

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	1
1	0	1	1
1	0	0	1
0	1	1	1
0	1	0	1
0	0	1	1
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.

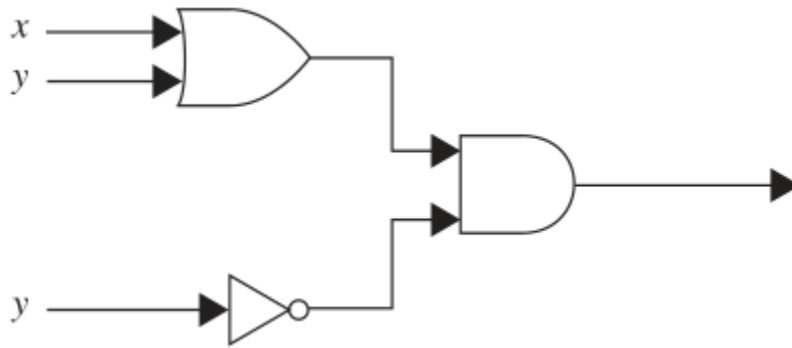
w	x	y	z	Odd number of value 1
1	1	1	1	0
1	1	1	0	1
1	1	0	1	1
1	1	0	0	0
1	0	1	1	1
1	0	1	0	0
1	0	0	1	0
1	0	0	0	1
0	1	1	1	1
0	1	1	0	0
0	1	0	1	0
0	1	0	0	1
0	0	1	1	0
0	0	1	0	1
0	0	0	1	1
0	0	0	0	0

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

Exercise 12.3

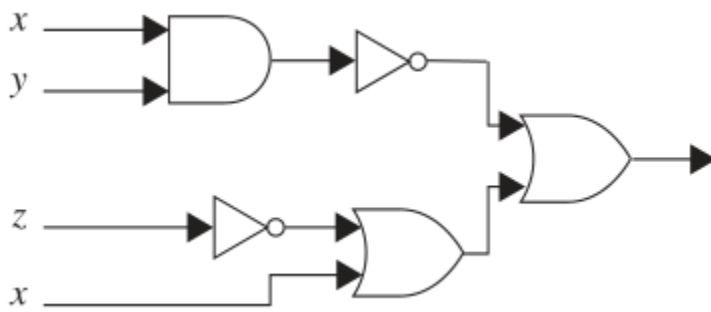
For 1 and 5, find the output of the given circuit.

1.



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

3.



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