

Algebra 2

2.1

Analyze relations and functions

Use equations of relations and functions

activity: mailman

relation

function

one-to-one function

onto (not one-to-one) function

• domain

• range

continuous

discrete

vertical line test (VLT)

pairs of data
specific relation
no sharing

$X \rightarrow 1 \text{ partner}$

disregard :(

• X-word.

• Y-word.

independent variable

dependent variable

function notation

X
Y



VLT

Graph: each x-coordinate has only one y-coordinate

x

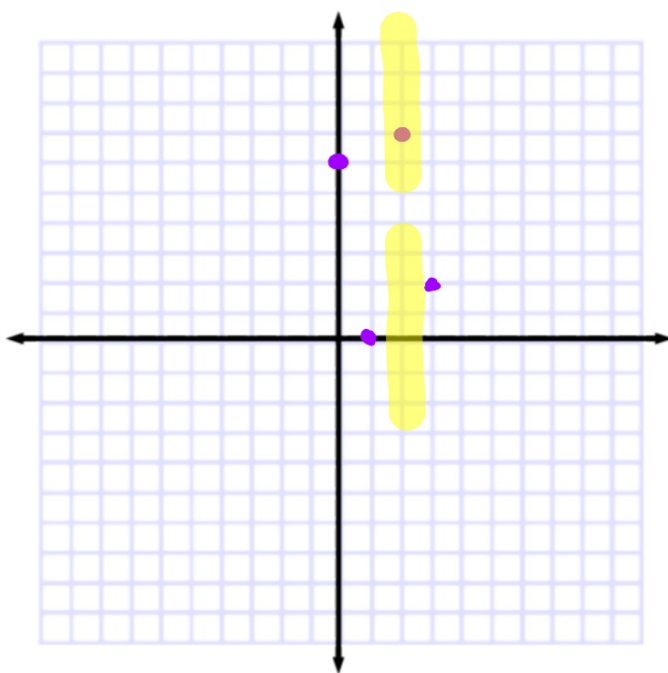
y

2 → 7

3 → 2

1 → 0

0 → 6





- The table shows the monthly average low and high temperatures for Charlotte, North Carolina.

Monthly Average Temperature (°F) Charlotte, NC						
Month	Jan	Feb	Mar	Apr	May	Jun
Low	32	34	42	49	58	66

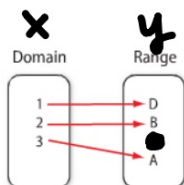
Month	Jul	Aug	Sep	Oct	Nov	Dec
Low	71	69	63	51	42	35

Every month has an average temp.
Can 2 different months have the same low temp?
Can the same month have more than one low temp?

KeyConcept Functions

one-to-one function

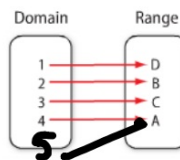
Each element of the domain pairs to exactly one unique element of the range.



KeyConcept Functions

both one-to-one and onto

Each element of the domain is paired to exactly one element of the range, and each element of the range corresponds to a unique element of the domain.



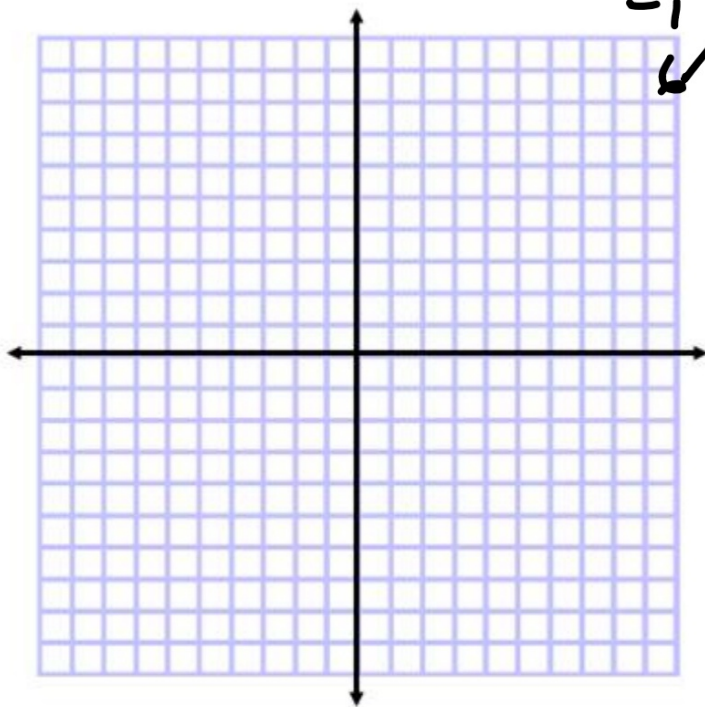
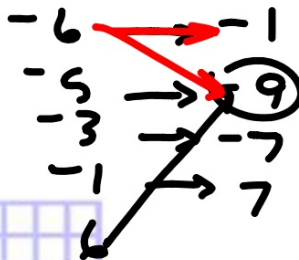
Disregard questions about "onto"

Example 1 Domain and Range

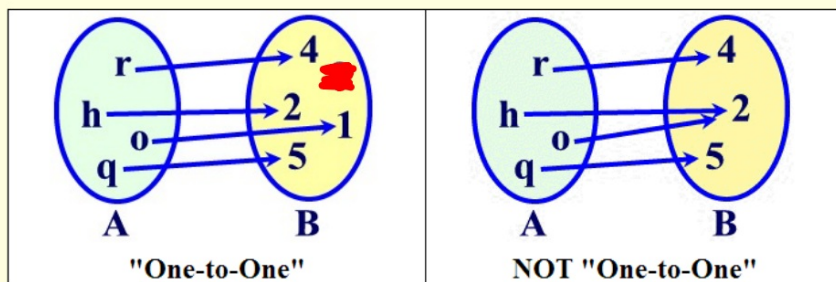
State the domain and range of each relation. Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, *onto*, both, or neither.

- a. $\{(-6, -1), (-5, -9), (-3, -7), (-1, 7), (6, -9)\}$

function



In a one-to-one function, given any y there is only one x that can be paired with the given y .
Such functions are referred to as injective.



function?

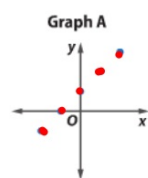
function?

Function: Does every x have a single partner?

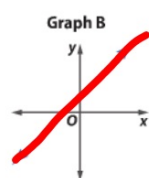
One to one function: Does every x have a single partner?

AND Nobody shares a y partner either?

A relation in which the domain is a set of individual points, like the relation in Graph A, is said to be a **discrete relation**. Notice that its graph consists of points that are not connected. When the domain of a relation has an infinite number of elements and the relation can be graphed with a line or smooth curve, the relation is a **continuous relation**.



discrete relation



continuous relation

Number of pets

Weight of a pet

D: 2, -1, -2

b.

x	2	-1	-2	-1	2
y	-2	-1	0	1	2

R: -2, -1, 0, 1, 2

$$\begin{array}{r|l} & 1 \\ 2 & -2 \\ -1 & -1 \\ -2 & 0 \\ -1 & 1 \\ 2 & 2 \end{array}$$

discrete vs
continuous

specific ordered pairs are given vs equation given

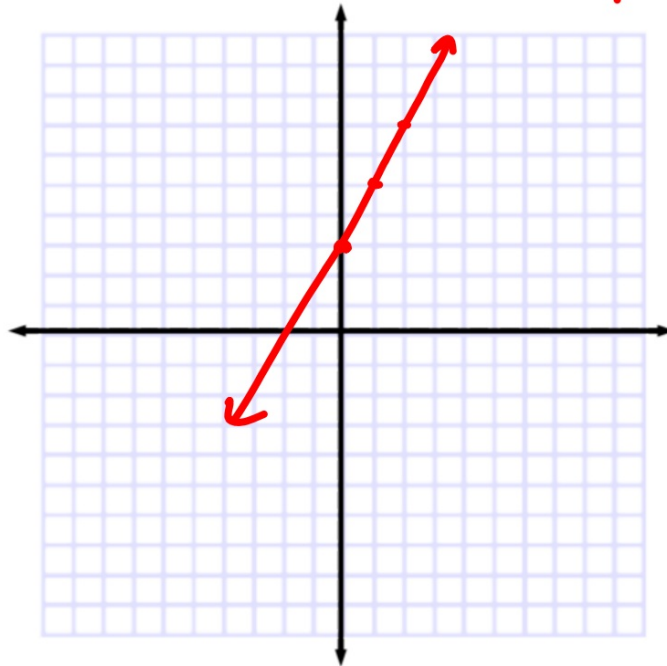
$$y = -\frac{2}{1}x + 3$$

D: $\mathbb{A} \mathbb{R} \mathbb{N}$

all real

all real

R: $\mathbb{A} \mathbb{R} \mathbb{N}$



Example 7 Graph a Relation

Graph $y = \frac{1}{2}x - 3$, and determine the domain and range. Then determine whether the equation is a *function*, is *one-to-one*, discrete or continuous.



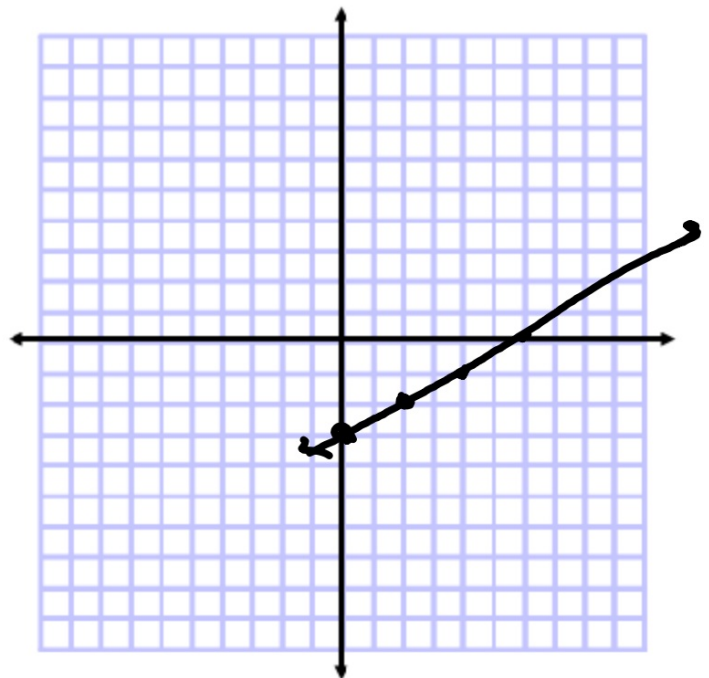
discrete vs continuous
equation: we choose the domain to evaluate
(could choose anything)

D: any

R: any

function
one to one
1:1

order of operations...



GEM A

Guided Practice

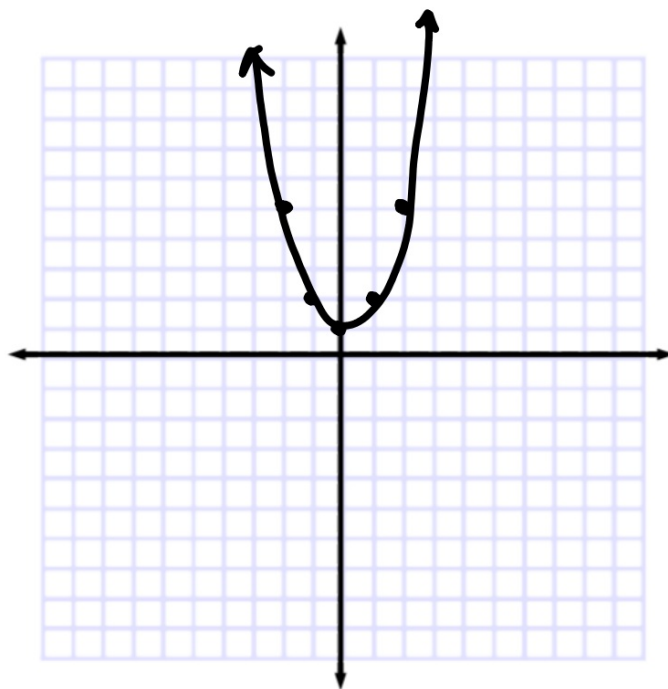
3. Graph $y = x^2 + 1$, and determine the domain and range. Then determine whether the equation is a function, is one-to-one, State whether it is discrete or continuous.

$$y = x^2 + 1$$

0	$0+1$	1
1	$1+1$	2
2	$4+1$	5
-1	$1+1$	2
-2	$4+1$	5

order of operations...

D: all
R: $y \geq 1$ function
no 1:1



x
↓

When an equation represents a function, the variable, often x , with values making up the domain is called the **independent variable**. The other variable, often y , is called the **dependent variable** because its values depend on x .

y

spaghetti & nickles

Function notation (algebra 1) every place you see an x, substitute
cut & paste

Example 4 Evaluate a Function

Given $f(x) = 2x^2 - 8$, find each value.

a. $f(6)$

b. $f(2y)$

$$y = 2x + 5$$

$$f(x) = 2x + 5$$

$$f(x) = 2x^2 - 8$$

$$f(6) = 2 \cdot 6^2 - 8$$

$$2 \cdot 36 - 8$$

$$72 - 8 = 64$$

$$2(2y)^2 - 8$$

$$2 \cdot 4y^2 - 8$$

$$8y^2 - 8$$

Guided Practice

Give $g(x) = 0.5x^2 - 5x + 3.5$, find each value.

4A. $g(2.8)$

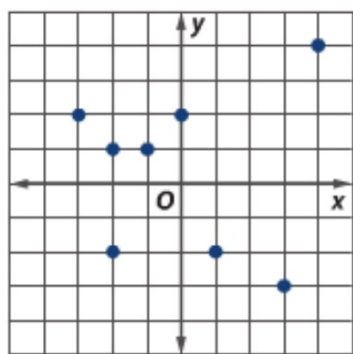
4B. $g(4a)$

$$0.5(2.8)^2 - 5(2.8) + 3.5$$

whiteboards

State the domain and range of each relation. Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, ~~one~~ *both*, or *neither*.

1A.



1B.



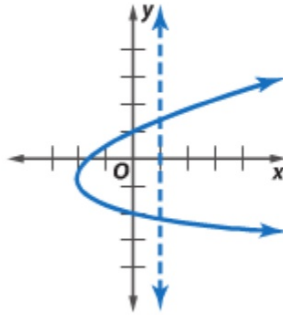
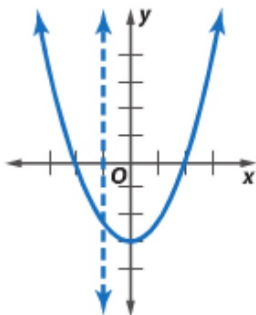
KeyConcept Vertical Line Test

Words

If no vertical line intersects a graph in more than one point, the graph represents a function.

If a vertical line intersects a graph in two or more points, the graph does not represent a function.

Models



P-65

11-310

41-550