

3.3 Function Notation

Terminology

$f(x)$, read as “F of x”, is another name for y

Example 1: Evaluating a Function

a) Evaluate $f(x) = -4x + 7$ when $x = 2$ and $x = -5$

b) Write your answers in function notation:

Example 2: Interpreting Function Notation

Let $f(t)$ be the outside temperature ($^{\circ}\text{F}$) t hours after 6am. Explain the meaning of each statement.

a) $f(0) = 58$

b) $f(6) = 64$

c) $f(3) < f(9)$

Example 3: Solving for the Independent Variable

Given $g(x) = \frac{2}{3}x - 5$, find the value of x for which $g(x) = -7$

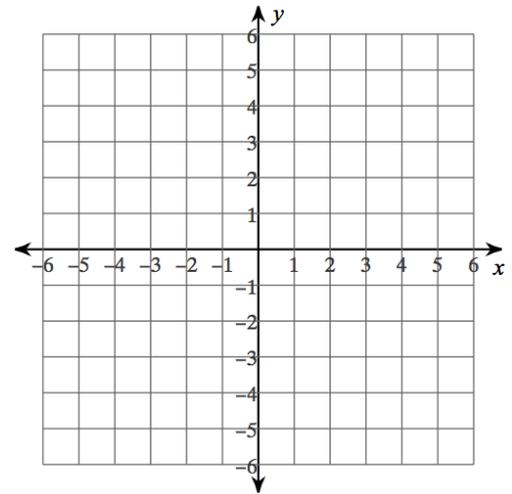
Try on your own: find the value of x so that the function has the given value.

1) $f(x) = 6x + 9$; $f(x) = 21$

2) $f(x) = -\frac{1}{2}x + 3$; $f(x) = -1$

Example 4: Graphing a Linear Function

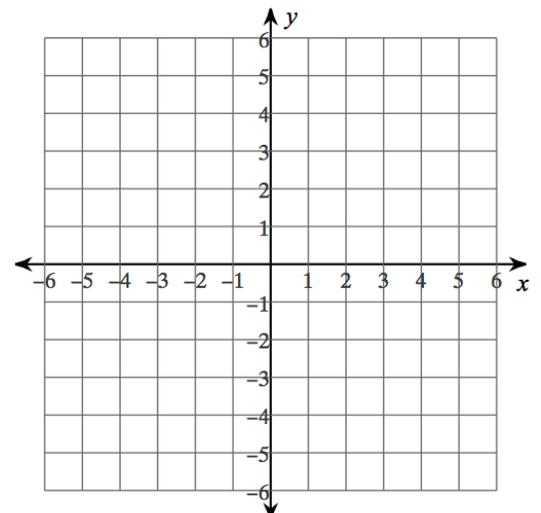
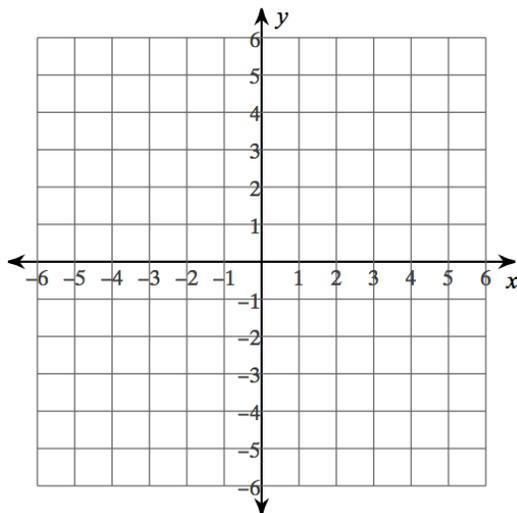
Graph $f(x) = 2x + 5$



Try on your own: Graph the following

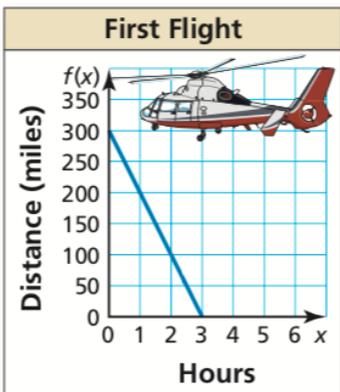
1) $f(x) = 3x - 2$

2) $g(x) = -\frac{1}{2}x + 2$



Example 5: Modeling with Mathematics

The graph shows the number of miles a helicopter is from its destination after x hours on its first flight. On its second flight, the helicopter travels 50 miles farther and increases its speed by 25mph. The function $f(x) = 350 - 125x$ represents the second flight, where $f(x)$ is the number of miles the helicopter is from its destination after x hours. Which flight takes less time? Explain your answer.



3.3 Exercises

Vocabulary and Core Concept Check

- COMPLETE THE SENTENCE** When you write the function $y = 2x + 10$ as $f(x) = 2x + 10$, you are using _____.
- REASONING** Your height can be represented by a function h , where the input is your age. What does $h(14)$ represent?

Monitoring Progress and Modeling with Mathematics

In Exercises 3–10, evaluate the function when $x = -2, 0$, and 5. (See Example 1.)

- | | |
|-------------------------|-------------------------|
| 3. $f(x) = x + 6$ | 4. $g(x) = 3x$ |
| 5. $h(x) = -2x + 9$ | 6. $r(x) = -x - 7$ |
| 7. $p(x) = -3 + 4x$ | 8. $b(x) = 18 - 0.5x$ |
| 9. $v(x) = 12 - 2x - 5$ | 10. $n(x) = -1 - x + 4$ |

11. **INTERPRETING FUNCTION NOTATION** Let $c(t)$ be the number of customers in a restaurant t hours after 8 A.M. Explain the meaning of each statement. (See Example 2.)

- | | |
|----------------|--------------------|
| a. $c(0) = 0$ | b. $c(3) = c(8)$ |
| c. $c(n) = 29$ | d. $c(13) < c(12)$ |

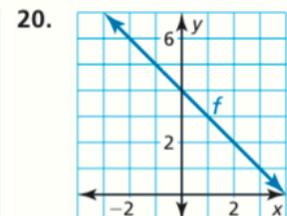
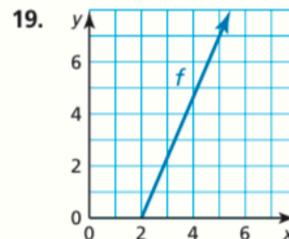
12. **INTERPRETING FUNCTION NOTATION** Let $H(x)$ be the percent of U.S. households with Internet use x years after 1980. Explain the meaning of each statement.

- | | |
|----------------------------------|---------------|
| a. $H(23) = 55$ | b. $H(4) = k$ |
| c. $H(27) \geq 61$ | |
| d. $H(17) + H(21) \approx H(29)$ | |

In Exercises 13–18, find the value of x so that the function has the given value. (See Example 3.)

- $h(x) = -7x; h(x) = 63$
- $t(x) = 3x; t(x) = 24$
- $m(x) = 4x + 15; m(x) = 7$
- $k(x) = 6x - 12; k(x) = 18$
- $q(x) = \frac{1}{2}x - 3; q(x) = -4$
- $j(x) = -\frac{4}{5}x + 7; j(x) = -5$

In Exercises 19 and 20, find the value of x so that $f(x) = 7$.



21. **MODELING WITH MATHEMATICS** The function $C(x) = 17.5x - 10$ represents the cost (in dollars) of buying x tickets to the orchestra with a \$10 coupon.

- How much does it cost to buy five tickets?
- How many tickets can you buy with \$130?

22. **MODELING WITH MATHEMATICS** The function $d(t) = 300,000t$ represents the distance (in kilometers) that light travels in t seconds.

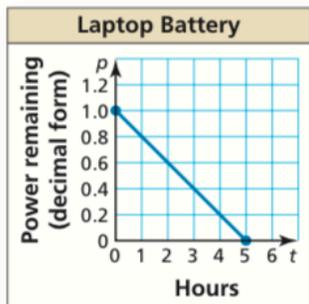
- How far does light travel in 15 seconds?
- How long does it take light to travel 12 million kilometers?



In Exercises 23–28, graph the linear function. (See Example 4.)

- | | |
|--------------------------------|-------------------------------|
| 23. $p(x) = 4x$ | 24. $h(x) = -5$ |
| 25. $d(x) = -\frac{1}{2}x - 3$ | 26. $w(x) = \frac{3}{5}x + 2$ |
| 27. $g(x) = -4 + 7x$ | 28. $f(x) = 3 - 6x$ |

29. **PROBLEM SOLVING** The graph shows the percent p (in decimal form) of battery power remaining in a laptop computer after t hours of use. A tablet computer initially has 75% of its battery power remaining and loses 12.5% per hour. Which computer's battery will last longer? Explain. (See Example 5.)



30. **PROBLEM SOLVING** The function $C(x) = 25x + 50$ represents the labor cost (in dollars) for Certified Remodeling to build a deck, where x is the number of hours of labor. The table shows sample labor costs from its main competitor, Master Remodeling. The deck is estimated to take 8 hours of labor. Which company would you hire? Explain.

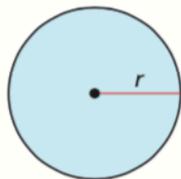
Hours	Cost
2	\$130
4	\$160
6	\$190

31. **MAKING AN ARGUMENT** Let $P(x)$ be the number of people in the U.S. who own a cell phone x years after 1990. Your friend says that $P(x + 1) > P(x)$ for any x because $x + 1$ is always greater than x . Is your friend correct? Explain.

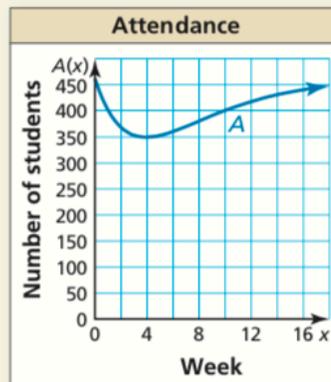
32. **THOUGHT PROVOKING** Let $B(t)$ be your bank account balance after t days. Describe a situation in which $B(0) < B(4) < B(2)$.

33. **MATHEMATICAL CONNECTIONS** Rewrite each geometry formula using function notation. Evaluate each function when $r = 5$ feet. Then explain the meaning of the result.

- Diameter, $d = 2r$
- Area, $A = \pi r^2$
- Circumference, $C = 2\pi r$



34. **HOW DO YOU SEE IT?** The function $y = A(x)$ represents the attendance at a high school x weeks after a flu outbreak. The graph of the function is shown.



- What happens to the school's attendance after the flu outbreak?
- Estimate $A(13)$ and explain its meaning.
- Use the graph to estimate the solution(s) of the equation $A(x) = 400$. Explain the meaning of the solution(s).
- What was the least attendance? When did that occur?
- How many students do you think are enrolled at this high school? Explain your reasoning.

35. **INTERPRETING FUNCTION NOTATION** Let f be a function. Use each statement to find the coordinates of a point on the graph of f .

- $f(5)$ is equal to 9.
- A solution of the equation $f(n) = -3$ is 5.

36. **REASONING** Given a function f , tell whether the statement

$$f(a + b) = f(a) + f(b)$$

is true or false for all inputs a and b . If it is false, explain why.

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Solve the inequality. Graph the solution. (Section 2.5)

37. $-2 \leq x - 11 \leq 6$

38. $5a < -35$ or $a - 14 > 1$

39. $-16 < 6k + 2 < 0$

40. $2d + 7 < -9$ or $4d - 1 > -3$

41. $5 \leq 3y + 8 < 17$

42. $4v + 9 \leq 5$ or $-3v \geq -6$