

## The Absolute Value Function

The absolute value of a  $x$ , written  $|x|$ , is defined piecewise

For positive  $x$ ,  $|x| = x$ .

For negative  $x$ ,  $|x| = -x$ .

(Remember that  $-x$  is a positive number if  $x$  is a negative number.) For example, if  $x = -3$ , then

$$|-3| = -(-3) = 3.$$

For  $x = 0$ , we have  $|0| = 0$ . This leads to the following two-part definition:

The **Absolute Value Function** is defined by

$$f(x) = |x| = \begin{cases} x & \text{for } x \geq 0 \\ -x & \text{for } x < 0 \end{cases}.$$

Table 2.9 gives values of  $f(x) = |x|$  and Figure 2.14 shows a graph of  $f(x)$ .

Table 2.9 Absolute value function

$x$	$ x $
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3

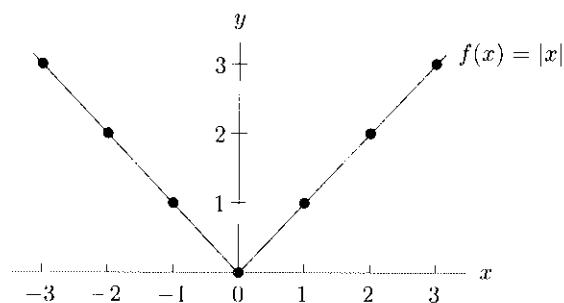


Figure 2.14: Graph of absolute value function

## Exercises and Problems for Section 2.3

## Exercises

Graph the piecewise defined functions in Exercises 1–4. Use an open circle to represent a point which is not included and a solid dot to indicate a point which is on the graph.

$$1. f(x) = \begin{cases} -1, & -1 \leq x < 0 \\ 0, & 0 \leq x < 1 \\ 1, & 1 \leq x < 2 \end{cases}$$

$$2. f(x) = \begin{cases} x + 4, & x \leq -2 \\ 2, & -2 < x < 2 \\ 4 - x, & x \geq 2 \end{cases}$$

$$3. f(x) = \begin{cases} x^2, & x \leq 0 \\ \sqrt{x}, & 0 < x < 4 \\ x/2, & x \geq 4 \end{cases}$$

$$4. f(x) = \begin{cases} x + 1, & -2 \leq x < 0 \\ x - 1, & 0 \leq x < 2 \\ x - 3, & 2 \leq x < 4 \end{cases}$$