

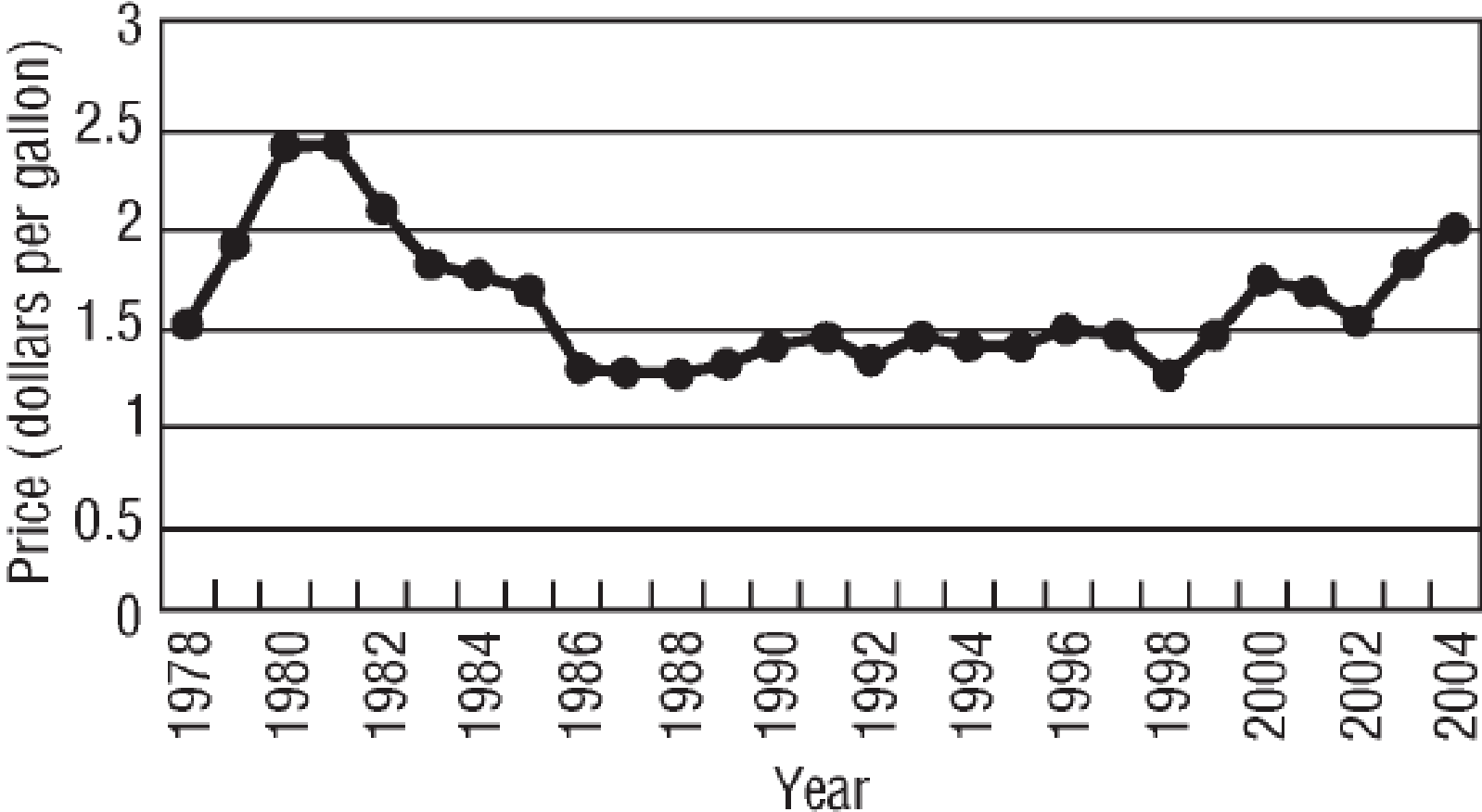
Section 2.2

The Graph of a Function

Average Price of Gasoline, Adjusted for Inflation.

Year	Price	Year	Price
1978	1.5207	1992	1.3460
1979	1.9263	1993	1.4622
1980	2.4197	1994	1.4166
1981	2.4258	1995	1.4111
1982	2.1136	1996	1.4804
1983	1.8210	1997	1.4697
1984	1.7732	1998	1.2685
1985	1.6998	1999	1.4629
1986	1.3043	2000	1.7469
1987	1.2831	2001	1.6821
1988	1.2674	2002	1.5339
1989	1.3134	2003	1.8308
1990	1.4160	2004	2.0047
1991	1.4490		

Price of Gasoline Adjusted for Inflation, 1978–2004



OBJECTIVE 1



Identify the Graph of a Function

Theorem

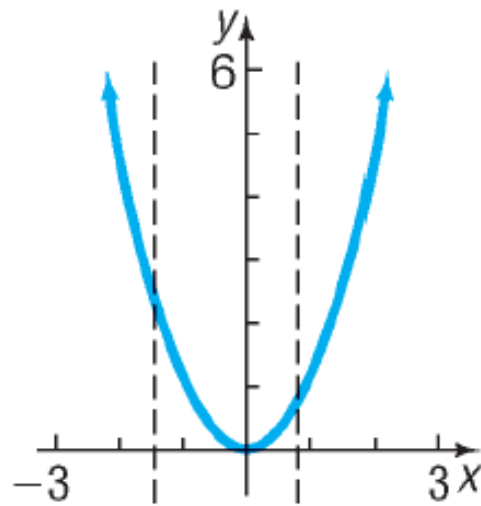
Vertical-line Test

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.

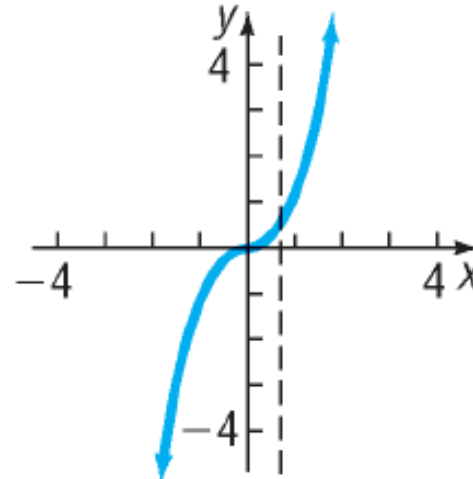
EXAMPLE

Identifying the Graph of a Function

Which of the following are graphs of functions?



(a) $y = x^2$

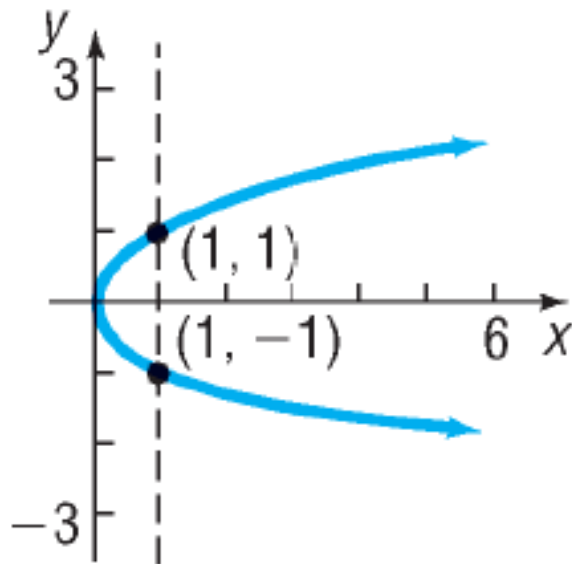


(b) $y = x^3$

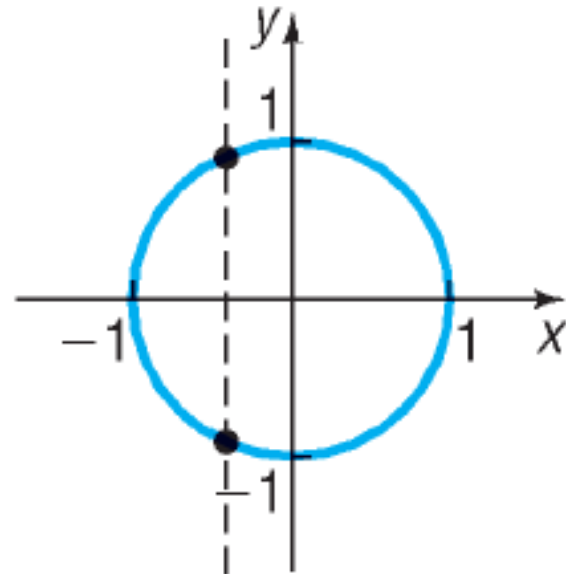
EXAMPLE

Identifying the Graph of a Function

Which of the following are graphs of functions?



(c) $x = y^2$



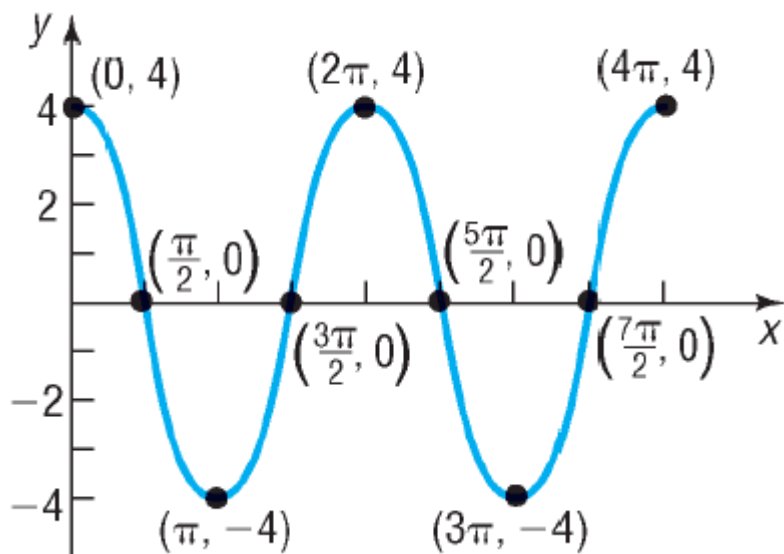
(d) $x^2 + y^2 = 1$

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?

EXAMPLE

Average Cost Function

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

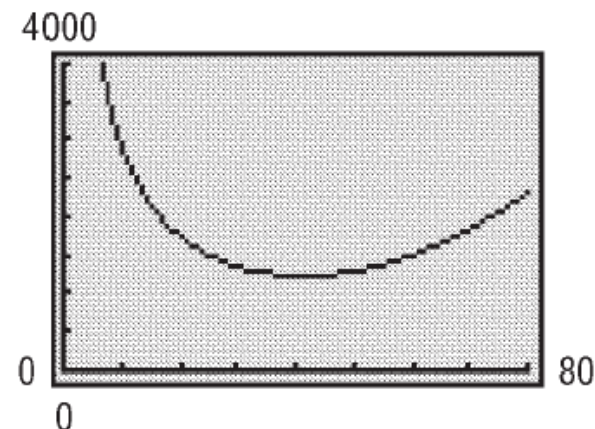
- (a) 30 computers in a day = \$1351.54
(b) 40 computers in a day = \$1232.97
(c) 50 computers in a day = \$1293.07
(d) Graph the function $\bar{C} = \bar{C}(x)$, $0 < x \leq 80$.
(e) Create a TABLE with TblStart = 1 and $\Delta\text{Tbl} = 1$

X	Y1
30	21179
31	11146
32	7781.1
33	6084
34	5054.6
35	4359.7
36	3856.4

Y1 = .56X² - 34.39X...

X	Y1
38	1240.7
39	1235.9
40	1233
41	1231.74487805
42	1232.2
43	1234.4
44	1238.1

Y1 = 1231.74487805



Which value of x minimizes the average cost? \$1231.74

Summary

Graph of a function

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

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