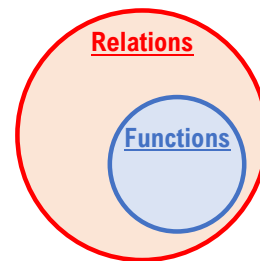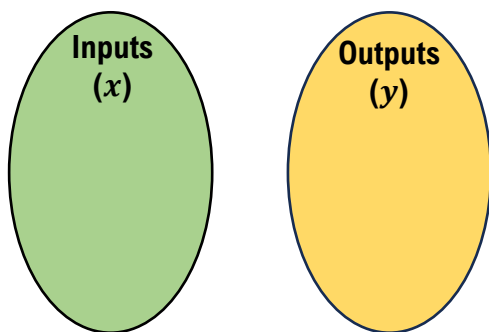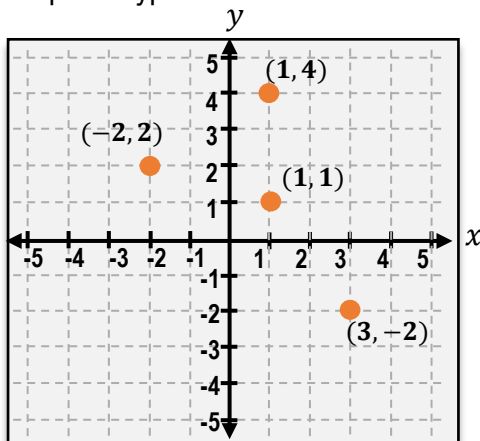# TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS

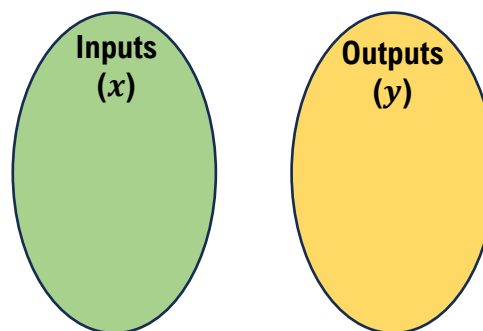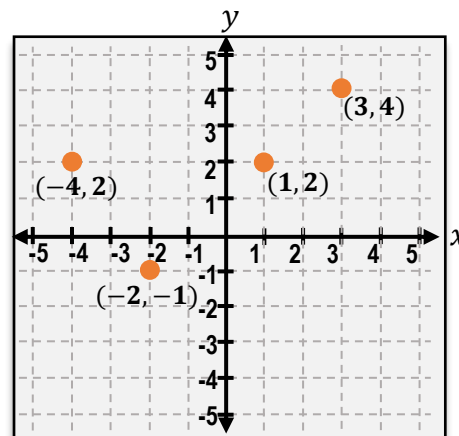## Relations and Functions

- **Relation:** A connection between _____ & _____ values.

  - Graphically, they are represented as _____ pairs (x, y)

- **Function:** A special type of relation where each **input** has at most _____ **output**.

Relations

Functions

[Graph 1: points (1,4), (−2,2), (1,1), (3,−2)]

[Graph 2: points (3,4), (−4,2), (1,2), (−2,−1)]

Inputs (x)   **Outputs (y)**

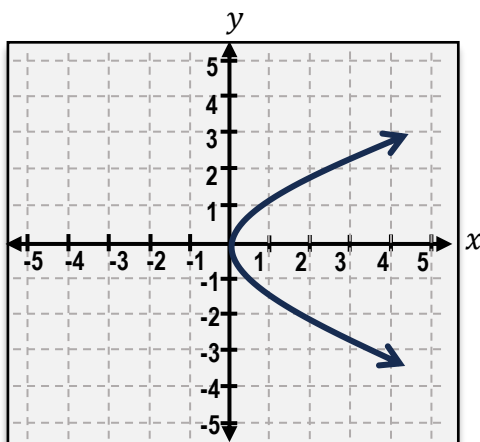**Inputs (x)**   **Outputs (y)**
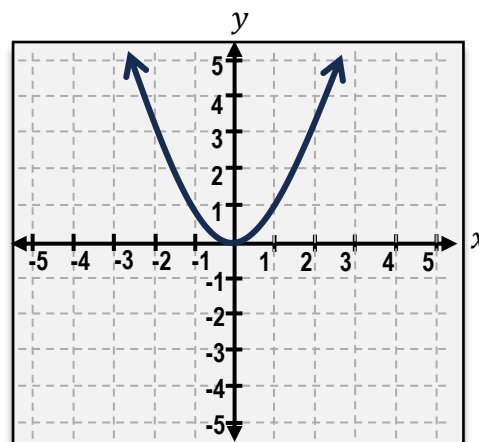
[FUNCTION | NOT A FUNCTION]

[FUNCTION | NOT A FUNCTION]

- A way to quickly determine if a graph is a function or not is the **Vertical Line Test:**
  - If you can draw **any** vertical line that passes through more than 1 point, the graph _____ a function.

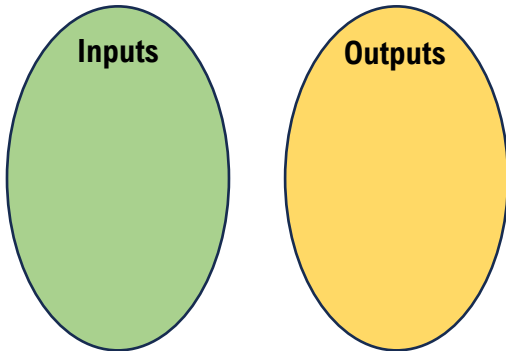[Graph 3: sideways curve]

[Graph 4: parabola]

[FUNCTION | NOT A FUNCTION]

[FUNCTION | NOT A FUNCTION]
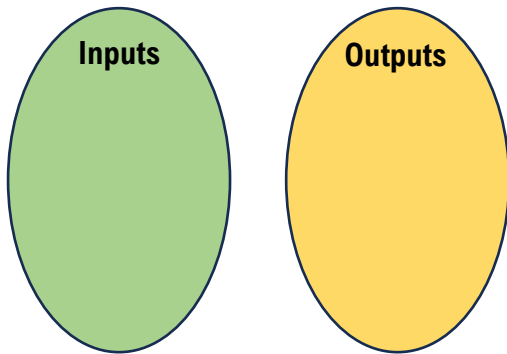
TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS

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

Inputs
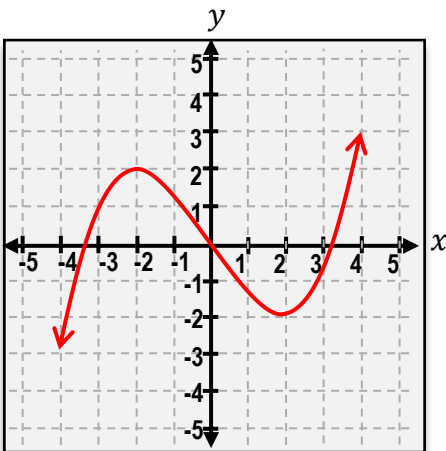
Outputs

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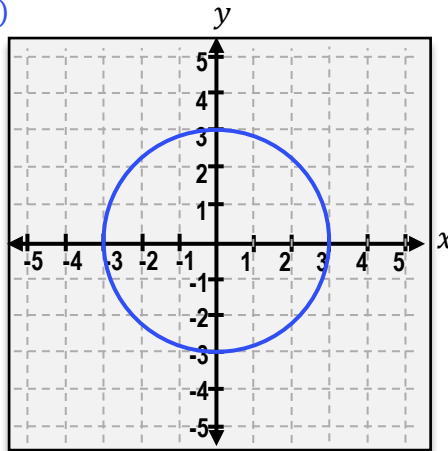
Inputs

Outputs

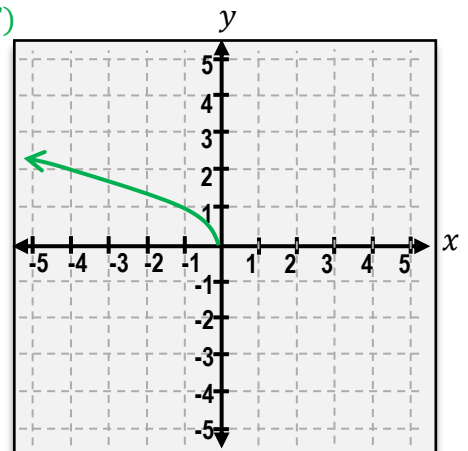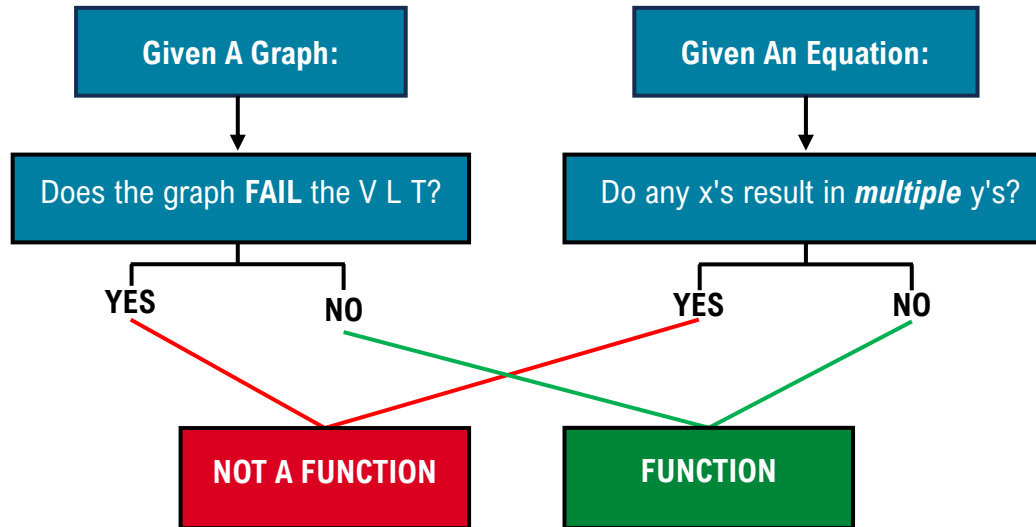PROBLEM: Determine below which of the graphs are functions (select all that apply).

(A)

(B)

(C)

TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS
Verifying if Equations are Functions

● To verify if an **equation** is a function, you should _____ for _____ as a first step.

Given A Graph:	Given An Equation:
Does the graph **FAIL** the V L T?	Do any x's result in *multiple* y's?
YES NO	YES NO

NOT A FUNCTION   **FUNCTION**

EXAMPLE: Determine if each of the equations below is **a function**, or **not a function**.

(A)
$$y + 4 = 3x$$

x		y
-1		
0		
1		
2		

If equation is a _____, then it is a

[**FUNCTION** | **NOT A FUNCTION**].

(B)
$$x^2 + y^2 = 25$$

x		y
-1		
0		
1		
2		

If equation has an _____ power of y, then it is a

[**FUNCTION** | **NOT A FUNCTION**].

● If an equation is a function, we can write it using function _____ (replace _____ with _____).

   ▪ We can write $y = 3x - 4$ as ____ $= 3x - 4$

TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS

PRACTICE: Is the equation $y = -2x + 10$ a function? If so, rewrite it in function notation and evaluate at $f(3)$.
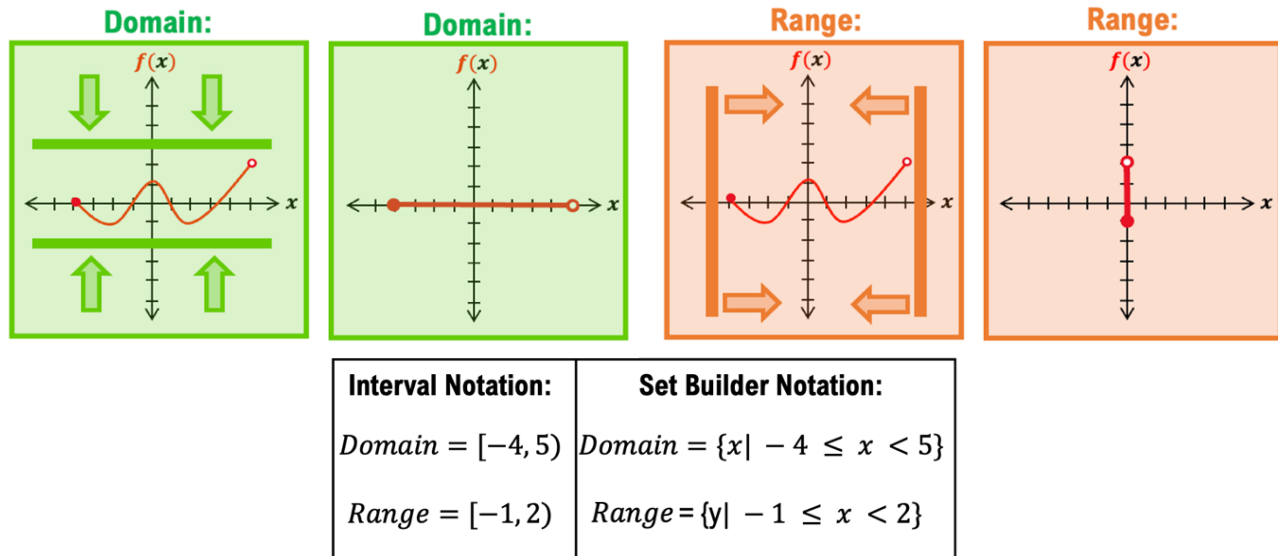

PRACTICE: Is the equation $y^2 + 2x = 10$ a function? If so, rewrite it in function notation and evaluate at $f(-1)$.
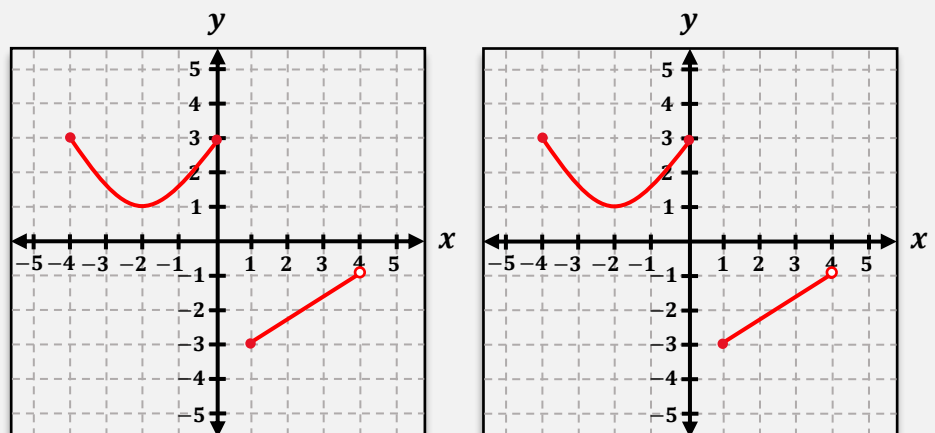
TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS
Finding The Domain And Range Of A Graph

● The **domain** of a graph is the allowed ___-values, and the **range** of a graph is the allowed ___-values.

    ▪ To find the **domain** of a graph, "*squish*" to the ___-axis. To find the **range**, "*squish*" to the ___-axis.

Domain:	Domain:	Range:	Range:
$f(x)$	$f(x)$	$f(x)$	$f(x)$

Interval Notation:	Set Builder Notation:
$Domain = [-4, 5)$	$Domain = \{x \mid -4 \le x < 5\}$
$Range = [-1, 2)$	$Range = \{y \mid -1 \le x < 2\}$

    ● The **[,], ≤, ≥** symbols mean we **[INCLUDE | DON'T INCLUDE]** the value.

    ● The **(,), <, >** symbols mean we **[INCLUDE | DON'T INCLUDE]** the value.
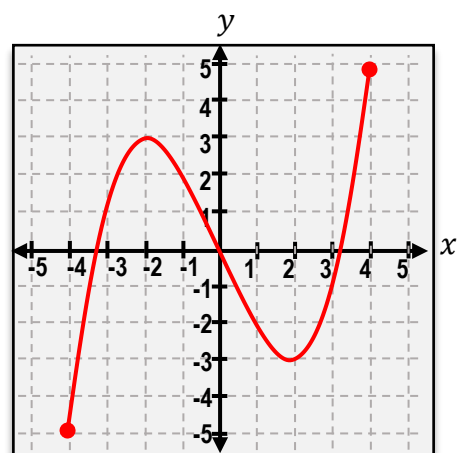

<u>EXAMPLE</u>: Determine the **domain** & **range** of the following graph below. Express the answer using interval notation.

● When we have multiple intervals or "jumps" in the graph, use the union symbol (___).

TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS

PRACTICE: Find the domain and range of the following graph (write your answer using interval notation).

## TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS
Finding the Domain of an Equation

● You may need to find the **domain** (allowed x-values) of a function when given an equation instead of a graph.

▪ First determine **restrictions** by identifying values that _____ the function. Two common situations:

1) x inside of a Square Root

Domain: x-values that don't make the inside of the square root _____.

Graph of $f(x) = \sqrt{x}$:
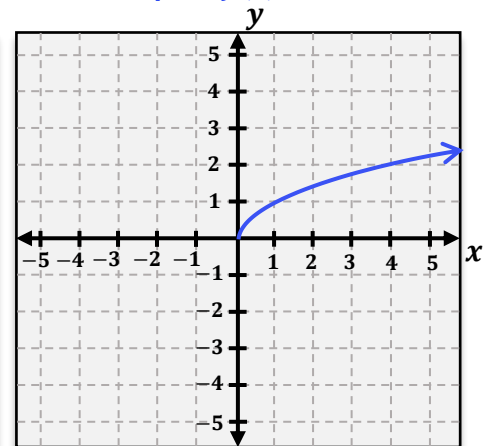
EXAMPLE: Find the domain of the function $f(x) = \sqrt{x}$ without graphing. Express using interval notation.

Restriction: x-values that make $\sqrt{}$ negative: _____, therefore

Domain:

2) x in the Denominator of a Fraction

Domain: x-values that don't make the denominator _____.

EXAMPLE: Find the domain of the function $f(x) = \dfrac{2}{x-5}$ using interval notation.

Restriction: x-values that make denominator 0: _____, therefore

Domain:

TOPIC: INTRO TO FUNCTIONS & THEIR GRAPHS

<u>PRACTICE</u>: Find the domain of $f(x) = \sqrt{x + 4}$. Express your answer using interval notation.

<u>PRACTICE</u>: Find the domain of $f(x) = \frac{1}{x^2 - 5x + 6}$. Express your answer using interval notation.