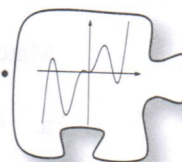# 11.1.5 How can I describe this relation?

Investigating a New Relation

You are now familiar with the graphs of lines, parabolas, and square roots. What other types of relations can you study? Today you will use the questions your class generated in Lesson 11.1.1 to investigate several new relations. Your team will then report its findings to the class. Pay close attention to presentations! As you listen to the presentations of your classmates, you will learn about several new and interesting relations.

11-51. **NEW RELATIONS**

Your teacher will assign your team a new relation from the list below. On graph paper, carefully graph your new relation. Be sure to include enough values in your table to show any unusual behavior of your graph. Then use your list of questions about relations to investigate your particular relation.

Write clear summary statements that describe your relation. Create a team poster for your relation with a graph and any observations and statements your team made. Be ready to present your poster to the class.

(1) $f(x) = \frac{1}{x}$

(2) $f(x) = x^3$

(3) $f(x) = \frac{1}{x^2}$

(4) $f(x) = 0.5^x$

(5) $f(x) = 2^x$

(6) $f(x) = \sqrt{16 - x^2}$

11-52. On the resource page provided by your teacher, find a box for each of the relations listed in problem 11-51. As you listen to the presentations, take notes on each relation. Be sure to sketch a graph of the relation as well as list any special points or features. Remember to date this entry and place the resource page in your Learning Log.

11-53.   MATCH-A-GRAPH

Match each rule (a) through (f) with its corresponding graph below.
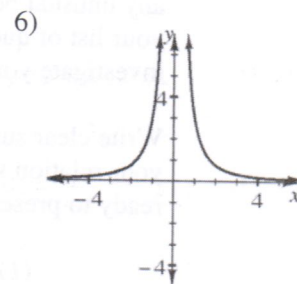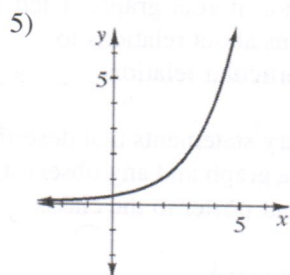
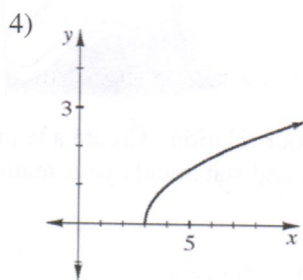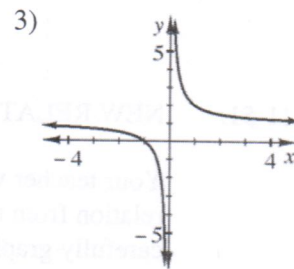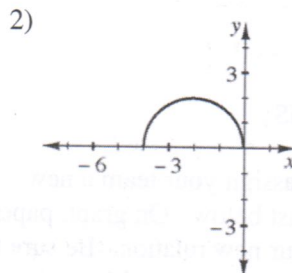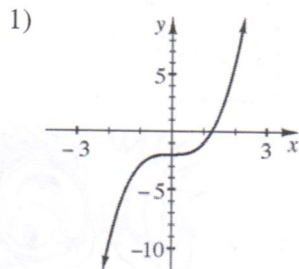a. $f(x) = \sqrt{x-3}$

b. $f(x) = \frac{1}{x} + 1$

c. $f(x) = x^3 - 2$

d. $f(x) = \sqrt{4 - (x+2)^2}$

e. $f(x) = \frac{3}{x^2}$

f. $f(x) = 2^{x-2}$

1)

2)

3)

4)

5)

6)

══════ Review & Preview ══════

11-54.   For each relation graphed in problem 11-53, name the domain and the range.

11-55.   On the same set of axes, graph $y = |x|$ and $y = |x| + 2$. What is the same about these two graphs? What is different?

11-56.   Simplify the rational expression below. What values can x not be?

$$\frac{3x^2 + 11x - 20}{2x^2 + 11x + 5}$$

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11-57. Find the corresponding inputs or outputs for the following relations. If there is no solution, explain why not. Be careful: In some cases, there may be no solution or more than one possible solution.

a. $x = 8$

$$f(x) = |x|$$

$f(8) = ?$

b. $x = ?$

$$f(x) = 3 - \sqrt{x}$$

$f(x) = 2$

c. $k = -6$

$$f(k) = \frac{k}{2} + 1$$

$f(-6) = ?$

d. $x = 3$

$$f(x) = \sqrt{x - 5}$$

$f(3) = ?$

11-58. Find the equation of a line that is perpendicular to $y = -\frac{1}{5}x + 11$ but goes through the point (6, 8).

11-59. Solve each equation below for the given variable. Be sure to check your solution.

a. $6x - 11 = 3x + 16$

b. $-2(5 - 3x) + 5 = 9 + 3x$

c. $\frac{6}{k-2} = 10$

d. $\frac{4}{3x-1} = \frac{2}{x+3}$

11-60. Simplify using only positive exponents.

a. $(3x^2y)(5x)$

b. $(x^2y^3)(x^{-2}y^{-2})$

c. $\frac{x^3}{x^{-2}}$

d. $(2x^{-1})^3$

11-61. Find the inputs for the following relations with the given outputs. If there is no possible input for the given output, explain why not.
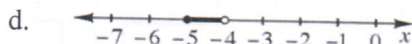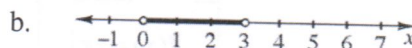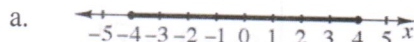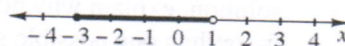
a. $x = ?$

$$f(x) = 3x - 7$$
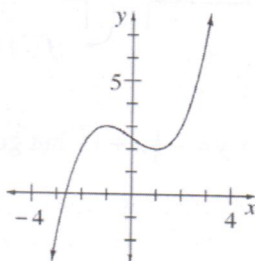
$f(x) = -1$

b. $x = ?$

$$f(x) = \sqrt{2x - 6}$$

$f(x) = 10$

11-62.   One way to represent the solutions shown on the number line at right is $-3 \le x < 1$. For each number line below, write a similar mathematical sentence to describe the solutions for x.
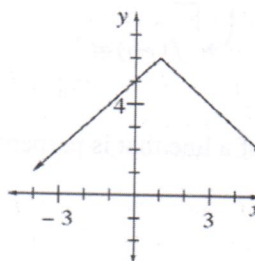

a.

b.

c.

d.

11-63.   Which graphs below have a domain of all numbers? Which have a range of all numbers?
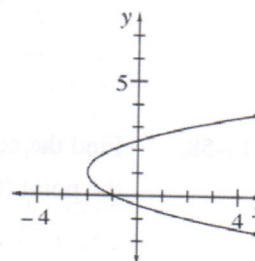
a.

b.

c.

11-64.   Solve each of the following equations or systems.

a. $x^2 - 1 = 15$

b. $y = 3x - 2$
       $y = 4x + 3$

c. $x^2 - 2x - 8 = 0$

d. $2x^2 = -x + 7$

11-65.   Graph and shade the solution for the system of inequalities below.

$$y \le 4 + \tfrac{3}{4}x$$
$$y > -\tfrac{1}{2}x + 1$$