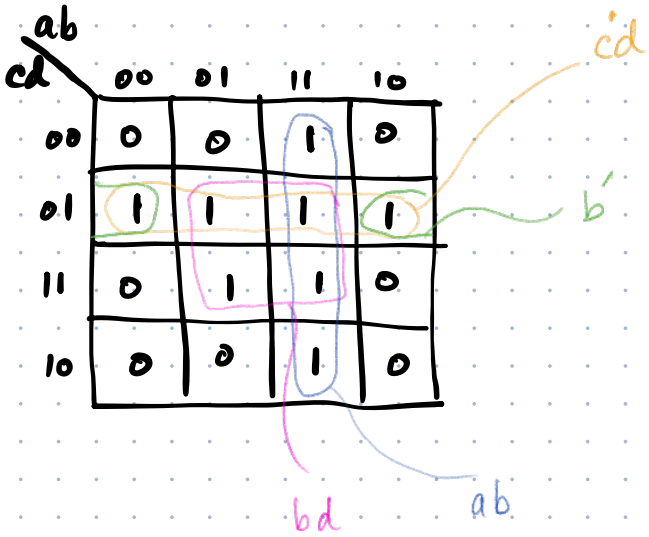
x	y	z	$xy + x'z + yz$
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



$$xy + x'z + yz = x'z + xy$$

(v) K-map for 4 variables.

$$f(a,b,c,d) = abc'd' + abc'd + abcd + abcd' + a'bc'd + a'bcd + a'b'c'd + ab'c'd = bd + ab + b'$$



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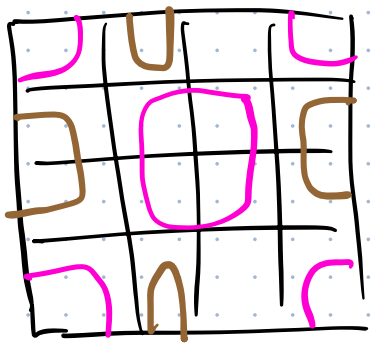
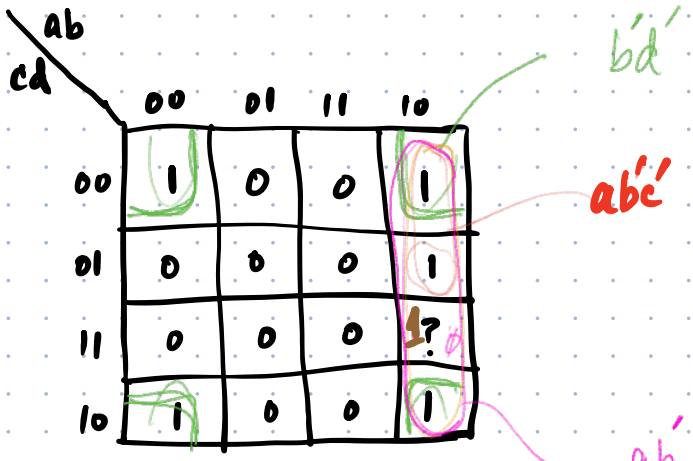
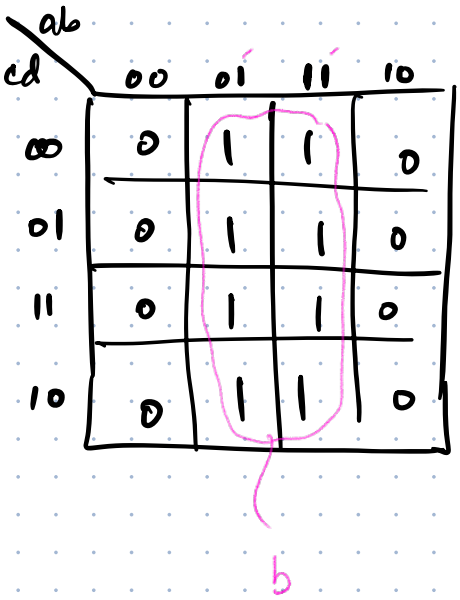


Exercise





$bd' + ab'$