Skill check:

Evaluate the expression:

$x = 2$

$4(x + 2 - 5x)$

3-3 Function Notation

Vocabulary:

1.) Function notation: is another name for y
ex: y = mx + b now f(x) = mx + b

x= represents its domain
f(x) = represents the output of f corresponding to input x

EXAMPLE 1 Evaluating a Function

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

SOLUTION

$f(x) = -4x + 7$	Write the function.	$f(x) = -4x + 7$
$f(2) = -4(2) + 7$	Substitute for x.	$f(-2) = -4(-2) + 7$
$= -8 + 7$	Multiply.	$= 8 + 7$
$= -1$	Add.	$= 15$

▶ When $x = 2, f(x) = -1$, and when $x = -2, f(x) = 15$.

EXAMPLE 2 Interpreting Function Notation

Let $f(t)$ be the outside temperature (°F) t hours after 6 A.M. Explain the meaning of each statement.

a. $f(0) = 58$ **b.** $f(6) = n$ **c.** $f(3) < f(9)$

SOLUTION

a. The initial value of the function is 58. So, the temperature at 6 A.M. is 58°F.

b. The output of f when $t = 6$ is n. So, the temperature at noon (6 hours after 6 A.M.) is n°F.

c. The output of f when $t = 3$ is less than the output of f when $t = 9$. So, the temperature at 9 A.M. (3 hours after 6 A.M.) is less than the temperature at 3 P.M. (9 hours after 6 A.M.).

Evaluate the function when $x = -4, 0$, and 3.

1. $f(x) = 2x - 5$

2. $g(x) = -x - 1$

3. WHAT IF? In Example 2, let $f(t)$ be the outside temperature (°F) t hours after 9 A.M. Explain the meaning of each statement.

a. $f(4) = 75$ **b.** $f(m) = 70$ **c.** $f(2) = f(9)$ d. $f(6) > f(0)$

EXAMPLE 3 Solving for the Independent Variable

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

SOLUTION

$h(x) = \frac{2}{3}x - 5$	Write the function.
$-7 = \frac{2}{3}x - 5$	Substitute –7 for $h(x)$.
$+5 \qquad +5$	Add 5 to each side.
$-2 = \frac{2}{3}x$	Simplify.
$\frac{3}{2} \cdot (-2) = \frac{3}{2} \cdot \frac{2}{3}x$	Multiply each side by $\frac{3}{2}$.
$-3 = x$	Simplify.

▶ When $x = -3$, $h(x) = -7$.

EXAMPLE 4 **Graphing a Linear Function in Function Notation**

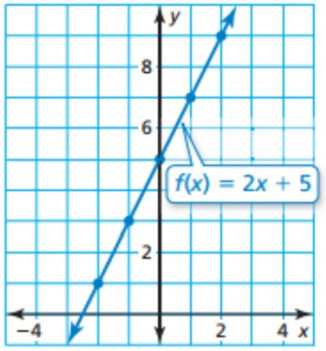
Graph $f(x) = 2x + 5$.

Step 1 Make an input-output table to find ordered pairs.

x	-2	-1	0	1	2
$f(x)$	1	3	5	7	9

Step 2 Plot the ordered pairs.

Step 3 Draw a line through the points.



Find the value of x so that the function has the given value.

4. $f(x) = 6x + 9;\ f(x) = 21$

5. $g(x) = -\frac{1}{2}x + 3;\ g(x) = -1$

Graph the linear function.

6. $f(x) = 3x - 2$

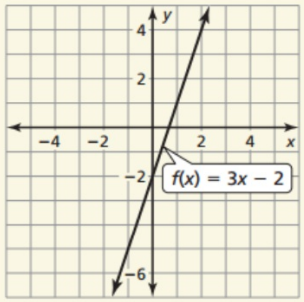
7. $g(x) = -x + 4$

8. $h(x) = -\frac{3}{4}x - 1$

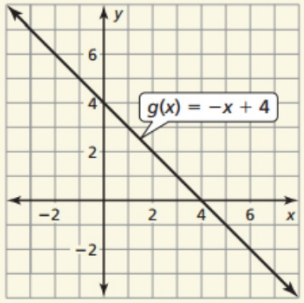
4. $x = 2$

5. $x = 8$

6.

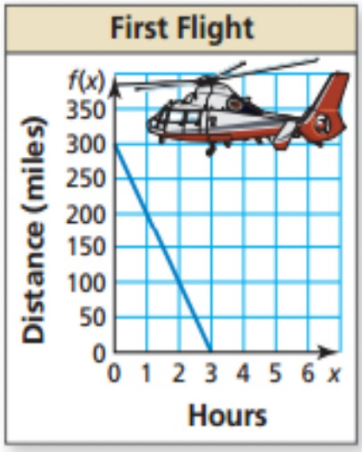


7.



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 25 miles per hour. 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.



SOLUTION

1. **Understand the Problem** You are given a graph of the first flight and an equation of the second flight. You are asked to compare the flight times to determine which flight takes less time.

2. **Make a Plan** Graph the function that represents the second flight. Compare the graph to the graph of the first flight. The x-value that corresponds to $f(x) = 0$ represents the flight time.

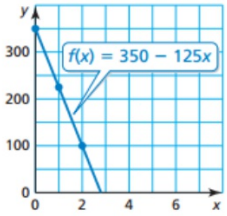
3. **Solve the Problem** Graph $f(x) = 350 - 125x$.

   Step 1 Make an input-output table to find the ordered pairs.

x	0	1	2	3
$f(x)$	350	225	100	−25

   Step 2 Plot the ordered pairs.

   Step 3 Draw a line through the points. Note that the function only makes sense when x and $f(x)$ are positive. So, only draw the line in the first quadrant.



   ▶ From the graph of the first flight, you can see that when $f(x) = 0$, $x = 3$. From the graph of the second flight, you can see that when $f(x) = 0$, x is slightly less than 3. So, the second flight takes less time.

4. **Look Back** You can check that your answer is correct by finding the value of x for which $f(x) = 0$.

$$f(x) = 350 - 125x \qquad \text{Write the function.}$$
$$0 = 350 - 125x \qquad \text{Substitute 0 for } f(x).$$
$$-350 = -125x \qquad \text{Subtract 350 from each side.}$$
$$2.8 = x \qquad \text{Divide each side by } -125.$$

So, the second flight takes 2.8 hours, which is less than 3.