

TOPIC: INTRO TO RELATIONS AND FUNCTIONS

Intro to Relations and Functions

- ◆ A **relation** is a connection between **inputs** (x) & **outputs** (y) often represented as a set of ordered pairs (x, y) .
- ▶ A **function** is a relation where each input (x) is paired with at most ____ output (y).

EXAMPLE

For each relation, list the inputs & outputs and draw arrows showing how the values correspond.

Relations

$\{(-2, 2), (1, 1), (3, -2), (1, 4)\}$

Inputs
(x)

Outputs
(y)

Functions

$\{(-4, 2), (-2, -1), (1, 2), (3, 4)\}$

Inputs
(x)

Outputs
(y)

- ◆ Relations can be represented as a set of ordered pairs, a correspondence, table, graph, or equation.

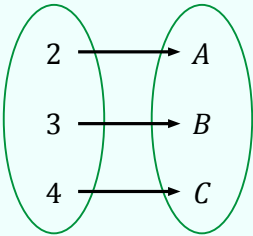
EXAMPLE

Determine if each relation is a function.

(A)

x	y
$\frac{1}{2}$	4
1	$\frac{3}{2}$
2	$\frac{3}{2}$
$\frac{1}{2}$	5

(B)



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Vertical Line Test

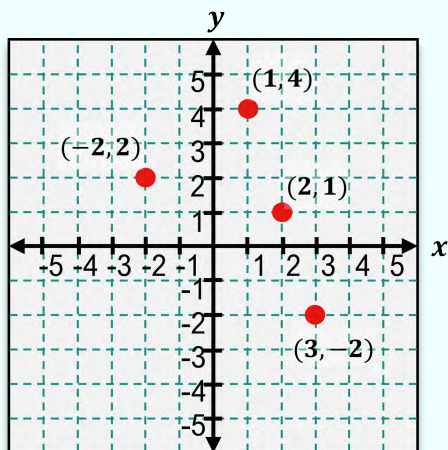
◆ When a relation is represented on a graph, you can determine if it is a function using the **vertical line test**.

► If you can draw **any** vertical line that passes through more than 1 point, the graph _____ a function.

EXAMPLE

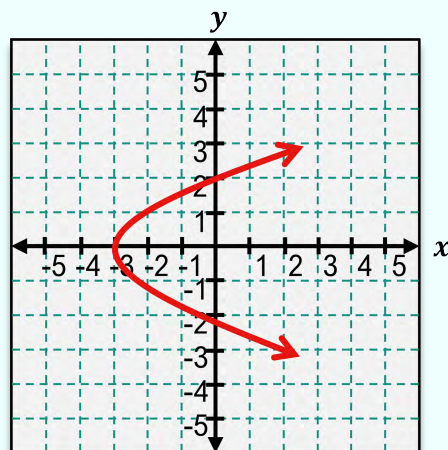
Use the vertical line test to determine if each graph is a function.

(A)



[FUNCTION | NOT A FUNCTION]

(B)

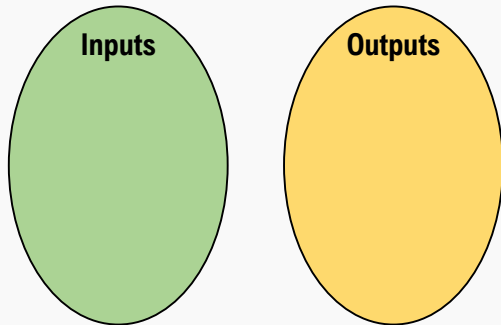


[FUNCTION | NOT A FUNCTION]

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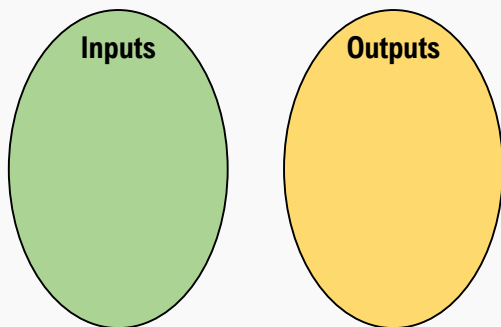
PRACTICE

State the inputs and outputs of the following relation. Is it a function? $\{(-3, 5), (0, 2), (3, 5)\}$



PRACTICE

State the inputs and outputs of the following relation. Is it a function? $\{(2, 5), (0, 2), (2, 9)\}$

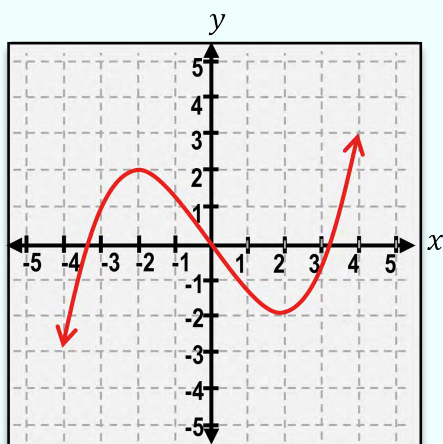


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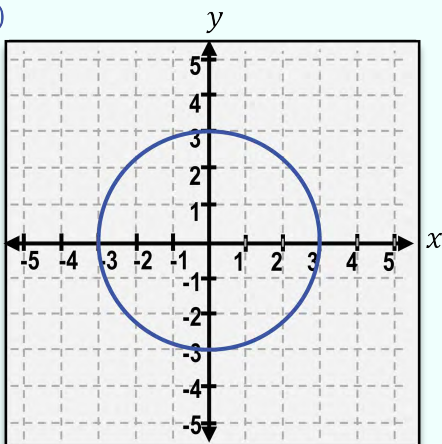
EXAMPLE

Determine below which of the graphs are functions (select all that apply).

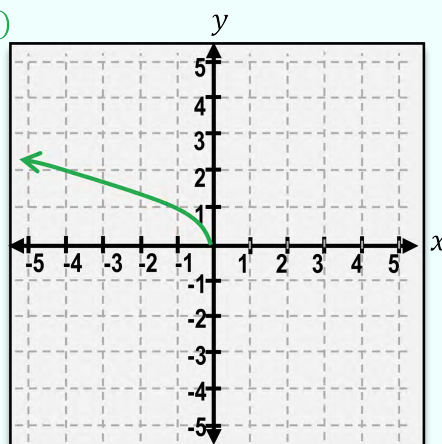
(A)



(B)



(C)



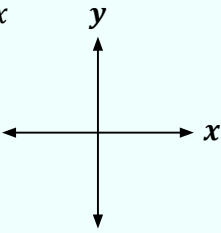
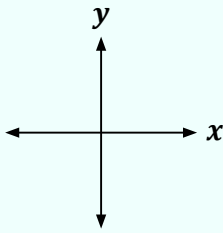
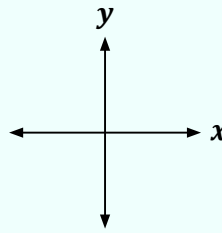
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Determining if a Relation is a Function Given an Equation

- ◆ Recall: A relation as a *set of points* is a function if each input has at most 1 output (*graph* passes vertical line test).
- ▶ A relation as an *equation* is a function if each ___-value (input) results in at most 1 ___-value (output).

EXAMPLE

Are the following relations also functions?

(A) $y - 1 = 2x$ 	(B) $x = y^2$ 	(C) $x = 4$ 
[FUNCTION NOT A FUNCTION]	[FUNCTION NOT A FUNCTION]	[FUNCTION NOT A FUNCTION]

- ◆ All linear equations are functions except those of the form $x = \#$, which are vertical lines.

PRACTICE

Determine if each equation is a function.

(A) $y = 2x + 3$	(B) $y = 7$	(C) $x = -100$
[FUNCTION NOT A FUNCTION]	[FUNCTION NOT A FUNCTION]	[FUNCTION NOT A FUNCTION]

EXAMPLE

Determine if each relation is a function.

(A) $y = x^2 + 1$	(B) $x = y^2 + 3$
[FUNCTION NOT A FUNCTION]	[FUNCTION NOT A FUNCTION]

TOPIC: INTRO TO RELATIONS AND FUNCTIONS

Domain and Range

◆ For a relation or function, the **domain** is the set of inputs (x -values) and the **range** is the set of outputs (y -values).

EXAMPLE

Write a list of ordered pairs for the relation, then find the domain and range.

New

Domain and Range

x	y
-2	2
1	1
3	-2
4	4

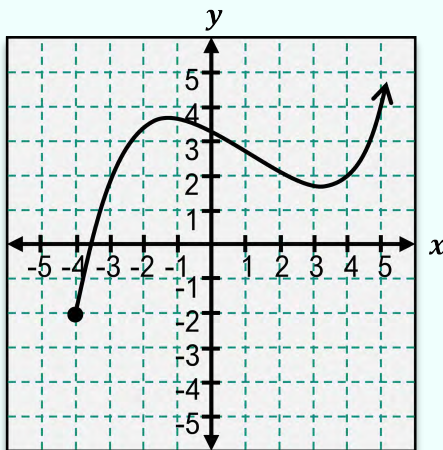
Domain:

Range:

◆ **Domain** of a _____ graph is the *interval* of all x -values, **range** is the *interval* of all y -values.

EXAMPLE

Find the domain and range of the function. Write using interval notation.



Domain:

Range:

Recall

- → Include with []
- → Exclude with ()

(Interval Notation)

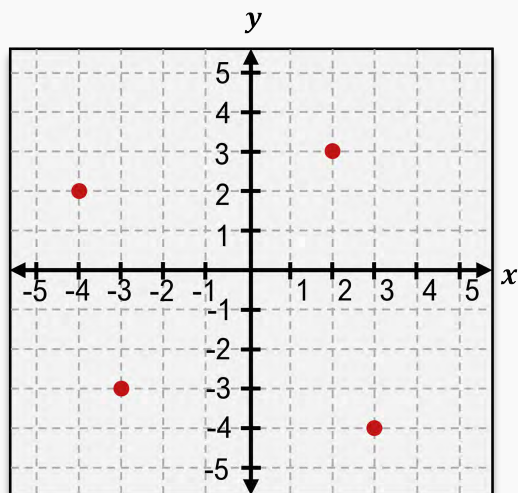
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PRACTICE

Find the domain and range for each relation.

(A) $\{(-4, 2), (-3, -5), (3, 4), (5, -2)\}$

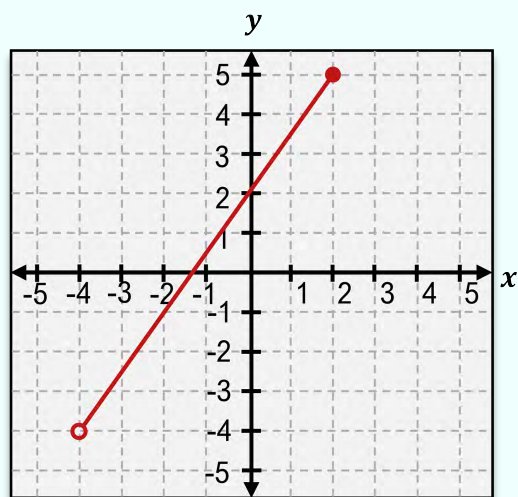
(B)



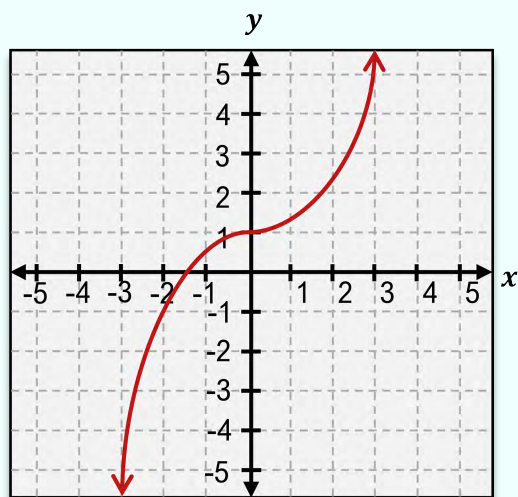
EXAMPLE

Find the domain and range of the following function given its graph. Write in interval notation.

(A)



(B)



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Finding Domain Given an Equation

◆ Recall: The **domain** of a relation or function is the set of inputs (x -values) & **range** is the set of outputs (y -values).

► The domain of a relation or function defined by an equation is **all real numbers, excluding** values that:

► Make the *denominator* of a fraction = ____ or the expression *under* a square root _____.

EXAMPLE

Find the domain of each relation.

(A) $y = \frac{1}{x - 2}$

Restrictions?

Interval: _____

(B) $y = \sqrt{x}$

Restrictions?

Interval: _____

(C) $y = 2x + 3$

Restrictions?

Interval: _____

◆ The range is all y -values that correspond with the x -values in the domain.

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PRACTICE

Find the domain of the following function.

(A) $y = \frac{2x + 3}{x - 4}$

(B) $x + y = 7$

(C) $y = x^3 - 2x + 1$

(D) $y = \sqrt{x - 3}$

EXAMPLE

What is the domain of the following rational function?

$$y = \frac{x + 2}{x^2 - 9}$$