

Functions
3.1

A **relation** pairs inputs with outputs. When a relation is given as ordered pairs, the x -coordinates are inputs and the y -coordinates are outputs.

Different representations of the same relation:

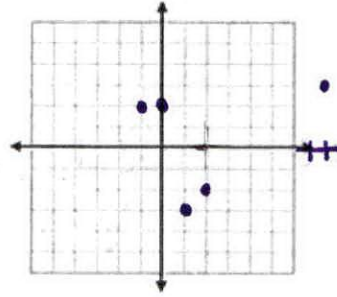
Ordered Pairs

$(-1, 2)$ $(0, 2)$
 $(1, -3)$ $(2, -2)$
 $(8, 3)$

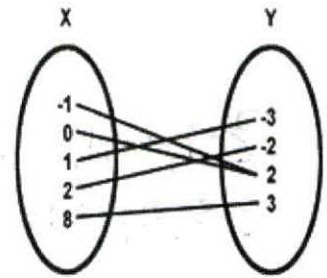
Table

x	y
-1	2
0	2
1	-3
2	-2
8	3

Graph



Mapping



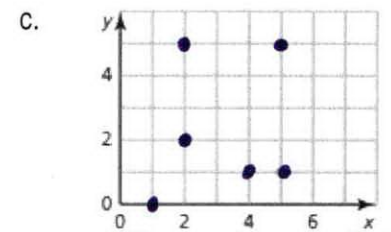
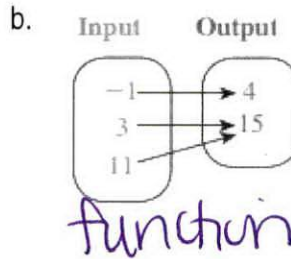
A relation that pairs each input with *exactly one* output is a **function**. One way to test whether a graph is a function is to complete the **Vertical Line Test**. A graph represents a function when no vertical line passes through more than one point on the graph.

Example 2: Determine whether each relation is a function.

a.

Input	-2	-1	0	0	1	2
Output	3	4	5	6	7	8

Not a function
0 repeats



NOT a fxn fails vertical line test

d. $x = y^2$ with inputs $x = 0$ and $x = 1$

$$\sqrt{0} = \sqrt{y^2} \quad \sqrt{1} = \sqrt{y^2}$$

$$0 = y \quad \pm 1 = y$$

input of $x=1$
gives two different
outputs

Not a function

c. $y = 5x$ with inputs $x = 1, x = 2, x = 3$

$$y = 5(1) = 5$$

$$y = 5(2) = 10$$

$$y = 5(3) = 15$$

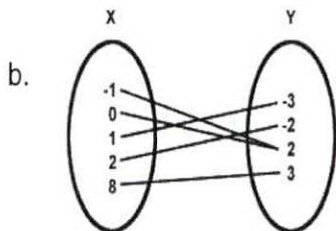
Function



Finding Domain and Range: Domain is the set of possible x-values. Range is the set of possible y-values.

To find domain and range from a table, set of ordered pairs and mapping, list the x and y-values from the given set of data.

a. $\{(-7,4), (-2,3), (12,8), (1,13), (-2,4), (3,8)\}$



c.

x	y
2	7
5	-3
3	5
-4	-2
5	2

Domain: $\{-7, -2, 1, 3, 12\}$

Domain: $\{-1, 0, 1, 2, 8\}$

Domain: $\{-4, 2, 3, 5\}$

Range: $\{3, 4, 8\}$

Range: $\{-3, -2, 2, 3\}$

Range: $\{-2, -3, 2, 5, 7\}$

Function: YES NO

Function: YES NO

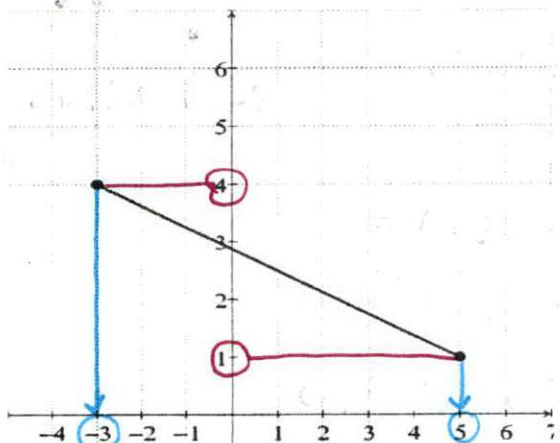
Function: YES NO

To find domain and range from a graph, list ALL possible x and y-values from the graph.

1) Begin with range starting from LEFT to RIGHT. List the farthest point on the left, the correct inequality, then list the farthest point on the right.

2) To find range, start from BOTTOM to TOP. List the lowest point on the bottom, the correct inequality, then list the highest point on the top.

Example 1:

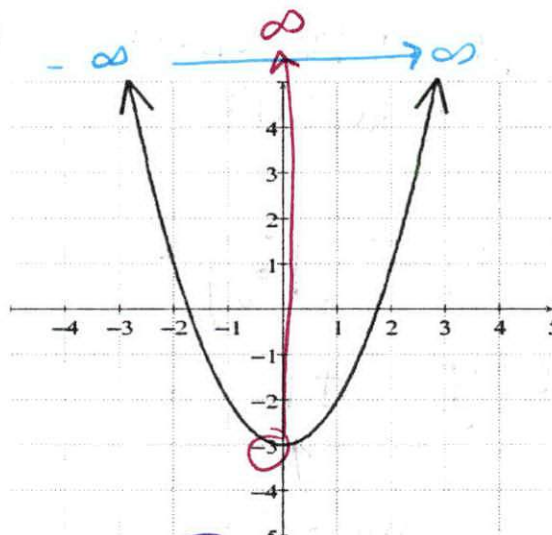


Domain: $-3 \leq x \leq 5$

Range: $1 \leq y \leq 4$

Function: YES NO

Example 2:



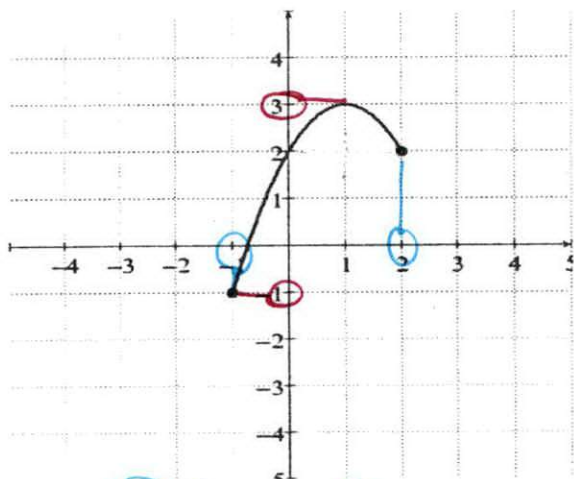
Domain: $x \in \mathbb{R} \quad -\infty < x < \infty$

Range: $y \geq -3$

Function: YES NO

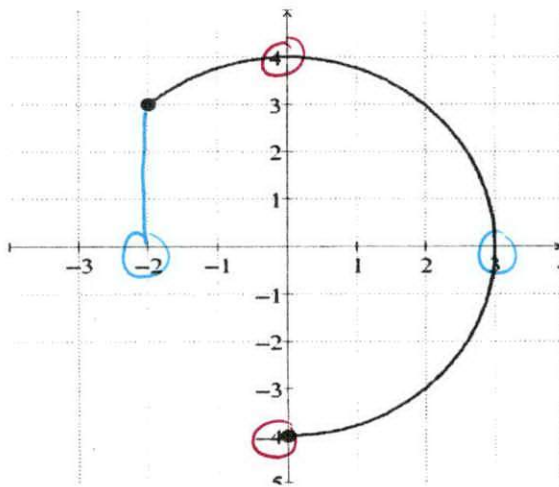


Example 3:



Domain: $-1 \leq x \leq 2$
 Range: $-1 \leq y \leq 3$
 Function: YES NO

Example 4:



Domain: $-2 \leq x \leq 3$
 Range: $-4 \leq y \leq 4$
 Function: YES NO
 fails vertical line test

Identifying Independent and Dependent Variables

The variable that represents the input values of a function is the **independent variable** because it can be any value in the domain. The variable that represents the output values of a function is the **dependent variable** because it *depends* on the value of the independent variable. When an equation represents a function, the dependent variable is defined in terms of the independent variable. The statement “y is a function of x” means that y varies depending on the value of x (y depends on x).

$y = -x + 10$
 dependent \leftarrow independent variable

The function $t = 19m + 65$ represents the temperature t (in degrees Fahrenheit) of an oven after preheating for m minutes.

- a. Identify the independent and dependent variables.

t - dependent variable m - independent variable

- b. A recipe calls for an oven temperature of 350°F. Describe the domain and range of the function.

least amount of time would be 0 min
 $t = 19(0) + 65$
 $t = 65$

$$\begin{array}{r} 350 = 19x + 65 \\ -65 \quad -65 \\ \hline 285 = 19x \\ 19 \quad 19 \\ \hline 15 = x \end{array}$$

$15 = x$

Homework: pg. 94: 4-30 even

