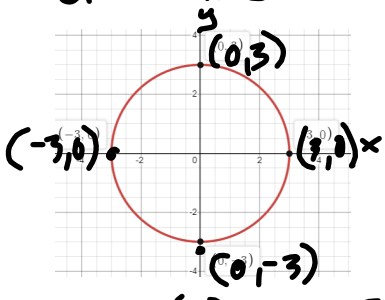
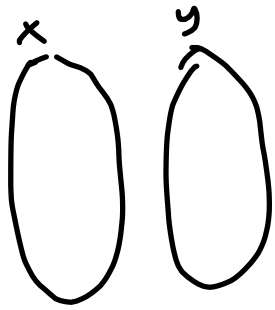
The Math Dawg

Introduction to Functions and Function Notation

Functions Versus Relations

A RELATION HAS SOME SORT OF ORDERING BETWEEN 2 SETS OF NUMBERS.





THE DOMAIN (D) IS THE SET OF X-VALUES

THE RANGE (R) IS THE SET OF y-VALUES.

FOR THE CIRCLE ABOVE

DOMAIN D: $\{\square \leq x \leq \square\}$

RANGE R: $\{\square \leq y \leq \square\}$

Functions Versus Relations

A FUNCTION IS A SPECIAL TYPE OF RELATION WHERE ALL "INPUTS" (x) MAP INTO EXACTLY ONE "OUTPUT" (y)

X CAN VARY: THAT IS WHY IT IS CALLED A VARIABLE

$x \rightarrow$ [APPLY SOME OPERATION ON x] $\rightarrow$ y OR $f(x)$ ← "f OF x"

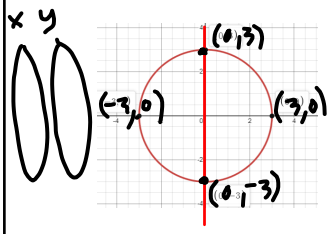
EXAMPLE:

$x \rightarrow$ [ADD 3 TO x] $\rightarrow f(x) = x + 3$ OR $y = x + 3$

EXAMPLE:

$x \rightarrow$ [SQUARE x AND SUBTRACT 1] $\rightarrow f(x) =$ _____ OR $y =$ _____

Functions Versus Relations

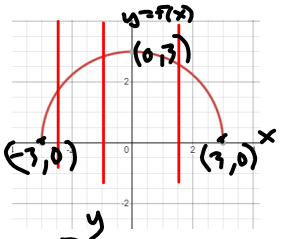


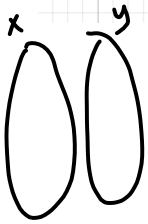
THIS IS CALLED "THE VERTICAL LINE TEST"

IF A VERTICAL LINE PASSES THROUGH MORE THAN 1 POINT THE RELATION IS NOT A FUNCTION

NOTE 3 → 0 ← -3

FOR A FUNCTION EACH INPUT MAPS INTO EXACTLY 1 OUTPUT





THIS SEMICIRCLE IS A FUNCTION. ALL VERTICAL LINES PASS THROUGH AT MOST 1 POINT.

DOMAIN: D: { ☐ ≤ x ≤ ☐ }

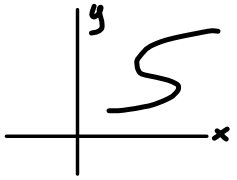
RANGE: R: { ☐ ≤ y ≤ ☐ }

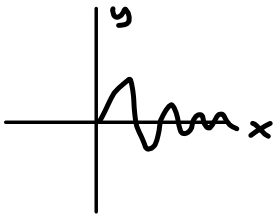
Functions Versus Relations

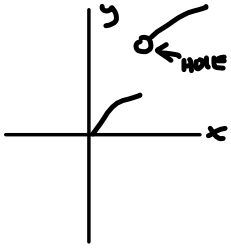
ALL FUNCTIONS ARE RELATIONS
NOT ALL RELATIONS ARE FUNCTIONS

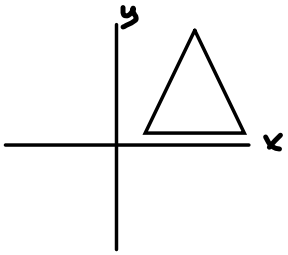
FUNCTIONS ⊂ RELATIONS
↑
SUBSET

IDENTIFY AS FUNCTIONS OR RELATIONS









Function Terminology

INPUT	OUTPUT
DOMAIN	RANGE
INDEPENDENT VARIABLE	DEPENDENT VARIABLE

Evaluating Functions

HERE ( ) DO NOT MEAN MULTIPLY

$f(x) = 2x + 4$ "f of x = 2x + 4"

$f(3) = 2 \cdot 3 + 4 = 10$

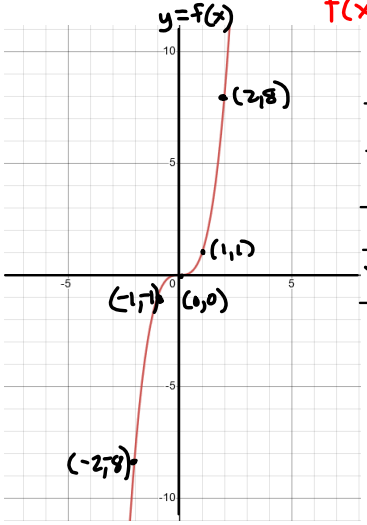
$f(-1) =$

$a(x) = 3x^2 + 2x - 5$

$a(2) =$

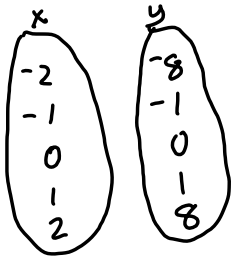
One-to-One Functions and The Horizontal Line Test

$F(x) = x^3$



x	$f(x)=x^3$	(x,y)
-2		
-1		
0		
1		
2		

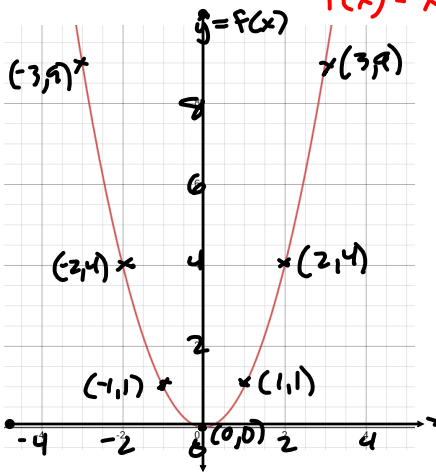
MAPPING DIAGRAM



Does the function pass the horizontal line test?

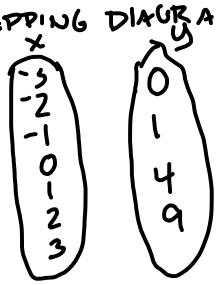
One-to-One Functions and The Horizontal Line Test

$f(x)=x^2$



x	$f(x)=x^2$	(x,y)
-3		
-2		
-1		
0		
1		
2		
3		

MAPPING DIAGRAM

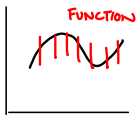


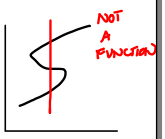
Does the function pass the horizontal line test?

Summary

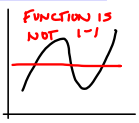
A relation is a set of ordered pairs (x,y) where the set of x-values are called the domain, and the set of y-values are called the range.

A function is a special relation where each x-value is associated with exactly one y-value. If a relation is a function, it passes the vertical line test. The vertical line test indicates a function if any vertical line that is drawn through the graph of the relation intersects at most 1 point on the graph.





A function is 1-1 if each output (y-value) has exactly one input (x-value) mapping into it. A 1-1 function passes the horizontal line test.



The horizontal line tests indicates a 1-1 function if any horizontal line drawn through the function intersects at most one point on the graph of the function.