Functions vs Relations

A relation is what connects two (or more) things.

Example: The date(x) & weight(y) at birth

*Many possible combinations, no rule that defines them

Functions vs Relations

A function is a relation where every independent variable (x) produces only one possible dependent variable (y)

Example: the amount of hours you work (x) determines the amount you earn (y)

*Unless your wage changes you won't make different amounts for the same hours.

All functions are relations but not all relations are functions.

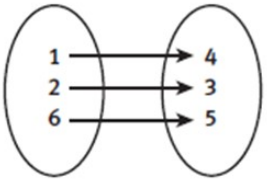
Different Representations of a Function

Consider the relation (1,4), (2,3), (6,5)

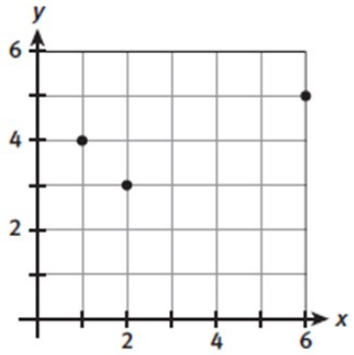
Table

x	y
1	4
2	3
6	5

Mapping



Graph



Is there anything that tells us if this is a function or not?

A function is a relation in which each x value has its own unique y value. If an x value repeats itself, it is no longer a function. It is still a relation.

Identify whether each list of ordered pairs is a function:

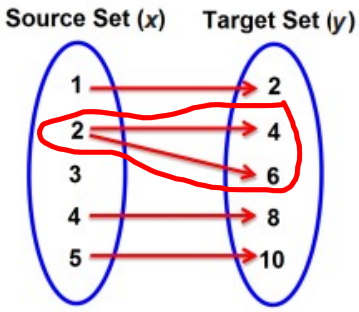
1. {(5, 4), (6, 3), (7, 2)}

2. {(4, 5), (4, 3), (5, 2)} No

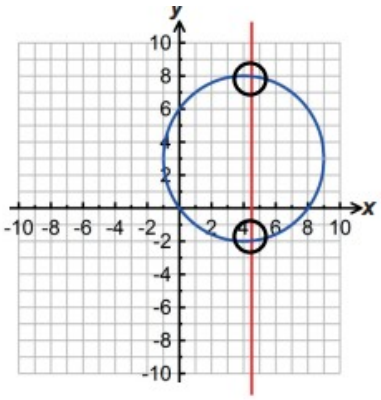
3. {(5, 4), (6, 4), (7, 4)}

A function is a relation in which each x value has its own unique y value. If an x value repeats itself, it is no longer a function. It is still a relation.

Identify whether each of the following are functions:



NO



NO

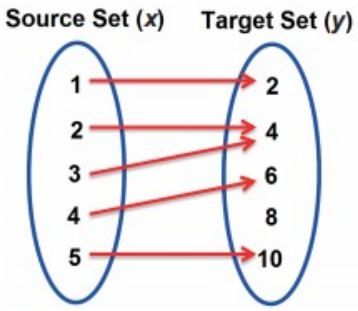
Vertical Line Test

Domain and Range

Domain is the set of all independent variables (x)

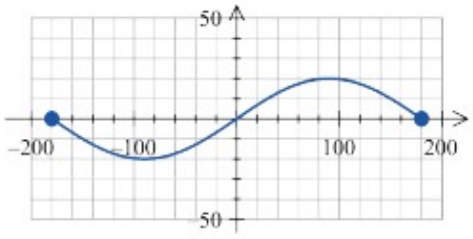
Range is the set of all dependent variables (y)

Both can be written as a finite set or in an interval:



Domain: {1, 2, 3, 4, 5}

Range: {2, 4, 6, 10}



Domain: [-190, 190]

Range: [-20, 20]

Function Notation

Function Notation Guide

When you first start using this notation it can be confusing. This guide will help you decipher what is expected of you.

$f(x) =$ **Means the same thing as "y"**

$f(5) =$ **Replace x with 5 and evaluate**

$f(x) = 5$ **Replace f(x) (or y) with 5 and solve for x.**

Example: Given $f(x) = 4x - 7$.

$$f(x) = 4x - 7$$

(a) Find $f(3)$

$$f(3) = 4(3) - 7$$
$$= 5$$

1. $f(x) = -3x^2 + 2$; find $f(-1)$

$f(-1) = -3(-1)^2 + 2 = -1 \longrightarrow (-1, -1)$

2. $g(x) = 4x^2 + 2x - 2$; find $g(0)$ *y intercept

$g(0) = 4(0)^2 + 2(0) - 2 = -2 \longrightarrow (0, -2)$ *initial value

3. $h(x) = 0$; $h(x) = x^2 - 16$

$0 = x^2 - 16 \longrightarrow 0 = (x-4)(x+4) \longrightarrow$ (4, 0) or (-4, 0)

*x intercept or zero

Initial Value:

- where the function crosses the y axis

- also called the y intercept (0, y)

- only one possible for a function

Zero:

- where the function crosses the x axis

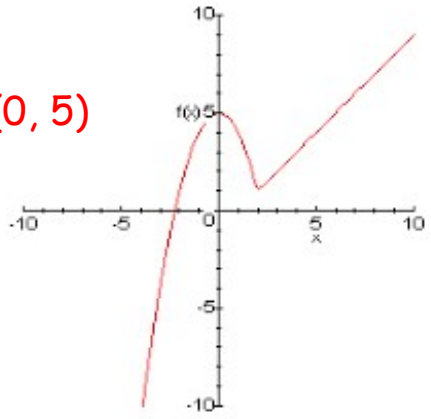
- also called the x intercept (x, 0)

- many possible for a function

1. *f(2)* = ? (2, 1)

2. find the initial value (0, 5)

3. find the zero (-2, 0)



Other Properties of Functions:

- Y intercept/Zero(s)

y int: where line crosses y axis (0, y); only one

x int: where line crosses x axis (x, 0); several possible

- Increasing/Decreasing/Constant

Inc: interval(s) where graph is going upwards, [x, X]

Dec: interval(s) where graph is going downwards, [x, X]

Con: interval(s) where graph is not going up/down, [x, X]

- Positive/Negative

Pos: interval(s) where graph is above x axis, [x, X]

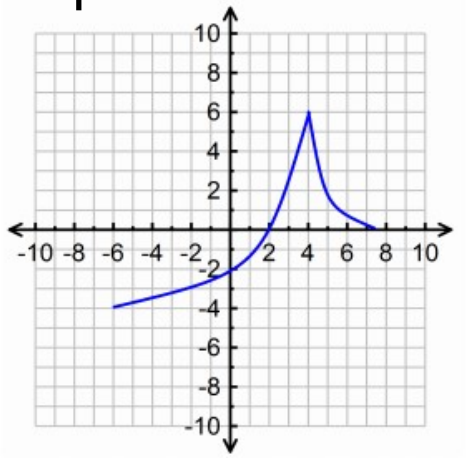
Neg: interval(s) where graph is below x axis, [x, X]

- Extrema

Max: highest y value

Min: lowest y value

Properties of Functions



Y intercept: {-2} or (0, -2)

Zeros: {2, 7.5} or (2, 0) U (7.5, 0)

Domain(x): [- 6, 7.5]

Range(y): [- 4, 6]

Increasing(x): [-6, 4]

Decreasing(x): [4, 7.5]

Positive(x): [2, 7.5]

Negative(x): [- 6, 2]

Maximum(y): {6}

Minimum(y): {-4}

Inverse of a Function