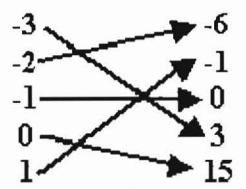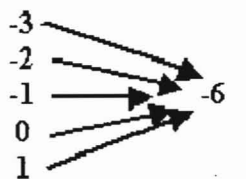# Properties of Functions

Domain and Range

The set of all the starting points is called "the domain" and the set of all the ending points is called "the range." The domain is what you start with; the range is what you end up with. The domain is the *x*'s; the range is the *y*'s.

- **State the domain and range of the following relation. Is the relation a function?**
  $\{(2, -3), (4, 6), (3, -1), (6, 6), (2, 3)\}$
  - **domain:** $\{2, 3, 4, 6\}$
  - **range:** $\{-3, -1, 3, 6\}$
  - Since $x = 2$ gives me two possible destinations (2,-3) and (2,3) then **this relation is not a function.**

- **State the domain and range of the following relation. Is the relation a function?**
  $\{(-3, 5), (-2, 5), (-1, 5), (0, 5), (1, 5), (2, 5)\}$

  I'll just list the *x*-values for the domain and the *y*-values for the range:

  domain: $\{-3, -2, -1, 0, 1, 2\}$

  range: $\{5\}$

domain range	
	This is a function. You can tell by tracing from each x to each y. There is only one y for each x; there is only one arrow coming from each x.
	Ha! Bet I fooled some of you on this one! This *is* a function! There is only one arrow coming from each x; there is only one y for each x. It just so happens that it's always the same y for each x, but it is only that one y. So this is a function; it's just an extremely *boring* function!

domain range	
-3 ⟶ -6 -2 ⟶ -1 -1 ⟶ 0 0 ⟶ 3 1 ⟶ 15	This one is not a function: there are *two* arrows coming from the number 1; the number 1 is associated with two *different* range elements. This is not a function!

The "Vertical Line Test"

Looking at this function stuff graphically, what if we had the relation that consists of a set containing just two points: $\{(2, 3), (2, -2)\}$? We already know that this is not a function, since $x = 2$ has two corresponding has two corresponding y values.

If we graph this relation, it looks like:	
Notice that you can draw a vertical line through the two points, like this:	

If you can draw a vertical line that crosses the graph in more than one place, then the relation is not a function. Here are a couple examples:

	This graph shows a function, because there is no vertical line that will cross this graph twice.
	This graph does not show a function, because any number of vertical lines will intersect this oval twice. For instance, the y-axis intersects (crosses) the line twice.

For each of the following cases, state whether the information describes a function. If so, state the domain and range.
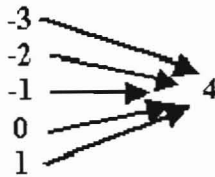
domain   range
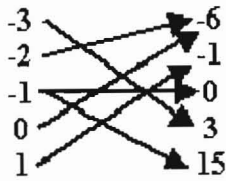
Function: _____
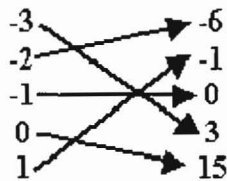
Domain: _____

Range: _____
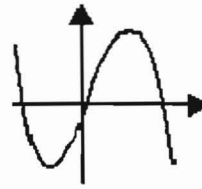

domain   range

Function: _____

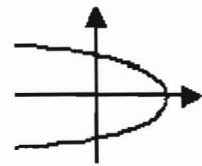Domain: _____

Range: _____

domain   range
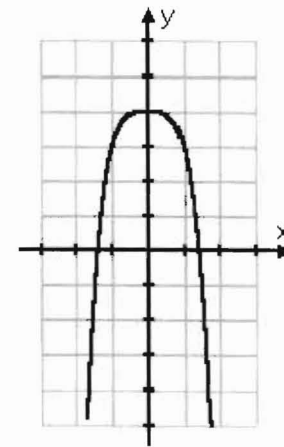
Function: _____

Domain: _____

Range: _____

Function: _____

Domain: _____

Range: _____

Function: _____

Domain: _____

Range: _____

Function: _____

Domain: _____

Range: _____

Relation, Function, Domain & Range

Part I

1) What is the domain and range of the following relation?

{ (-1,2), (2, 51), (1, 3), (8, 22), (9, 51) }

       domain:_____

       range:_____

2) What is the domain and range of the following relation?

{ (-5,6), (21, -51), (11, 93), (81, 202), (19, 51) }

       domain:_____

       range:_____

3) What is the domain and range of the following symbolic relation?

{ (🏃,✏️), (✏️,🎿), (🏧,🚲), (?,♥), (🚲,🚐), (📇,🎞️), (⛴️,🖼️)}

       domain:_____

       range:_____

Part II

1)   Which relations below are functions? _____

          Relation #1 { (-1,2), (-4,51), (1,2), (8,-51) }

          Relation #2 { (13,14), (13,5) , (16,7), (18,13) }

          Relation #3 { (3,90), (4,54), (6,71), (8, 90) }

2) Which relations below are functions? _____

    Why?

          Relation #1 { (3,4), (4,5), (6,7), (8,9) }

          Relation #2 { (3,4), (4,5), (6,7), (3,9) }

          Relation #3 { (-3,4), (4,-5), (0,0), (8,9) }

          Relation #4 { (8, 11), (34,5), (6,17), (8,19) }

3) Which relations below are functions? _____

    Why?

          Relation #1 { (3,4), (4,5), (6,7), (3,-9) }

          Relation #2 { (3,4), (4,5), (6,7), (5,4) }

          Relation #3 { (0,4), (4,-5), (0,0), (8,9) }

          Relation #4 { (8, 11), (34,5), (6,17), (6,19) }

4) For the following relation to be a function, **X** cannot be what values?

          { (8, 11), (34,5), (6,17), (**X** ,22) }

5) For the following relation to be a function, **X** cannot be what values?

$$\{ (12, 13), (-11, 22), (33, 101), (X, 22) \}$$

6) For the following relation to be a function, **X** can not be what values?

$$\{ (12,14), (13,5), (-2,7), (X,13) \}$$

7) For the following relation to be a function, **X** can not be what values?

$$\{ (13,14), (12,5), (16,7), (X,13) \}$$

Alex states that the relation below is not a function. Lillian says that it is a function. Who is correct? Explain your reasoning.

Relation $\{ (13,14), (12,5), (16,7), (13, 14), (-2, 33), (13, 14 \}$

Explanation:

_____
_____
_____
_____

RELATIONS AND FUNCTIONS 2

A RELATION   - is a correspondence between two variables.
     - is a set of points.

A FUNCTION   - is a relation such that for each **x-value** in the **Domain**,
     there is exactly 1 corresponding **y-value** in the **Range**.

Vertical Line Test for a Function

A vertical line can intersect the graph of a function in <u>at most one point,</u>   or using an alternate form,

If any vertical line intersects the graph <u>at more than one point</u>, then the graph is NOT the graph of a function.
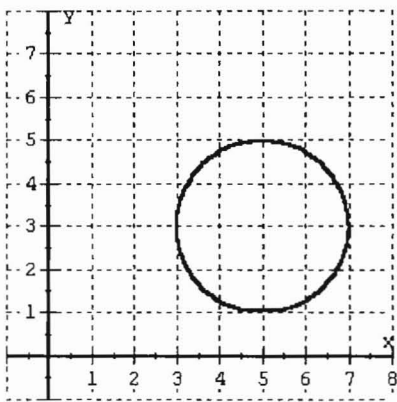
$$(x - 5)^2 + (y - 3)^2 = 4$$

Function?

Domain:

Range:
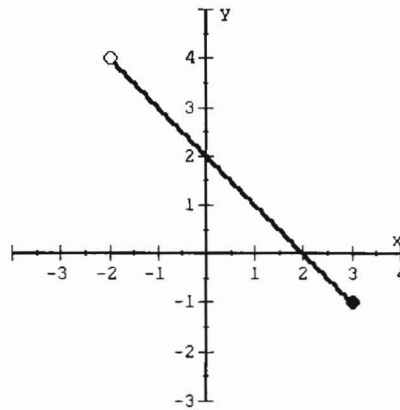
Line Segment

Function?

Domain:

Range:
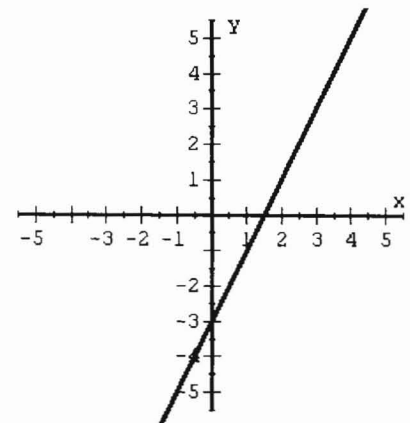
$$y = 2x - 3$$

Function?

Domain:

Range:

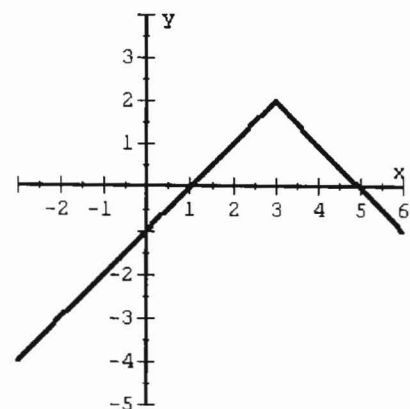---
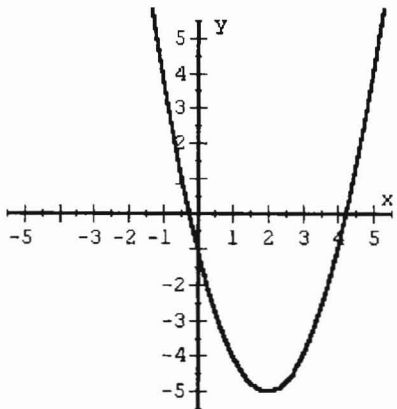
$$y = (x - 2)^2 - 5$$

Function?

Domain:

Range:
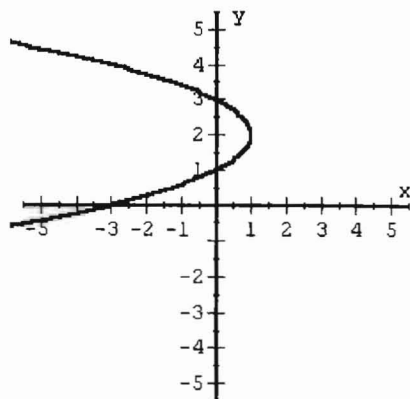
$$x = -(y - 2)^2 + 1$$

Function?

Domain:

Range:

$$y = -|x - 3| + 2$$

Function?

Domain:

Range:

Unit 2: Worksheet 2
Domain and Range

Name _____

Period _____

In 1 – 7, give the domain and range for each of the following, then determine whether it's a function.

1.

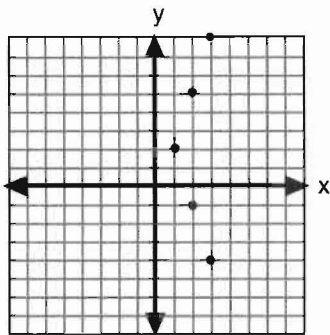| x	y
−4	−5
−3	−8
−2	−11
−1	−14

Domain: _____

Range: _____

Function? _____

2. {(9, 0), (0, 9), (4, 5), (5, 4)}

Domain: _____
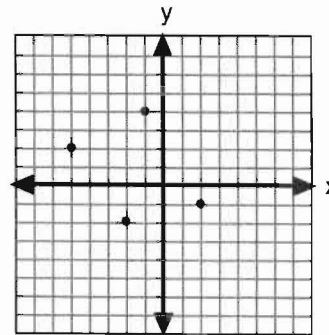
Range: _____

Function? _____

3.

Ordered Pairs:

_____

Domain: _____

Range: _____

Function? _____

4.

Ordered Pairs:

_____

Domain: _____

Range: _____

Function? _____

5.
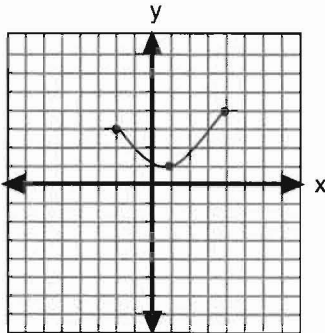
Domain: _____

Range: _____

Function? _____

6.
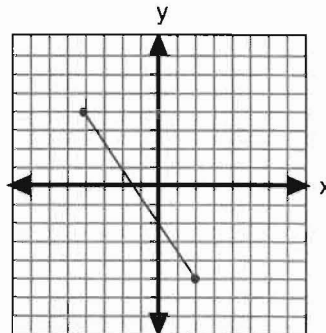
Domain: _____

Range: _____

Function? _____

7.

Domain: _____

Range: _____

Function? _____

Holt 14.1 p.692
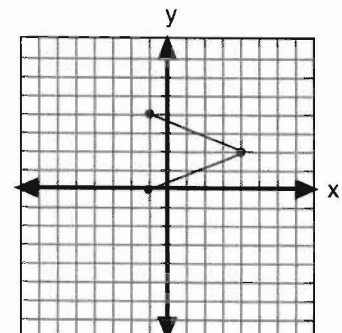
What Did the Baby Porcupine Say When It Backed Into a Cactus?

Determine which of the relations below are functions. Find the number of each relation that *is* a function at the bottom of the page and cross out the letter below it. When you finish, the answer to the title question will remain.

① {(−2, 7), (−1, 5), (0, 3), (1, 1), (2, 1)}

② {(−7, 20), (3, 5), (0, 5), (−2, 0), (6, −4), (−6, −9), (4, 4)}

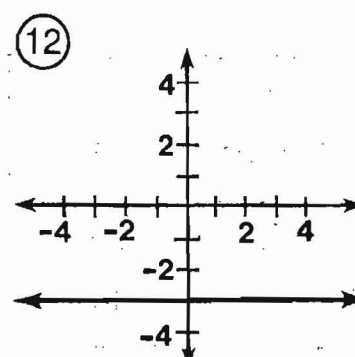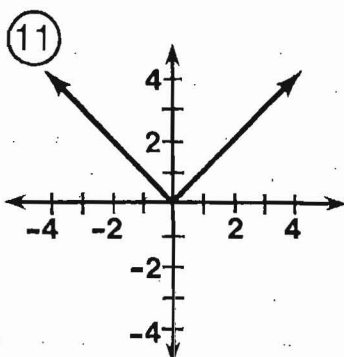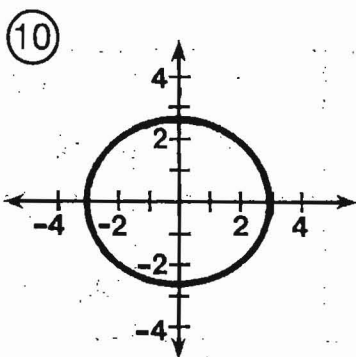③ {(4, 8), (−3, −2), (9, 6), (2, −1), (−4, −5), (2, 7), (−8, 0)}

④

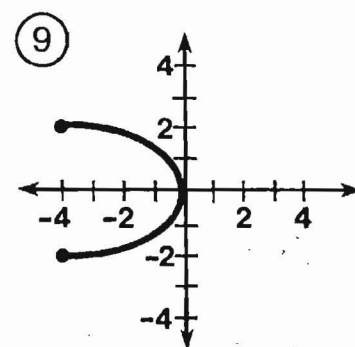| x	y
0	−19
1	−12
2	−4
3	3
4	13
5	27

⑤

x	y
−5	8
−3	8
−1	−2
1	−2
3	11
5	23

⑥

x	y
−2	−7
−2	5
0	−16
2	0
2	6

⑦

⑧

⑨

⑩

⑪

⑫
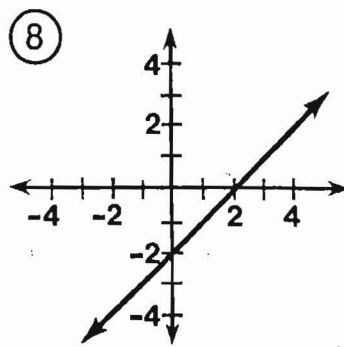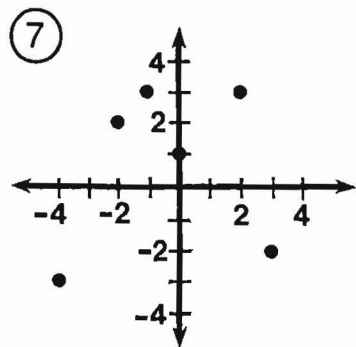
5	12	10	7	1	3	9	11	2	4	6	8
F	O	H	A	S	I	M	T	O	P	A	D

OBJECTIVE 1–a: To determine whether or not a relation is a function.

ALGEBRA

Relations and Functions

Name: _____

Period: _____

Is each relation a function? Use a mapping diagram. Explain your answer.

1. {(4, 7), (9, 11), (4, 6), (10, 2)}

2. {(-5, -8), (2, 4), (3, 4), (-6, -8)}

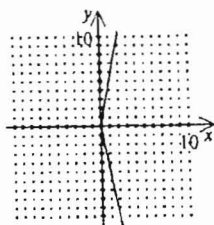Is it a function? _____

Is it a function? _____

Explain:

Explain:

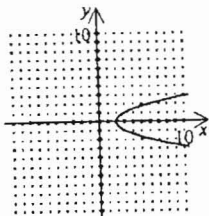Identify which of the following graphs are NOT functions.

Answer(s): _____. (there may be more than one!)
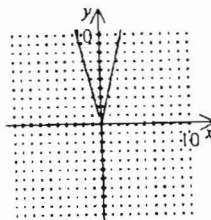
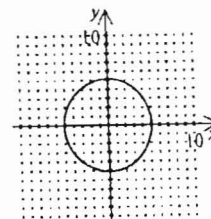3. [A]   [B]   [C]   [D]

Is each relation a function? Use the vertical line test. Explain your answer.

4. {(2, 5), (-3, 5), (0, 5), (3, 5)}

5. {(-1, -9), (1, 3), (-1, 9), (6, 6)}