Today's Objective

- Assess **the domain, and range of relations and functions**. Provide supporting evidence with key words in writing using sentence stems.
- Success Criteria
  - Relate domain and range to dependency relationship and mapping
  - Use a graphical representation to analyze a function
  - Apply step-by-step process for finding domain and range
- **Vocabulary:** domain, range, function, set, element, mapping, vertical

Function, Domain, and Range

A function from a set D to a set R is a rule that assigns to every element in D a unique element in R. The set D of all input values is the domain of the function, and the set R of all output values is the range of the function.

Domain: What you can put into your function

Dirty laundry

The washing machine is like your function

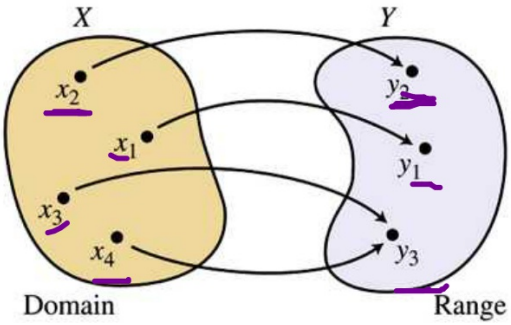
Range: What comes out of your function

Clean, wet laundry

What is a **function**?

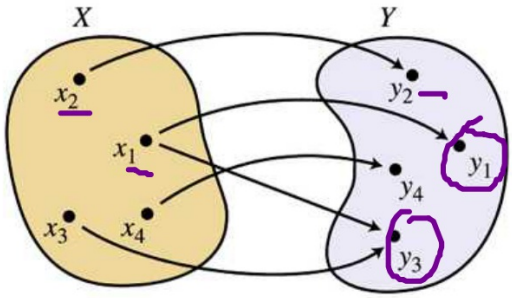
- A relation that associates each value in the domain (x) with exactly one value in the range (y).
- Example: If you have a 'functioning' relationship, you are seeing only one person. (If you are seeing more than one person, your relationship is not functioning)

Mapping



A function

(a)



Not a function

(b)

Vertical Line Test

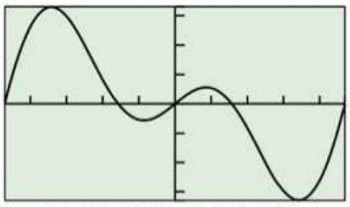
A graph (set of points (x,y)) in the xy-plane defines y as a function of x if and only if no vertical line intersects the graph in more than one point.

If ____, then ____.

Example Seeing a Function Graphically

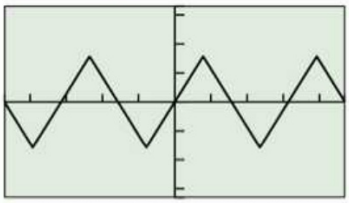
Of the three graphs shown below, which is not the graph of a function?

- Support your answer



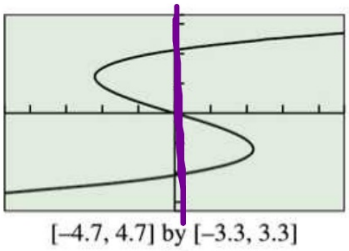
[–4.7, 4.7] by [–3.3, 3.3]

(a)



[–4.7, 4.7] by [–3.3, 3.3]

(b)

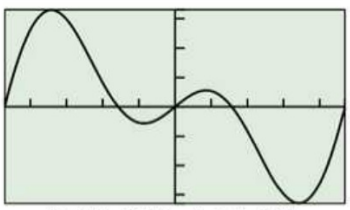


[–4.7, 4.7] by [–3.3, 3.3]

(c)

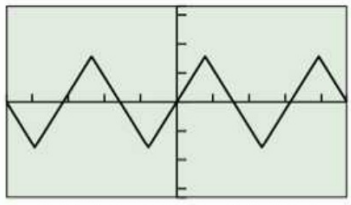
Example Seeing a Function Graphically

Of the three graphs shown below, which is not the graph of a function?



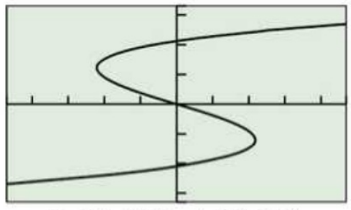
[–4.7, 4.7] by [–3.3, 3.3]

(a)



[–4.7, 4.7] by [–3.3, 3.3]

(b)



[–4.7, 4.7] by [–3.3, 3.3]

(c)

The graph in (c) is not the graph of a function.
There are three points on the graph with x-coordinates 0.

AM: Evaluate functions for given values

1. Let $f(x) = |x| - 2$. Find $f(5)$. [A] 3 [B] −3 [C] −7 [D] 7

$f(5) = |5| - 2$

$= 5 - 2$

$= 3$

AM: Evaluate functions for given values

2. Find $f(15)$ for $f(x) = \dfrac{x^2 - 9}{27 - x^3}$.

[A] $\dfrac{1}{8}$ [B] $\dfrac{1}{12}$ [C] $-\dfrac{2}{31}$ [D] none of these

$$f(15) = \frac{((15)^2 - 9)}{(27 - (15)^3)} = \frac{225 - 9}{27 - 3375}$$

AM: Evaluate functions for given values

3. If $Q(x) = x^2 + 5x - 6$, find $Q(-3)$. [A] 18 [B] 0 [C] −12 [D] 12

$(-3)^2 + 5(-3) - 6$

$9 - 15 - 6$

-12

AM: Evaluate functions for given values

4. Let $f(x) = |x| - 4$. Find $f(-5)$.

$|-5| - 4$

$5 - 4$

1

1

AM: Determine if relations are functions

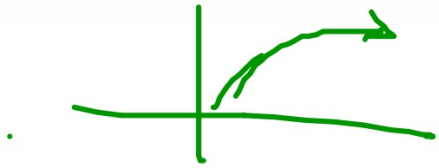
1. Which of the following is *not* a function?

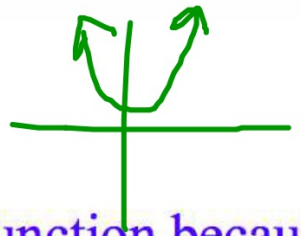
[A] $x = 2y^2 + 4$

[B] $\{(3, -4), (-5, 2), (-1, -4)\}$

[C] $\{(x, y) \mid y = 2\sqrt{x},\ x \geq 0\}$

[D] $\{(x, y) \mid y = 2x^2 + 4\}$





LO: The relation _____ is not a function because there exist inputs x which are assigned _____ output or ____values. Graphically the relation in ____ fails the _____.

AM: Determine if relations are functions

2. Which of the following is a function?

[A] {(−8, −5), (−5, −4), (−8, −3)}

[B] {−8, −5, −4, −3}

[C] {(−8, −5), (−4, −3), (−4, −8), (−3, −4)}

[D] {(−8, −5), (−5, −8), (−3, −3)}

LO: The relation D is a function because there every inputs x is assigned one output or y values.

AM: Determine if relations are functions

3. Which of the following data represents wind speed as a function of lift?

[A]

wind speed (m / h)	10	20	30	40
lift (ft / s)	7.5	13	17.9	21

[B]

wind speed (m / h)	10	20	30	40
lift (ft / s)	19.8	24.8	19.8	28.1

[C]

wind speed (m / h)	10	20	30	40
lift (ft / s)	5.2	9.2	12.9	9.2

[D] none of these

LO: The relation _____ represents a function because every x is assigned _____ output or _____values.