

Section 2.5

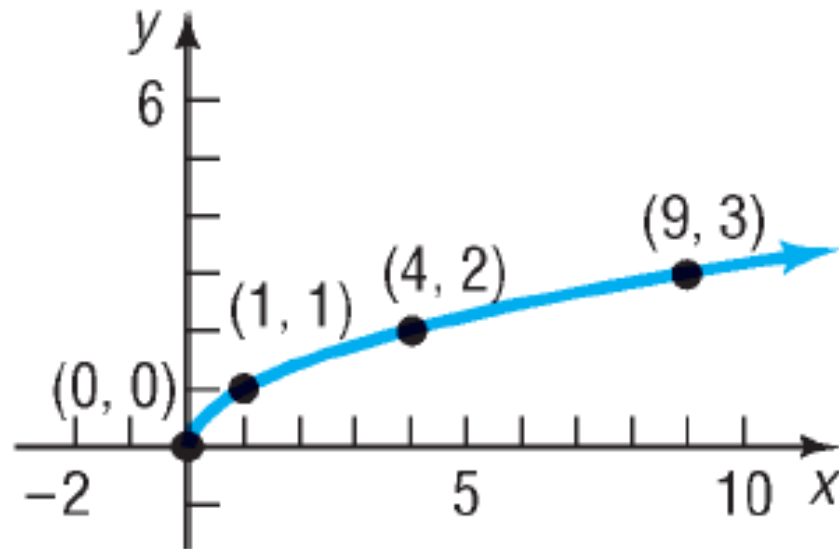
Library of Functions;

Piecewise-defined Functions

The Square Root Function

Properties of $f(x) = \sqrt{x}$

1. The x -intercept of the graph of $f(x) = \sqrt{x}$ is 0. The y -intercept of the graph of $f(x) = \sqrt{x}$ is also 0.
2. The function is neither even nor odd.
3. It is increasing on the interval $(0, \infty)$.
4. It has a local minimum of 0 at $x = 0$.

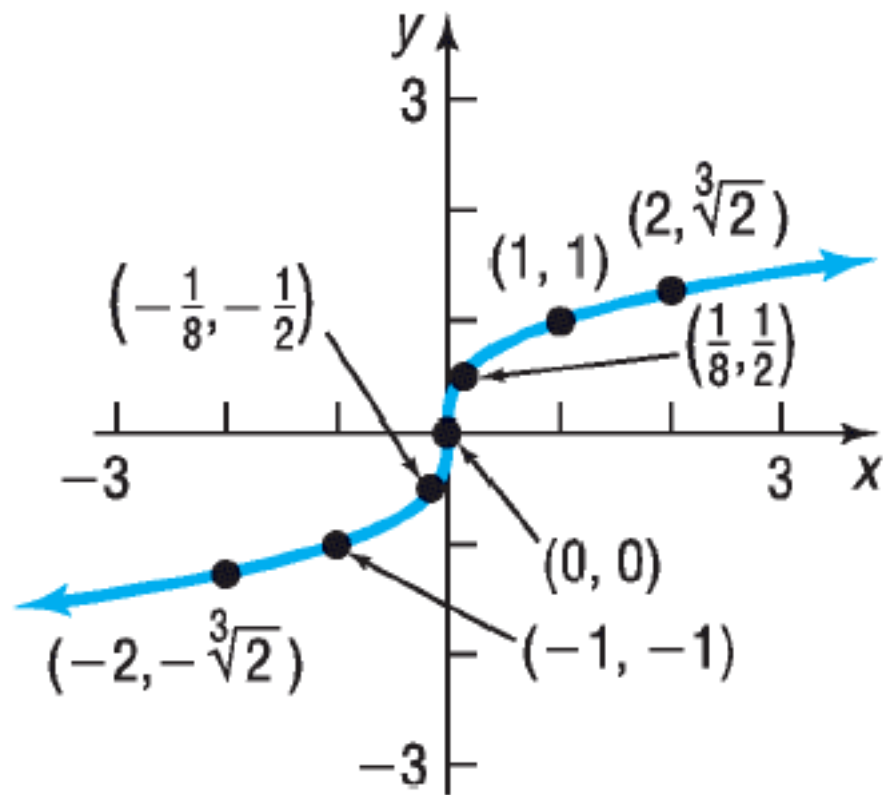


EXAMPLE

Graphing the Cube Root Function

- (a) Determine whether $f(x) = \sqrt[3]{x}$ is even, odd, or neither. State whether the graph of f is symmetric with respect to the y -axis or symmetric with respect to the origin.
- (b) Determine the intercepts, if any, of the graph of $f(x) = \sqrt[3]{x}$.
- (c) Graph $f(x) = \sqrt[3]{x}$.

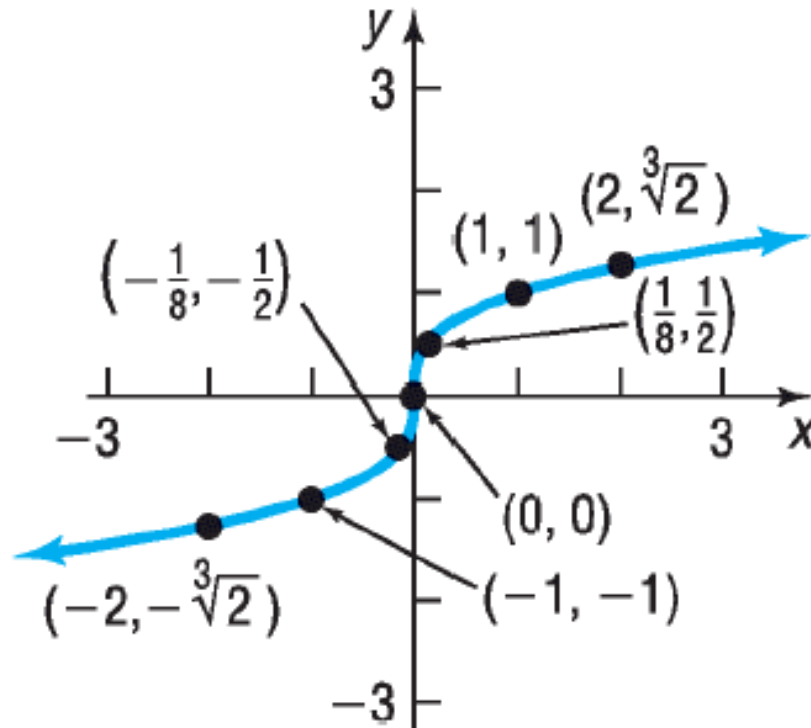
x	$y = f(x) = \sqrt[3]{x}$	(x, y)
0	0	$(0, 0)$
$\frac{1}{8}$	$\frac{1}{2}$	$(\frac{1}{8}, \frac{1}{2})$
1	1	$(1, 1)$
2	$\sqrt[3]{2} \approx 1.26$	$(2, \sqrt[3]{2})$
8	2	$(8, 2)$



The Cube Root Function

Properties of $f(x) = \sqrt[3]{x}$

1. The x -intercept of the graph of $f(x) = \sqrt[3]{x}$ is 0. The y -intercept of the graph of $f(x) = \sqrt[3]{x}$ is also 0.
2. The function is odd.
3. It is increasing on the interval $(-\infty, \infty)$.
4. It does not have a local minimum or a local maximum.

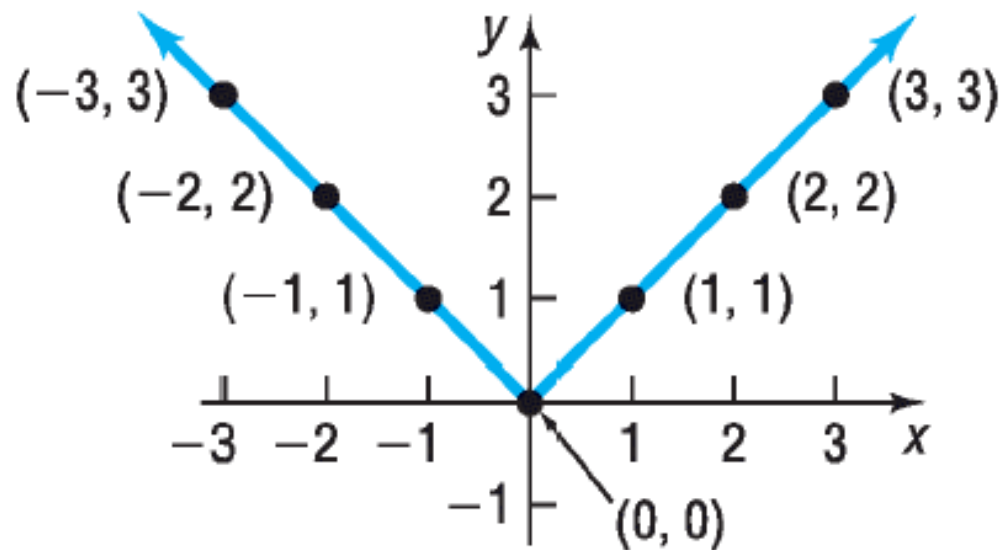


EXAMPLE

Graphing the Absolute Value Function

- (a) Determine whether $f(x) = |x|$ is even, odd, or neither. State whether the graph of f is symmetric with respect to the y -axis or symmetric with respect to the origin.
- (b) Determine the intercepts, if any, of the graph of $f(x) = |x|$.
- (c) Graph $f(x) = |x|$.

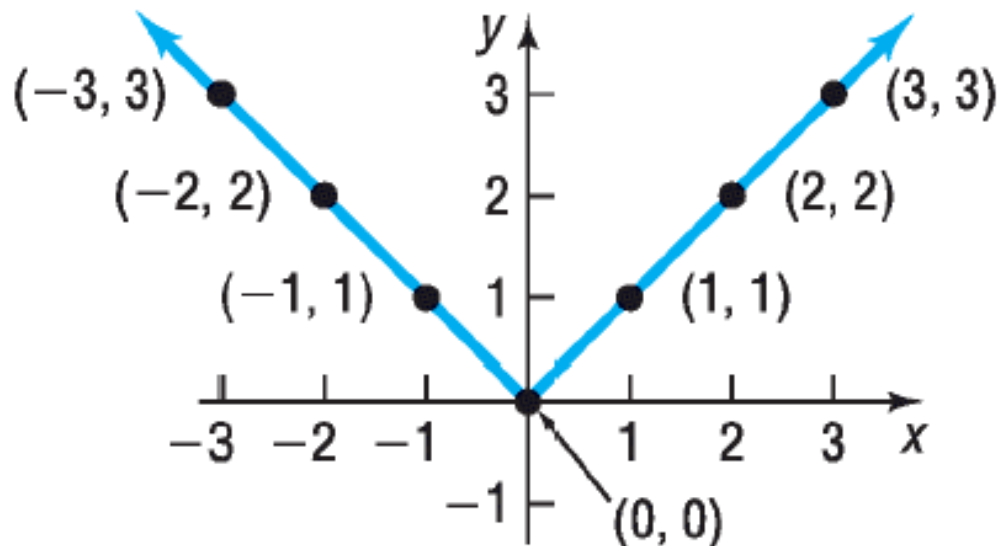
x	$y = f(x) = x $	(x, y)
0	0	(0, 0)
1	1	(1, 1)
2	2	(2, 2)
3	3	(3, 3)



The Absolute Value Function

Properties of $f(x) = |x|$

1. The x -intercept of the graph of $f(x) = |x|$ is 0. The y -intercept of the graph of $f(x) = |x|$ is also 0.
2. The function is even.
3. It is decreasing on the interval $(-\infty, 0)$. It is increasing on the interval $(0, \infty)$.
4. It has a local minimum of 0 at $x = 0$.



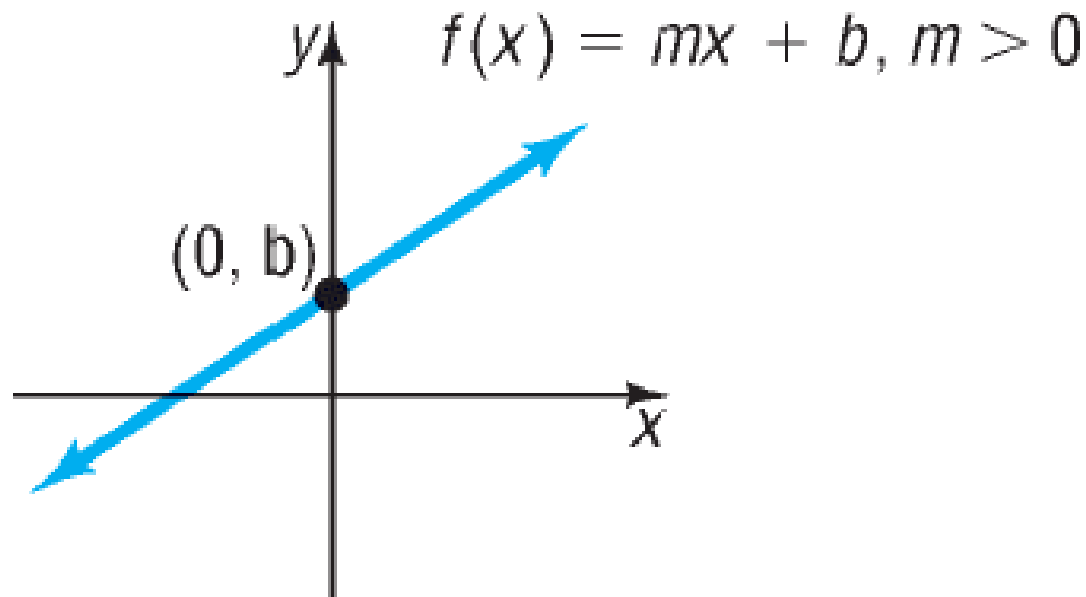
OBJECTIVE 1

 **Graph the Functions Listed in the Library of Functions**

Linear Function

$$f(x) = mx + b, \quad m \text{ and } b \text{ are real numbers}$$

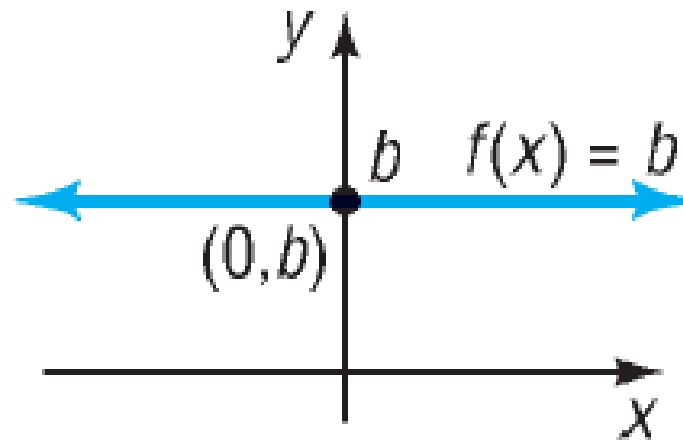
Linear Function



Constant Function

$$f(x) = b, \quad b \text{ is a real number}$$

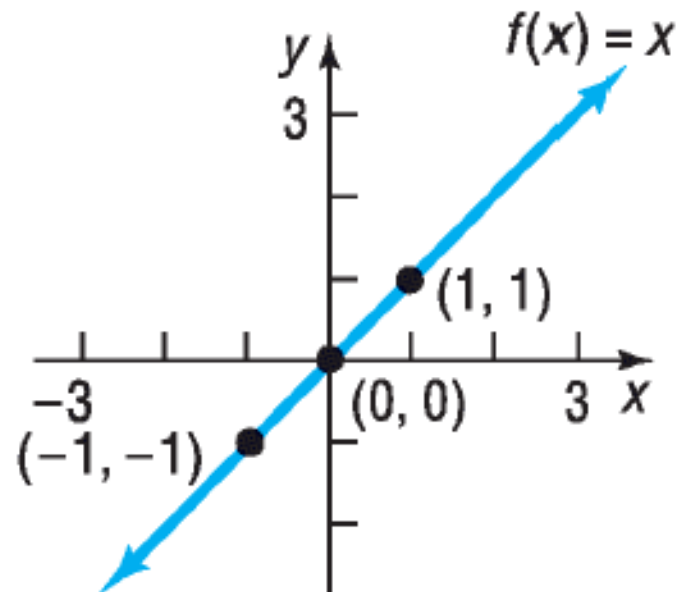
Constant Function



Identity Function

$$f(x) = x$$

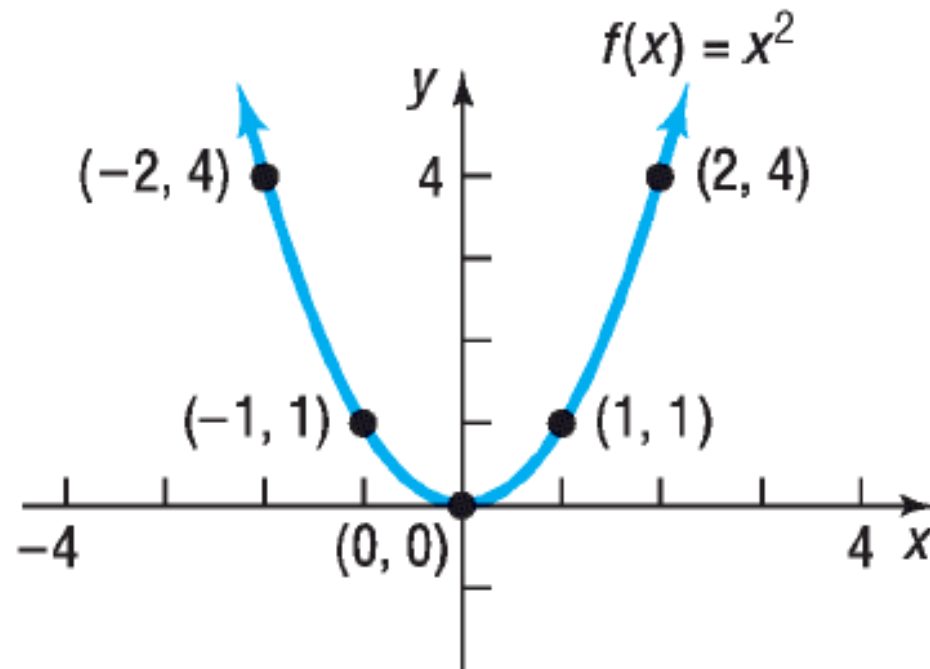
Identity Function



Square Function

$$f(x) = x^2$$

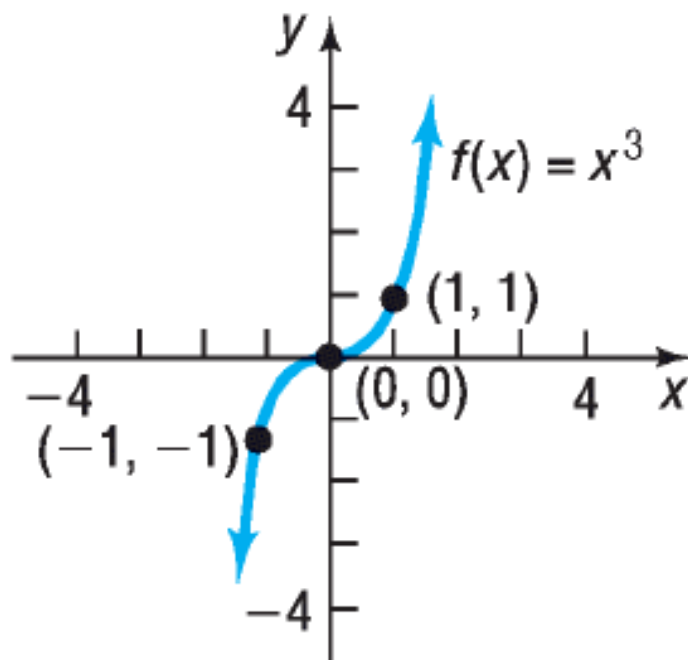
Square Function



Cube Function

$$f(x) = x^3$$

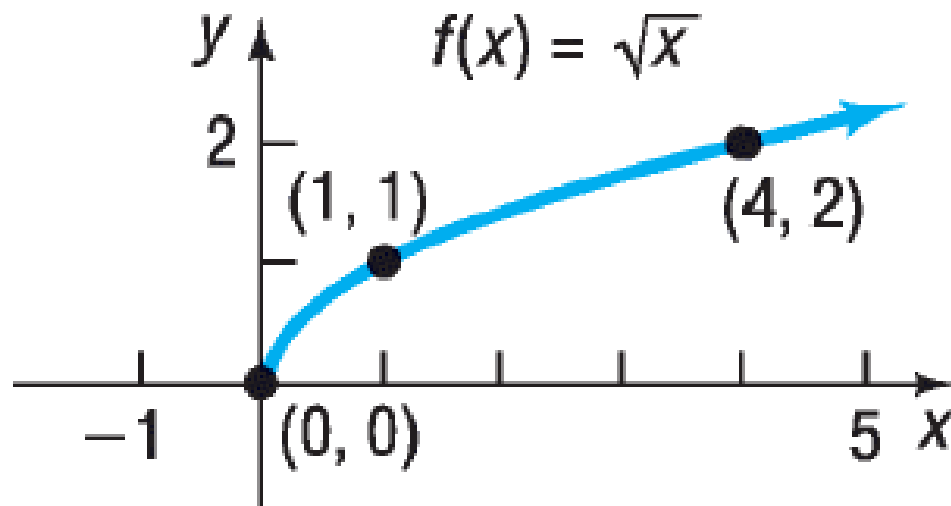
Cube Function



Square Root Function

$$f(x) = \sqrt{x}$$

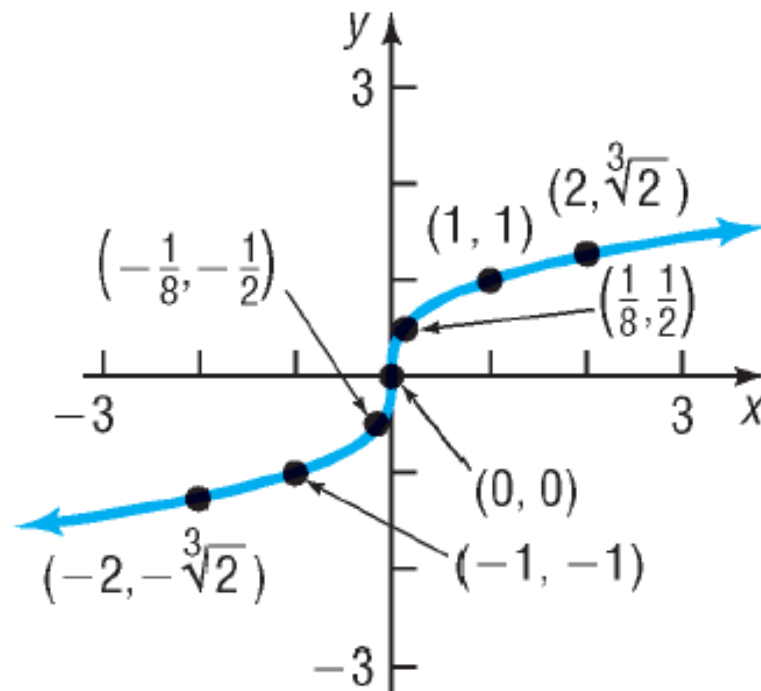
Square Root Function



Cube Root Function

$$f(x) = \sqrt[3]{x}$$

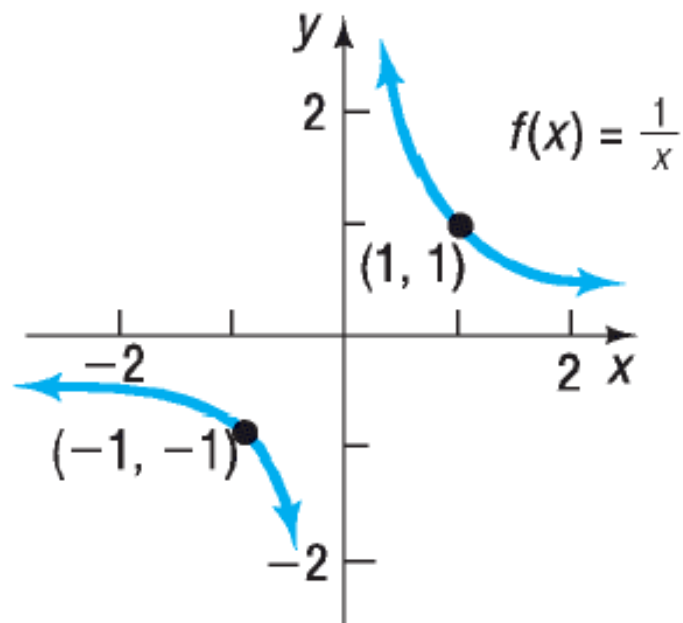
Cube Root Function



Reciprocal Function

$$f(x) = \frac{1}{x}$$

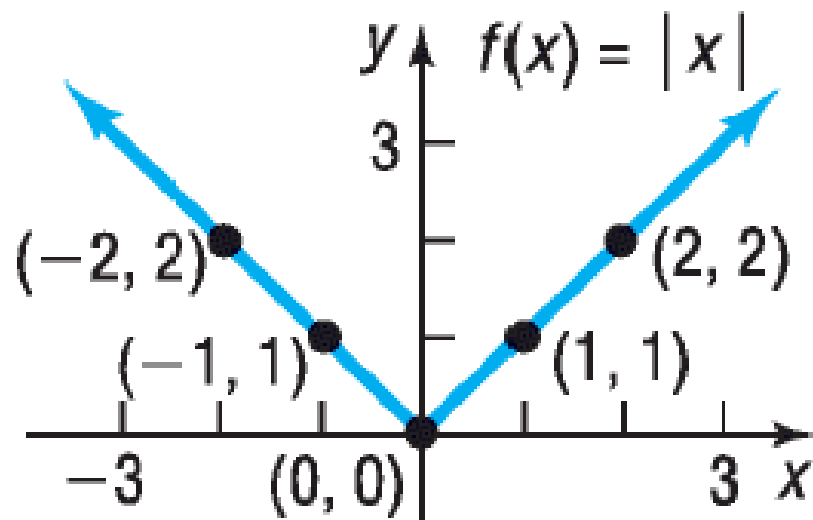
Reciprocal Function



Absolute Value Function

$$f(x) = |x|$$

Absolute Value Function

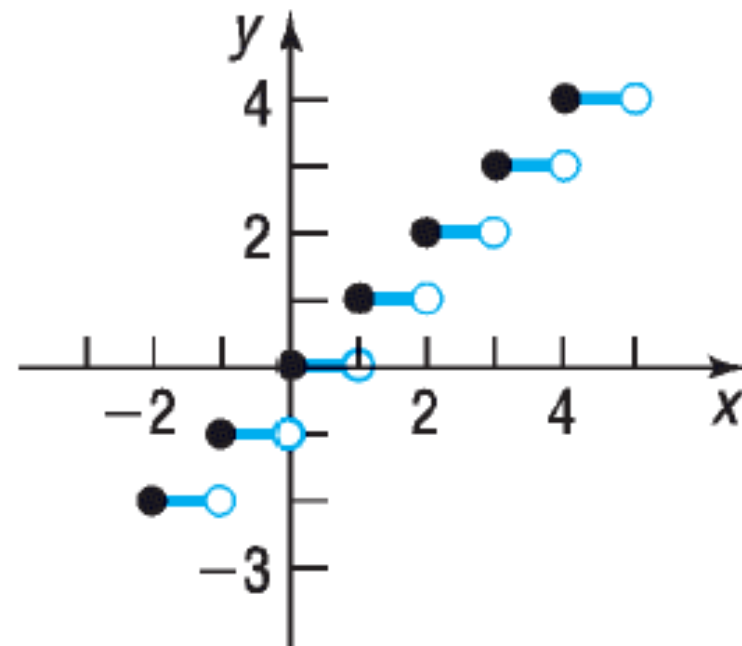


Greatest Integer Function

$f(x) = \text{int}(x)^* = \text{greatest integer less than or equal to } x$

x	$y = f(x)$ $= \text{int}(x)$	(x, y)
-1	-1	$(-1, -1)$
$-\frac{1}{2}$	-1	$(-\frac{1}{2}, -1)$
$-\frac{1}{4}$	-1	$(-\frac{1}{4}, -1)$
0	0	$(0, 0)$
$\frac{1}{4}$	0	$(\frac{1}{4}, 0)$
$\frac{1}{2}$	0	$(\frac{1}{2}, 0)$
$\frac{3}{4}$	0	$(\frac{3}{4}, 0)$

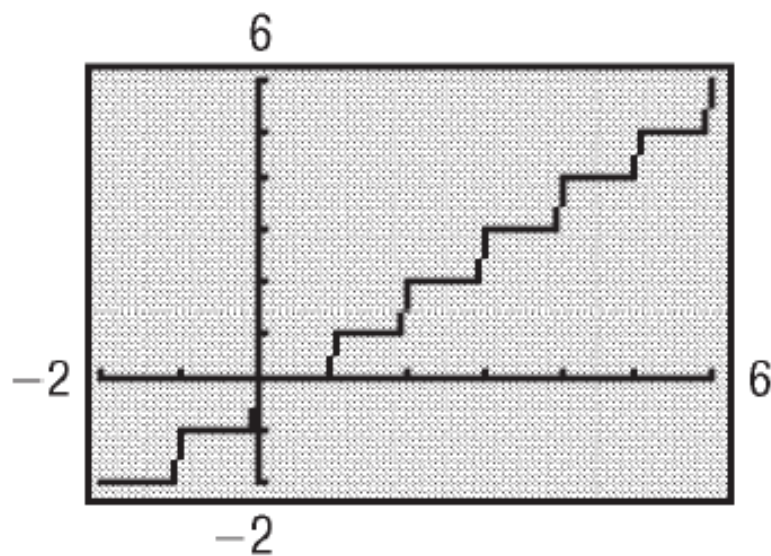
Greatest Integer Function



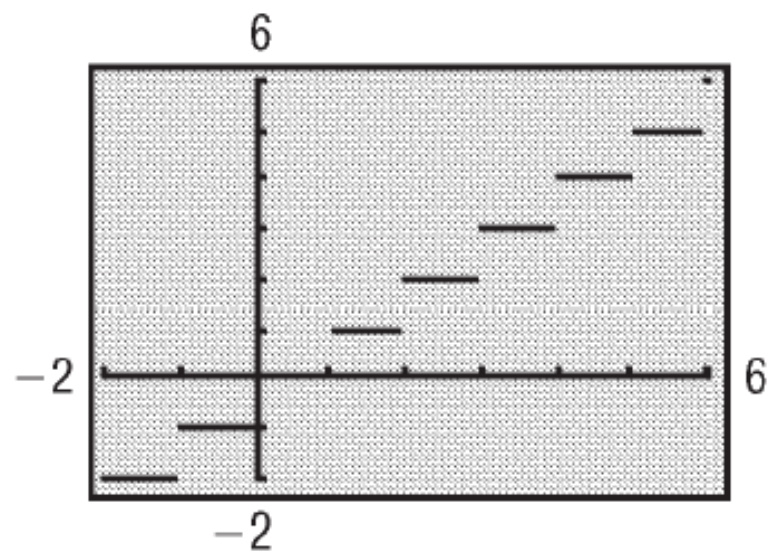
Greatest Integer Function

$f(x) = \text{int}(x)^* = \text{greatest integer less than or equal to } x$

$$f(x) = \text{int}(x)$$



(a) Connected mode



(b) Dot mode

OBJECTIVE 2

2

Graph Piecewise-defined Functions

**PIECE WISE
FUNCTIONS**

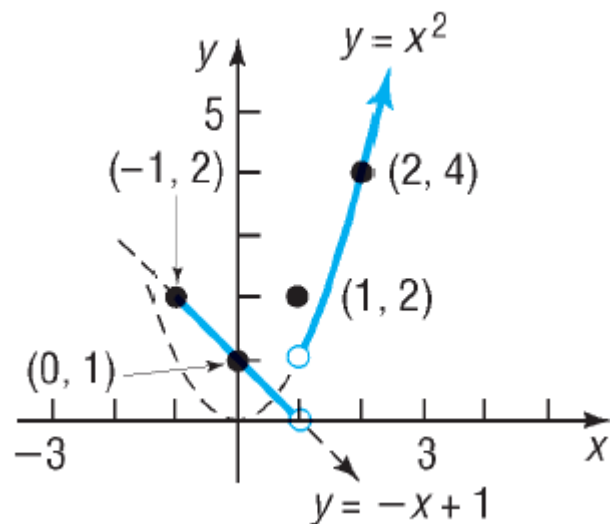
EXAMPLE

Analyzing a Piecewise-defined Function

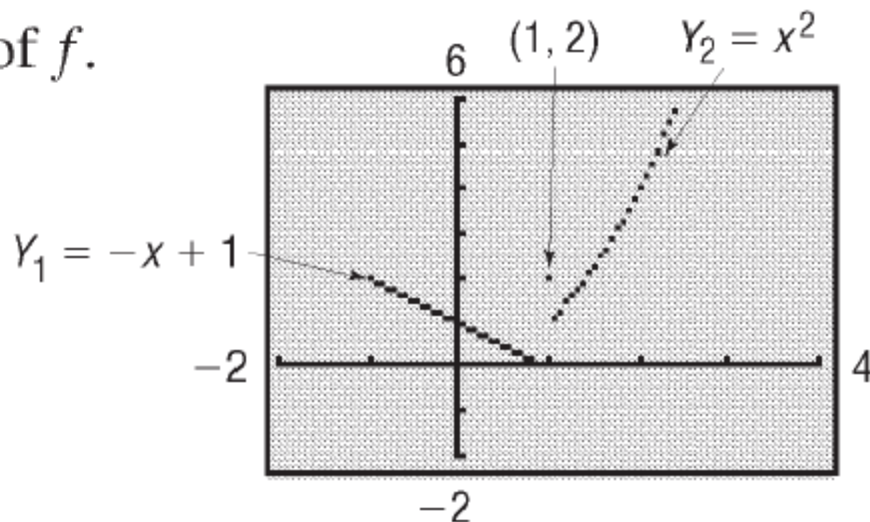
The function f is defined as

$$f(x) = \begin{cases} -x + 1 & \text{if } -1 \leq x < 1 \\ 2 & \text{if } x = 1 \\ x^2 & \text{if } x > 1 \end{cases}$$

- Find $f(0)$, $f(1)$, and $f(2)$.
- Determine the domain of f .
- Graph f by hand.
- Use the graph to find the range of f .



```
Plot1 Plot2 Plot3
\Y1 = (-X+1)(X ≥ -1)
(X < 1) + 2(X = 1) + (X^2
)(X > 1)
\Y2 =
\Y3 =
\Y4 =
\Y5 =
```



EXAMPLE

Cost of Electricity

In May 2004, Commonwealth Edison Company supplied electricity to residences for a monthly customer charge of \$7.13 plus 8.275¢ per kilowatt-hour (kWhr) for the first 400 kWhr supplied in the month and 6.208¢ per kWhr for all usage over 400 kWhr in the month.

- What is the charge for using 300 kWhr in a month?
- What is the charge for using 700 kWhr in a month?
- If C is the monthly charge for x kWhr, express C as a function of x .

