Exercise 12.1

1. Find the values of these expressions.

a) $1 \cdot \bar{0}$

$= 1 \cdot 1$

$= 1$

b) $1 + \bar{1}$

$= 1 + 0$

$= 1$

c) $\bar{0} \cdot 0$

$= 1 \cdot 0$

$= 0$

d) $\overline{(1 + 0)}$

$= \bar{1}$

$= 0$

5. Use a table to express the values of each of these Boolean functions.

a) F(x, y, z) = $\bar{x}$y

x	y	z	$\bar{x}$	$\bar{x}$y
1	1	1	0	0
1	1	0	0	0
1	0	1	0	0
1	0	0	0	0
0	1	1	1	1
0	1	0	1	1
0	0	1	1	0
0	0	0	1	0

Exercise 12.2

1. Find a Boolean product of the Boolean variables x, y, and z, or their complements, that has the value 1 if and only if

a) x = y = 0, z = 1.

$\bar{x}\bar{y}$z

3. Find the sum-of-products expansions of these Boolean functions.

a) F(x, y, z) = x + y + z

x	y	z	x + y + z
1	1	1	1
1	1	0	0
1	0	1	0
1	0	0	0
0	1	1	0
0	1	0	0
0	0	1	0
0	0	0	0

xyz + xy$\bar{z}$ + x$\bar{y}$z + x$\bar{y}\bar{z}$ + $\bar{x}$yz +$\bar{x}$y$\bar{z}$ + $\bar{x}\bar{y}$z

5. Find the sum-of-products expansion of the Boolean function F(w, x, y, z) that has the value 1 if and only if an odd number of w, x, y, and z have the value 1.

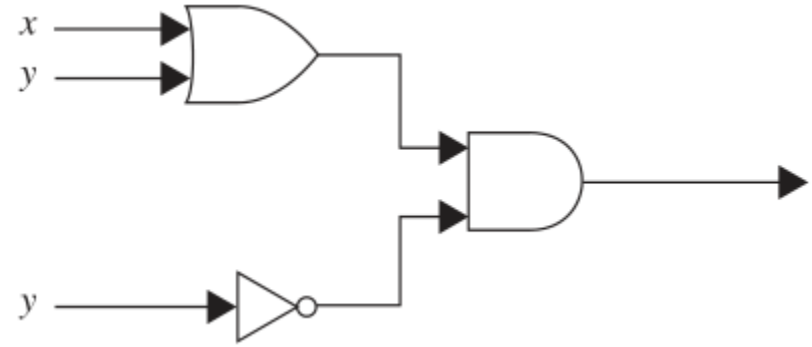
w	x	y	z	Odd number of value 1
1	1	1	1	0
1	1	1	0	1
1	1	0	1	1
1	1	0	0	0
1	0	1	1	1
1	0	1	0	0
1	0	0	1	0
1	0	0	0	1
0	1	1	1	1
0	1	1	0	0
0	1	0	1	0
0	1	0	0	1
0	0	1	1	0
0	0	1	0	1
0	0	0	1	1
0	0	0	0	0

wxy$\bar{z}$ + wx$\bar{y}$z + w$\bar{x}$yz + w$\bar{x}\bar{y}\bar{z}$ + $\bar{w}$xyz + $\bar{w}$x$\bar{y}\bar{z}$ + $\bar{w}\bar{x}$y$\bar{z}$ + $\bar{w}\bar{x}\bar{y}$z

Exercise 12.3

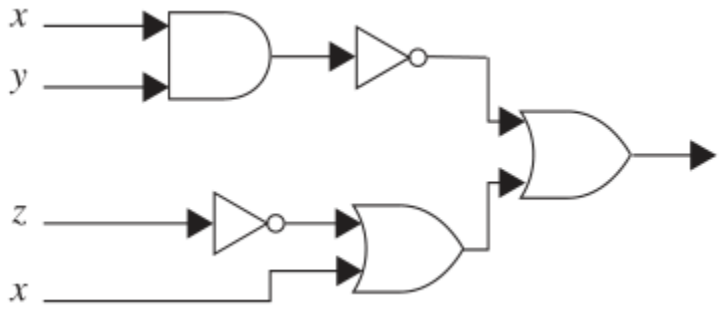
For 1 and 5, find the output of the given circuit.

1.



$(x + y) \cdot \bar{y}$

3.



$\overline{(xy)} + (\bar{z} + x)$