

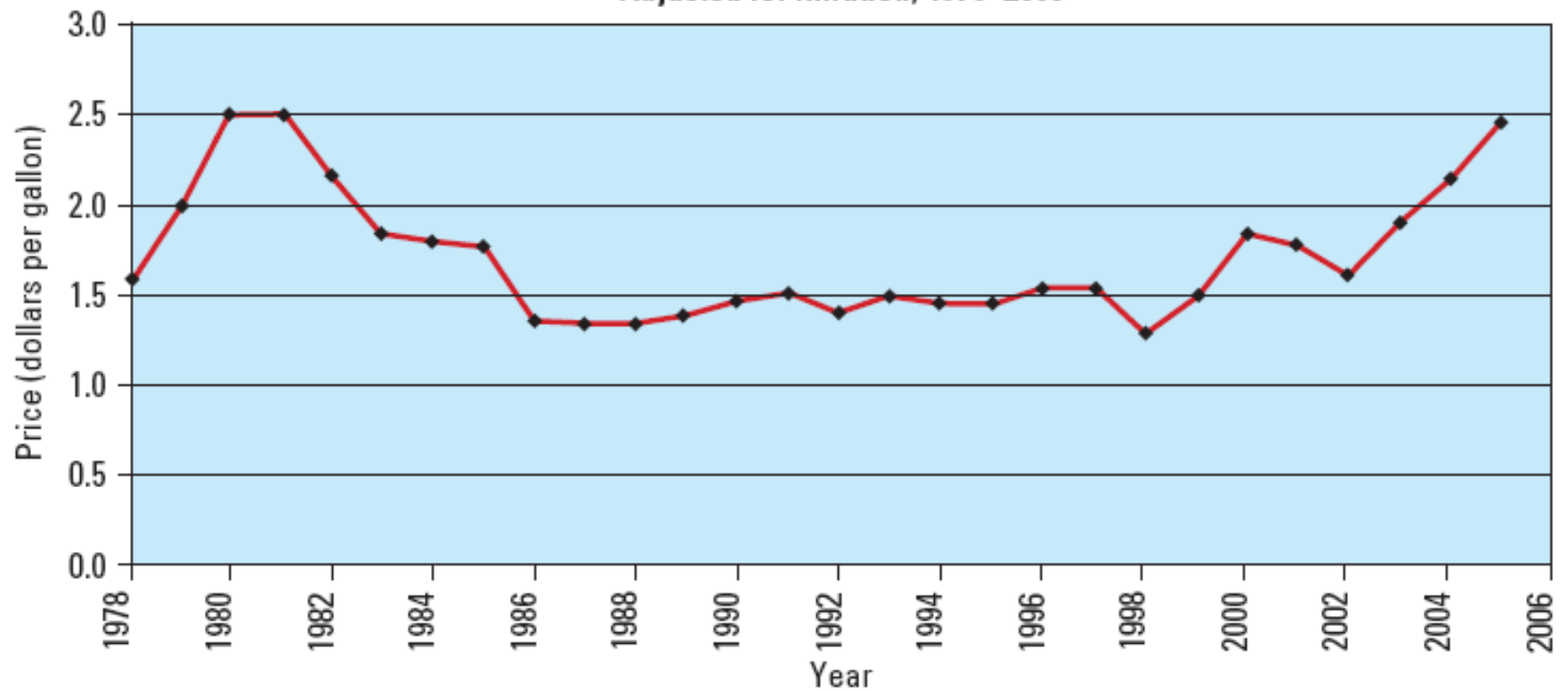
## **Section 3.2**

# **The Graph of a Function**

# Average Price of Gasoline in California adjusted for Inflation (based on 2005 dollars)

Year	Price	Year	Price	Year	Price	Year	Price
1979	1.9829	1986	1.3459	1993	1.5189	2000	1.8249
1980	2.4929	1987	1.3274	1994	1.4709	2001	1.7536
1981	2.4977	1988	1.3111	1995	1.4669	2002	1.5955
1982	2.1795	1989	1.3589	1996	1.5397	2003	1.8950
1983	1.8782	1990	1.4656	1997	1.5329	2004	2.1521
1984	1.8310	1991	1.4973	1998	1.3246	2005	2.4730
1985	1.7540	1992	1.3969	1999	1.5270	2006	2.8919

California Gasoline Prices Based on 2005 Dollars,  
Adjusted for Inflation, 1979–2006



# OBJECTIVE 1



**Identify the Graph of a Function**

# Theorem

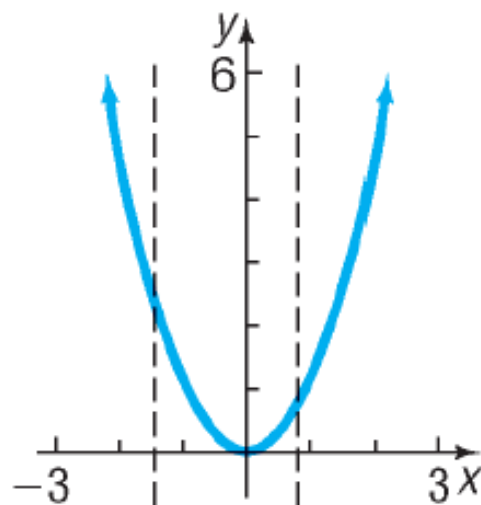
## Vertical-line Test

A set of points in the  $xy$ -plane is the graph of a function if and only if every vertical line intersects the graph in at most one point.

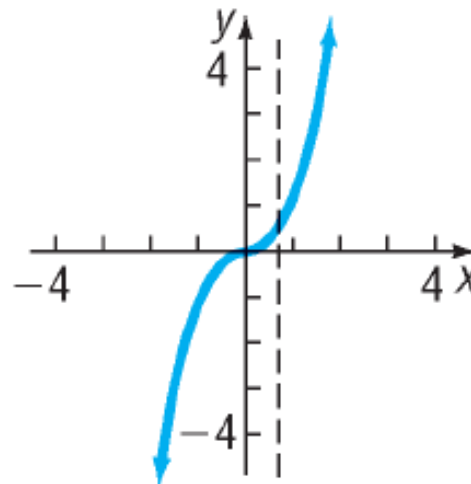
## EXAMPLE

### Identifying the Graph of a Function

Which of the following are graphs of functions?



(a)  $y = x^2$

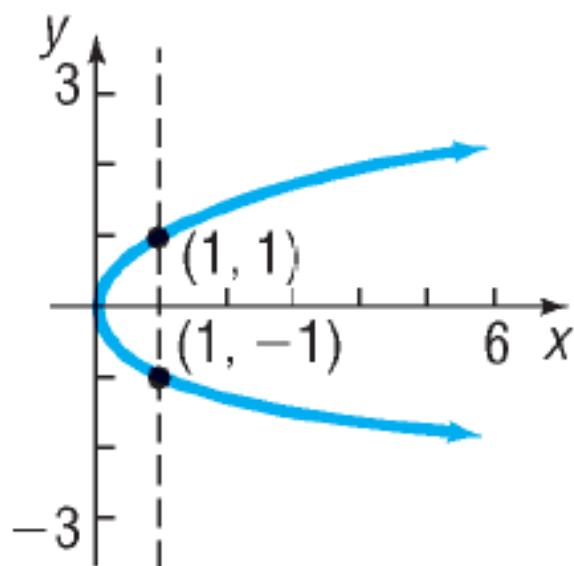


(b)  $y = x^3$

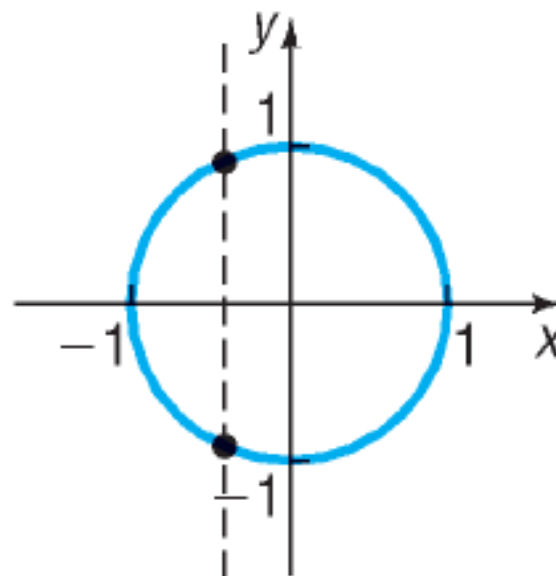
## EXAMPLE

### Identifying the Graph of a Function

Which of the following are graphs of functions?



(c)  $x = y^2$



(d)  $x^2 + y^2 = 1$

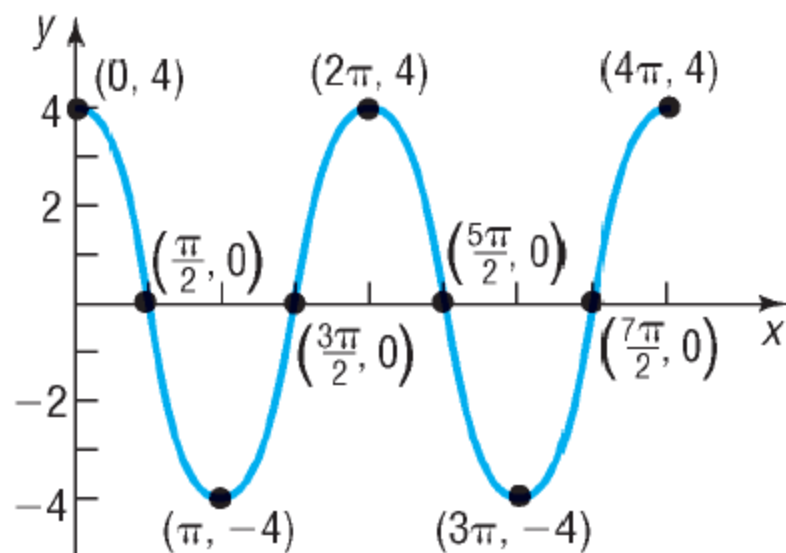
# OBJECTIVE 2

**2** Obtain Information from or about the Graph of a Function



## EXAMPLE

### Obtaining Information from the Graph of a Function



- (a) What are  $f(0)$ ,  $f\left(\frac{3\pi}{2}\right)$ , and  $f(3\pi)$ ?
- (b) What is the domain of  $f$ ?
- (c) What is the range of  $f$ ?
- (d) List the intercepts.
- (e) How often does the line  $y = 2$  intersect the graph?
- (f) For what values of  $x$  does  $f(x) = -4$ ?
- (g) For what values of  $x$  is  $f(x) > 0$ ?

## EXAMPLE

### Obtaining Information about the Graph of a Function

Consider the function  $f(x) = \frac{x}{x+1}$

- (a) Is the point  $\left(1, \frac{1}{2}\right)$  on the graph of  $f$ ?
- (b) If  $x = 2$ , what is  $f(x)$ ? What point is on the graph of  $f$ ?
- (c) If  $f(x) = 2$ , what is  $x$ ? What point is on the graph of  $f$ ?

**EXAMPLE****Average Cost Function**

The average cost  $\bar{C}$  of manufacturing  $x$  computers per day is given by the function

$$\bar{C}(x) = 0.56x^2 - 34.39x + 1212.57 + \frac{20,000}{x}$$

Determine the average cost of manufacturing:

- (a) 30 computers in a day
- (b) 40 computers in a day
- (c) 50 computers in a day
- (d) Graph the function  $\bar{C} = \bar{C}(x)$ ,  $0 < x \leq 80$ .
- (e) Create a TABLE with TblStart = 1 and  $\Delta\text{Tbl} = 1$ .

Which value of  $x$  minimizes the average cost?

# Summary

## Graph of a function

The collection of points  $(x, y)$  that satisfies the equation  $y = f(x)$ .

## Vertical-line test

A collection of points is the graph of a function provided that every vertical line intersects the graph in at most one point.