Karnaugh maps.

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- The disjunctive normal form
- The conjunctive normal form
- Functional completeness
- Karnaugh maps

Exercise 1

- Find the disjunctive normal form of the Boolean function $f(x, y, z)$ that has the value 1 if and only if

a) $x = 0,$

b) $x + y = 0,$

c) $xy = 0,$

d) $xyz = 0.$

Exercise 2

- Find the disjunctive normal form of the Boolean function $f(x, y, z, u, w)$ that has the value 1 if and only if three or more of the variables x, y, z, u, w have the value 1.

Exercise 3

- Express the Boolean function $x + \bar{y}(\bar{x} + z)$ using the operators + and $\bar{\ }$.

Exercise 4

Express the Boolean function $x + y + z$ using the operators $\cdot$ and $\bar{\ }$.

Exercise 5

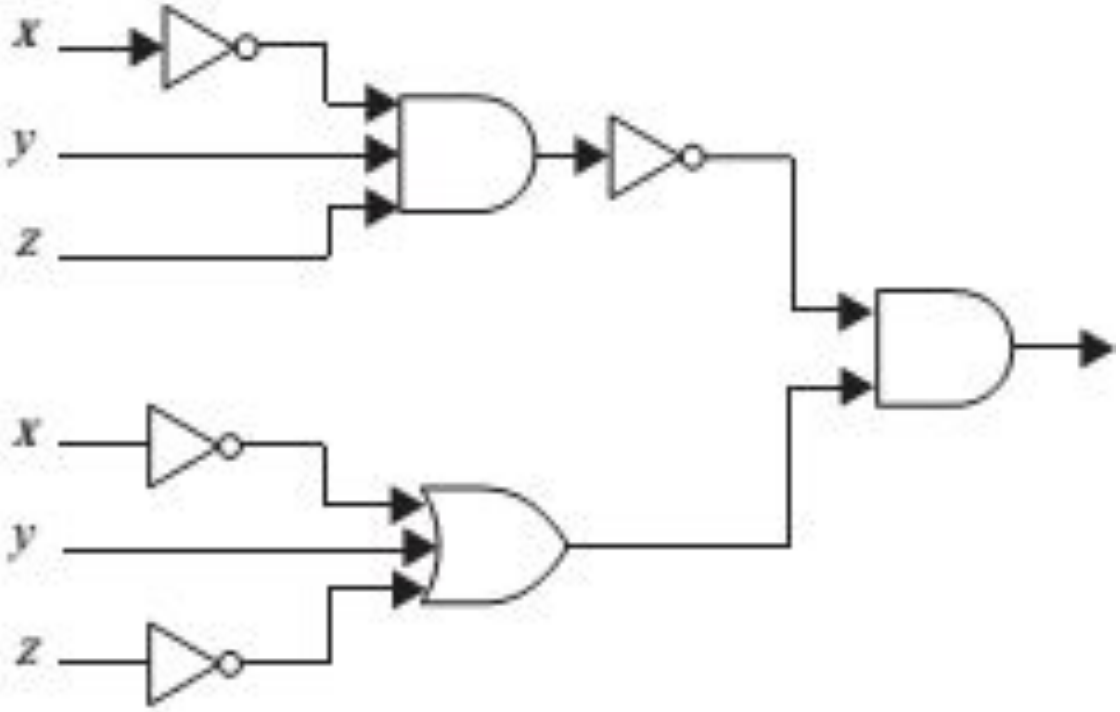
Use K-maps to find a minimal sum-of-products expansion that represents each of the Boolean functions:

a) $xyz + \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}\bar{z} + \bar{x}\bar{y}z,$

b) $xyzw + xyz\bar{w} + \bar{x}yz\bar{w} + x\bar{y}zw + x\bar{y}z\bar{w} + \bar{x}\bar{y}z\bar{w}.$

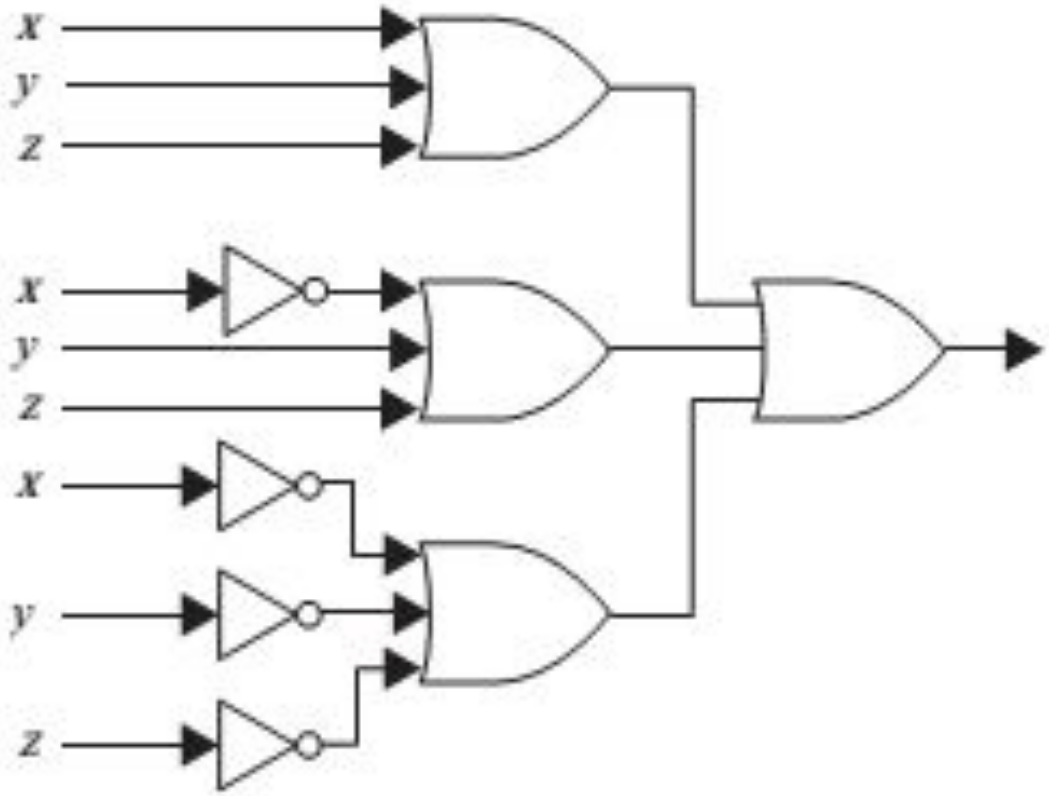
Exercise 6

Use K-maps to find simpler circuit with the same output as the circuit shown.



Exercise 7

Use K-maps to find simpler circuit with the same output as the circuit shown.



Exercise 8

- Use K-maps to find a minimal sum-of-products expansion that represents the Boolean function which is given in the following table:

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

Exercise 9

- Use K-maps to find a minimal sum-of-products expansion that represents the Boolean function which is given by the following vector of values:

$$f(\bar{x}^3) = (10101100).$$