Show how the circuit depicted in Figure 9.26 computes on input 0110 by showing the values computed by all of the gates, as we did in Figure 9.24.

Figure 9.26

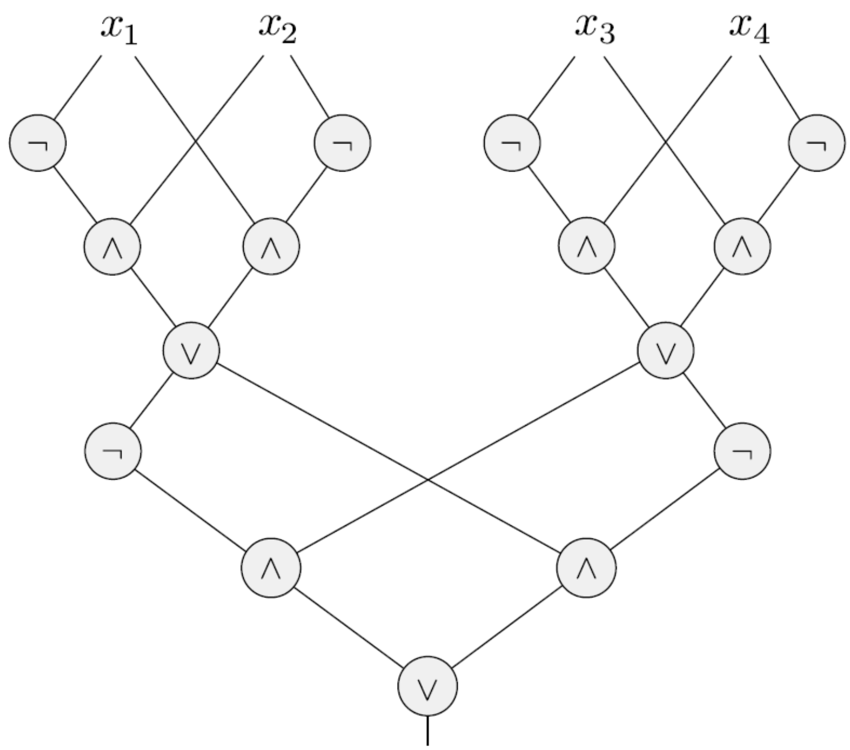



**FIGURE 9.26**
A Boolean circuit that computes the parity function on 4 variables

Figure 9.24

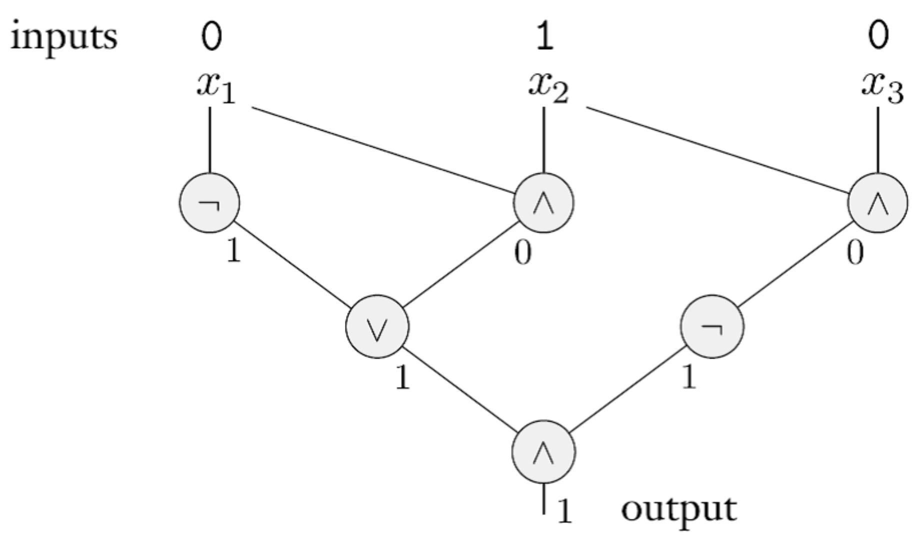



**FIGURE 9.24**
An example of a Boolean circuit computing

## Step-by-step solution

**Step 1** of 6

**Representation of the parity functional circuit**

The *n*-input *parity* function $parity_n : \{0,1\}^n \to \{0,1\}$ gives an output 1 if an odd number of 1’s appear in the input variable and otherwise gives 0. The circuit depicted here (refer figure 9.26) is used as a parity functional circuit on four variable.

In this parity functional circuit, a number of gates are used. Therefore, first of all, the working of gates will be discussed here to understand the process performed in that circuit.

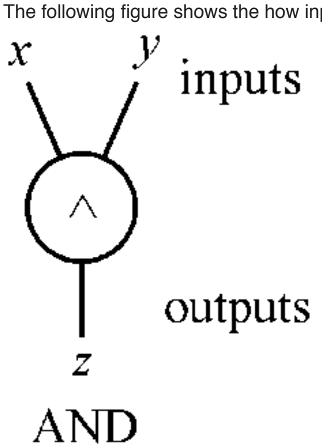
Comment

**Step 2** of 6

The Truth table for and operator is as follows:

| **Input** | Output z | |
|---|---|---|
| x | y | |
| 0 | 0 | 0 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 1 |

The following figure shows the how input and output can be taken in the above table (for and operator):



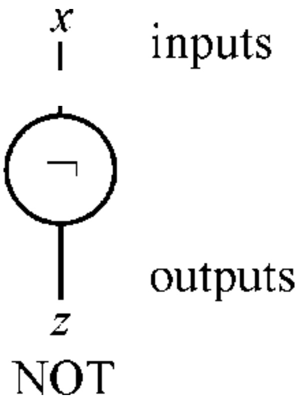

Comment

**Step 3** of 6

The Truth table for not operator is as follow:

| Input(x) | Output(z) |
|---|---|
| 0 | 1 |
| 1 | 0 |

The following figure shows the how input and output can be taken in the above table (for not operator):



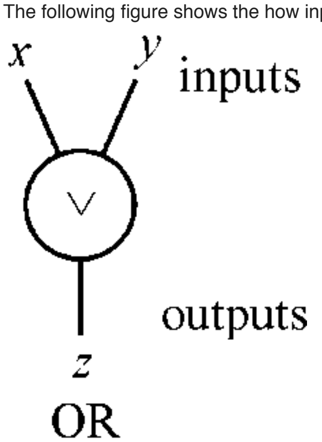

Comment

**Step 4** of 6

The Truth table for or operator is as follow:

| Input | Output z | |
|---|---|---|
| x | y | |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

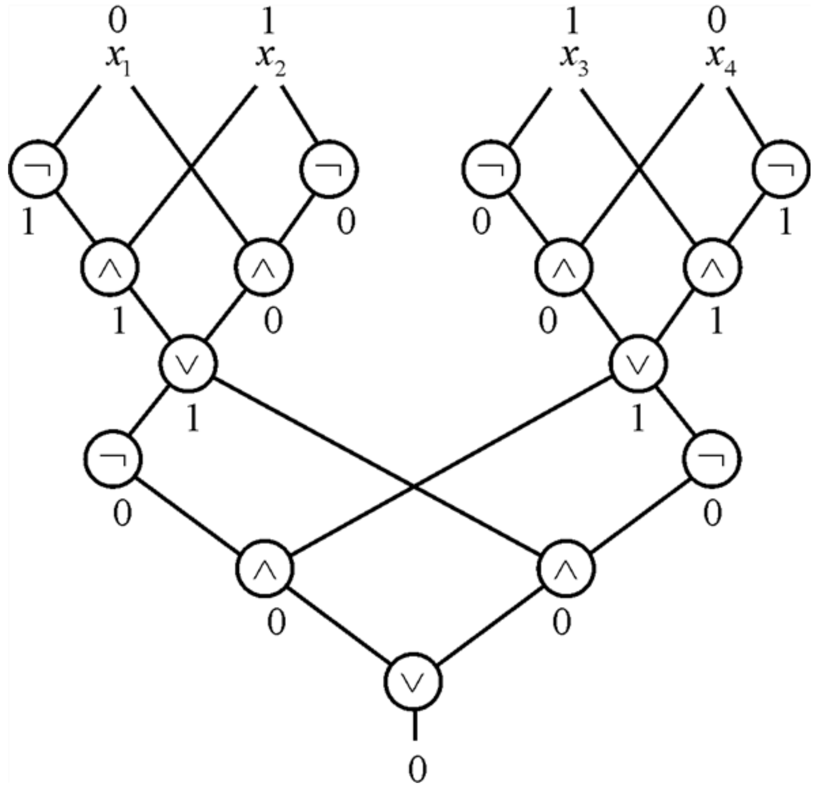
The following figure shows the how input and output can be taken in the above table (for or operator):




Comment

**Step 5** of 6

**Consider the figure given below:**




**Above figure shows the functional parity circuit on 4 variables**. Here 0110 is taken as an input variable. Now AND gate, OR gate and NOT gate applied on the input in the

Comment

**Step 6** of 6

same manner as it is discussed above. The final output is 0 because here even number of 1's has taken (as the definition of parity function says).

Comment