

Section 2.2

Graphs of Functions

Are You Sending that *First-Class*?



To Whom It May Concern:

An application in this section uses a graph to look at the cost of mailing a first class letter.

First Steps:

- Take **comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 2.2 of your textbook which begins on page 114.
- Complete the *Concept and Vocabulary Check* on page 120 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Graph functions by plotting points.

✓ *Solved Problem #1*

1. Graph the functions $f(x) = 2x$ and $g(x) = 2x - 3$ in the same rectangular coordinate system. Select integers for x , starting with -2 and ending with 2. How is the graph of g related to the graph of f ?

Make a table for $f(x) = 2x$:

x	$f(x) = 2x$	(x, y)
-2	$f(-2) = 2(-2) = -4$	(-2, -4)
-1	$f(-1) = 2(-1) = -2$	(-1, -2)
0	$f(0) = 2(0) = 0$	(0, 0)
1	$f(1) = 2(1) = 2$	(1, 2)
2	$f(2) = 2(2) = 4$	(2, 4)

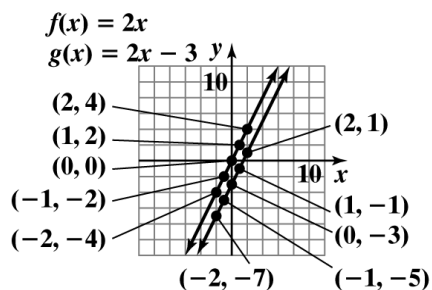
✎ *Pencil Problem #1* ✎

1. Graph the functions $f(x) = |x|$ and $g(x) = |x| - 2$ in the same rectangular coordinate system. Select integers for x , starting with -2 and ending with 2. How is the graph of g related to the graph of f ?

Make a table for $g(x) = 2x - 3$:

x	$g(x) = 2x - 3$	(x, y)
-2	$g(-2) = 2(-2) - 3 = -7$	$(-2, -7)$
-1	$g(-1) = 2(-1) - 3 = -5$	$(-1, -5)$
0	$g(0) = 2(0) - 3 = -3$	$(0, -3)$
1	$g(1) = 2(1) - 3 = -1$	$(1, -1)$
2	$g(2) = 2(2) - 3 = 1$	$(2, 1)$

Plot the points and draw the lines that pass through them.

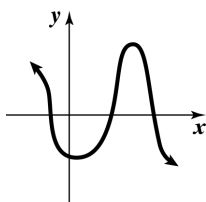


The graph of g is the graph of f shifted down by 3 units.

Objective #2: Use the vertical line test to identify functions.

✓ Solved Problem #2

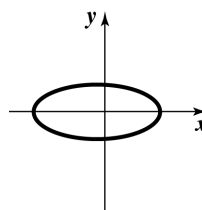
2. Use the vertical line test to determine if the graph represents y as a function of x .



The graph passes the vertical line test and thus y is a function of x .

✎ Pencil Problem #2 ✎

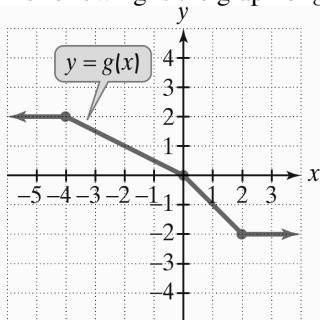
2. Use the vertical line test to determine if the graph represents y as a function of x .



Objective #3: Obtain information about a function from its graph.

 **Solved Problem #3**

3a. The following is the graph of g .



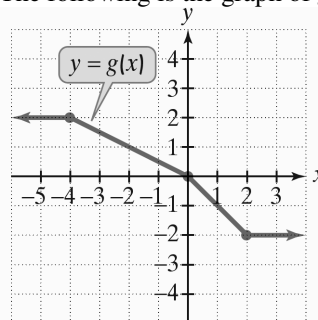
Use the graph to find $g(-20)$.

The graph indicates that to the left of $x = -4$, the graph is at a constant height of 2.

Thus, $g(-20) = 2$.

 **Pencil Problem #3**

3a. The following is the graph of g .



Use the graph to find $g(-4)$.

3b. Use the graph from *Problem 3a* above to find the value of x for which $g(x) = -1$.

$$g(1) = -1$$

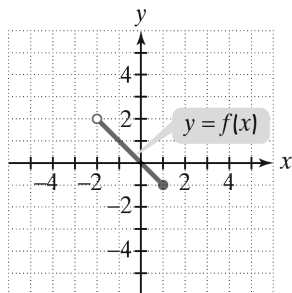
The height of the graph is -1 when $x = 1$.

3b. Use the graph from *Problem 3a* above to find the value of x for which $g(x) = 1$.

Objective #4: Identify the domain and range of a function from its graph.

✓ Solved Problem #4

4. Use the graph of the function to identify its domain and its range.

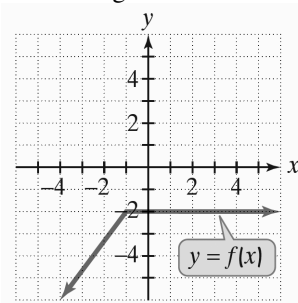


Inputs on the x -axis extend from -2 , excluding -2 , to 1 , including 1 .
The domain is $(-2, 1]$.

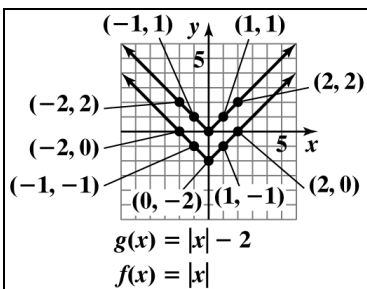
Outputs on the y -axis extend from -1 , including -1 , to 2 , excluding 2 .
The range is $[-1, 2)$.

✎ Pencil Problem #4 ✎

4. Use the graph of the function to identify its domain and its range.



Answers for Pencil Problems (Textbook Exercise references in parentheses):



- The graph of g is the graph of f shifted down 2 units. (2.2 #7)
- not a function (2.2 #17) **3a.** 2 (2.2 #25) **3b.** -2 (2.2 #29)
- Domain: $(-\infty, \infty)$. Range: $(-\infty, -2]$ (2.2 #37)

Homework:

- Review the Section 2.2 summary on page 167 of the textbook.
- Insert your homework into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.