

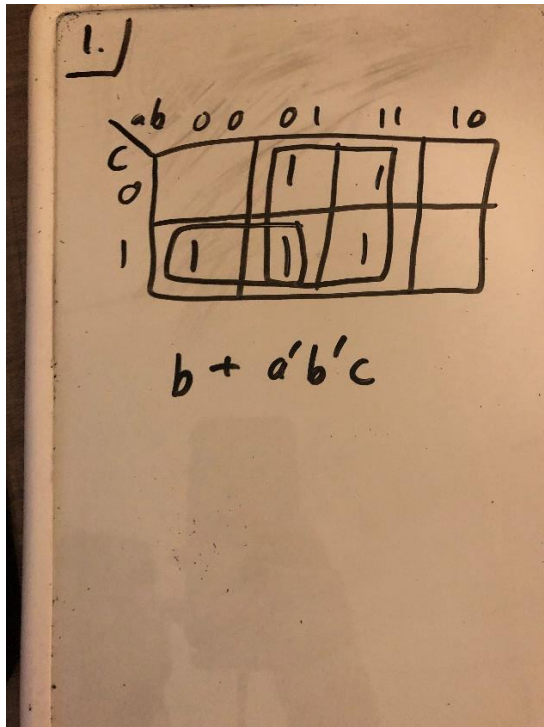
You must show all your work! Answers without supporting work will not be given credit. Illegible work falls under the *Intended Purpose* policy. Submissions crowded together on a single page will not be graded. Unclear answers will not be graded. All problems are taken from or inspired by our *Introduction to Logic Design 3rd Edition* text.

Points: 4

Name: Damian Sclafani

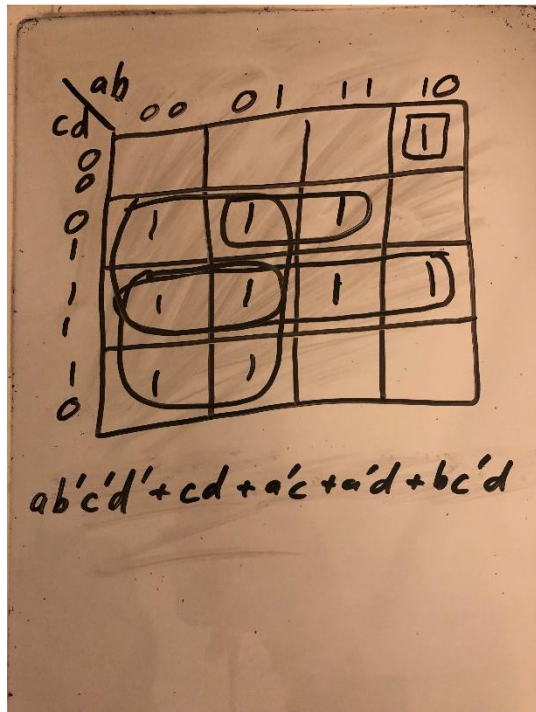
1. Find all minimum SoP expressions for the following functions:

(a)  $f(a, b, c) = \sum m(1, 2, 3, 6, 7)$ . (0.5 points)



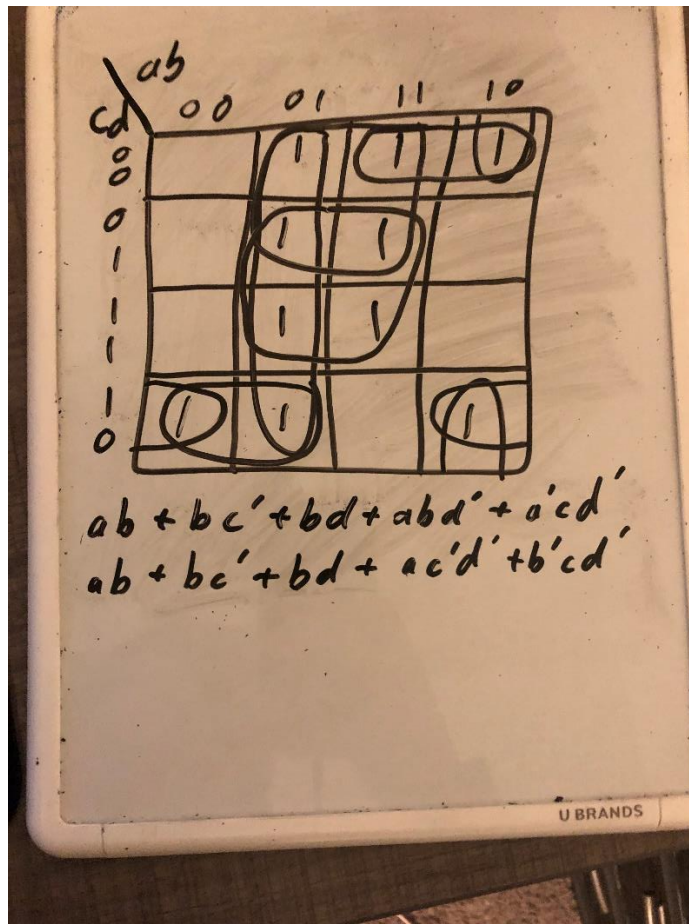
Answer:  $b + a'b'c$

(b)  $f(a, b, c, d) = \sum m(1, 2, 3, 5, 6, 7, 8, 11, 13, 15)$ . (0.5 points)



Answer:  $ab'c'd' + cd + a'c + a'd + bc'd$

(c)  $h(a, b, c, d) = \sum m(2, 4, 5, 6, 7, 8, 10, 12, 13, 15)$ . Two SoP expressions. (0.5 points)

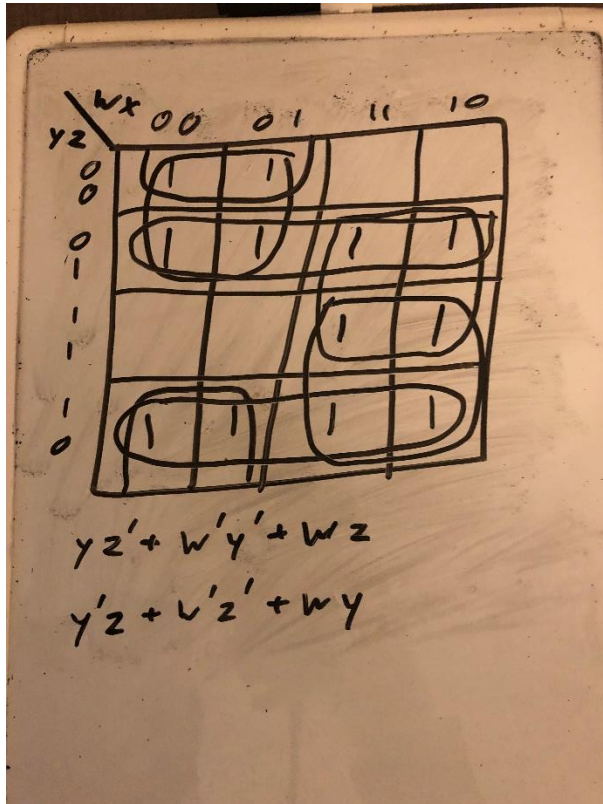


Answer:  $ab + bc' + bd + abd' + a'cd'$

Answer:  $ab + bc' + bd + ac'd' + b'cd'$

Cont.

(d)  $f(w, x, y, z) = \sum m(0, 1, 2, 4, 5, 6, 9, 10, 11, 13, 14, 15)$ . Two SoP expressions. (0.5 points)



Answer:  $yz' + w'y' + wz$

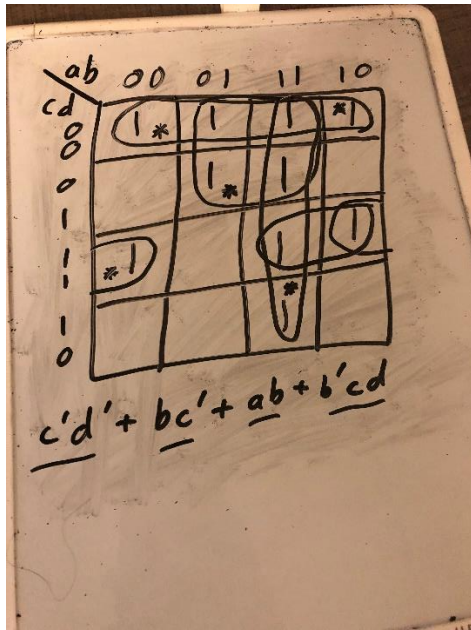
Answer:  $y'z + w'z' + wy$

Cont.

2. Given the function

$$f(a, b, c, d) = \sum m(0, 3, 4, 5, 8, 11, 12, 13, 14, 15),$$

(a) List all prime implicants and underline those which are essential. (0.4 points)



Answer:  $c'd' + bc' + ab + b'cd$

(b) List the minimum SoP expression. (0.1 points)

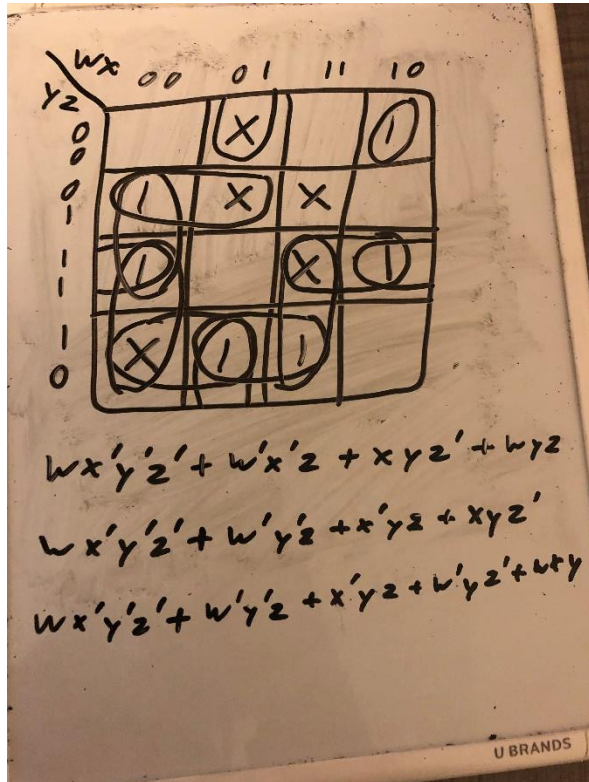
Answer:  $c'd + bc' + ab + b'cd$

Cont.

3. Given the function

$$f(w, x, y, z) = \Sigma m(1, 3, 6, 8, 11, 14) + \Sigma d(2, 4, 5, 13, 15),$$

Find three minimum SoP expressions. (0.5 points)



Answer:  $wx'y'z' + w'x'z + xyz' + wyz$

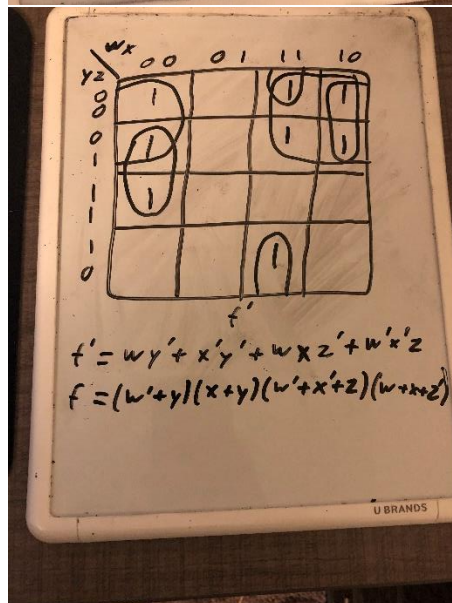
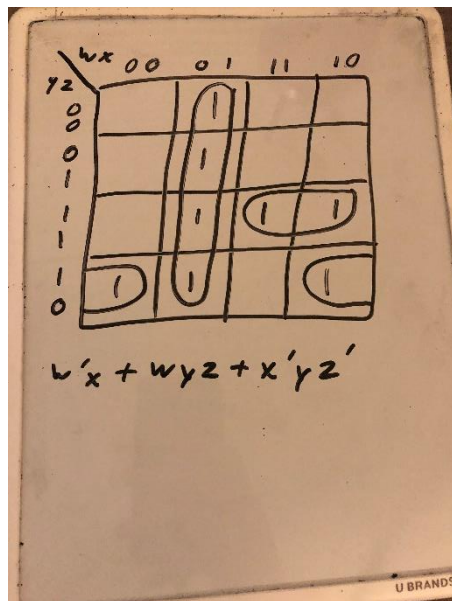
Answer:  $wx'y'z' + w'y'z + x'yz + xyz'$

Answer:  $wx'y'z' + w'y'z + x'yz + w'y'z' + wxy$

Cont.

4. For each of the following functions, find the indicated minimum SoP AND PoS expressions.

(a)  $f(w, x, y, z) = \Sigma m(2, 4, 5, 6, 7, 10, 11, 15)$ . One PoS expression / one SoP expression. (0.5 points)



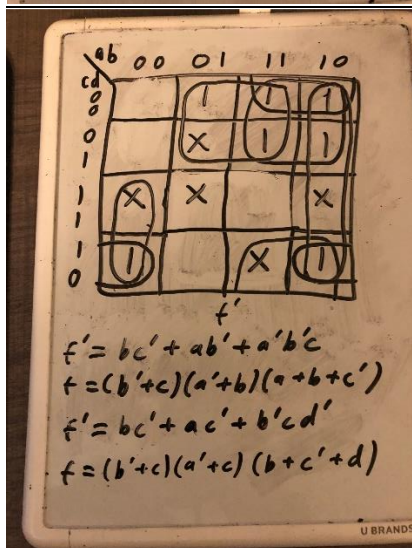
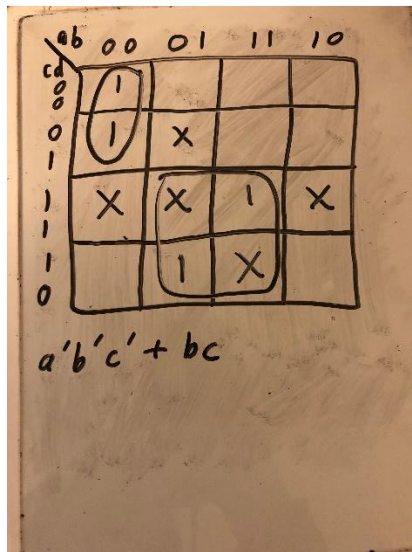
SoP  $w'x + wyz + x'yz'$

PoS  $(w'+y)(x+y)(w'+x'+z)(w+x+z')$

Cont.



- (b)  $f(a, b, c, d) = \sum m(0, 1, 6, 15) + \sum d(3, 5, 7, 11, 14)$ . Two PoS expressions / one SoP expression.  
(0.5 points)



SoP  $a'b'c' + bc$

PoS  $(b' + c)(a' + b)(a + b + c')$

PoS  $(b' + c)(a' + c)(b + c' + d)$

The End.