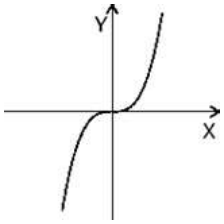
Section 1-2: Day 1

Functions & Their Properties



Section 1-2: Day 1

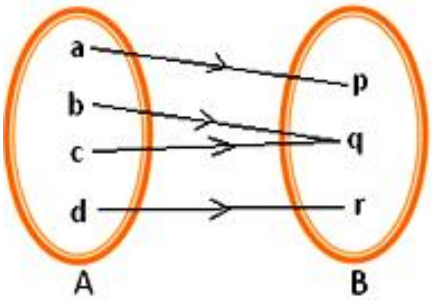
Functions & Their Properties

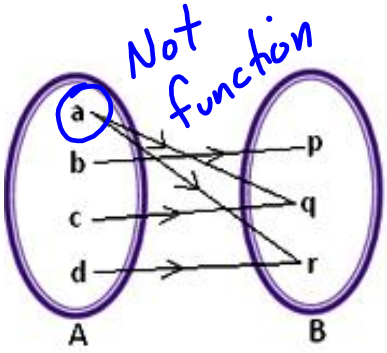
- Students will be able to represent functions numerically, algebraically and graphically
- Students will be able to determine the domain and range for the function
- Students will be able to analyze the function's characteristics such as extreme values, symmetry, asymptotes & end behavior

Function, Domain & Range

A function from set D to a set R is a rule that assigns 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.

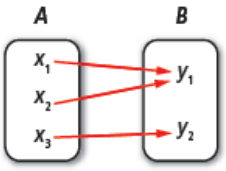




BIG IDEA Functions are sets of ordered pairs or correspondences in which each value of a domain variable is associated with exactly one value of a range variable.

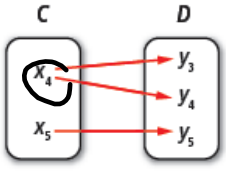
Definition of Function

A **function** is a correspondence between the elements of two sets *A* and *B* for which each element *x* in *A* corresponds to exactly one element *y* in *B*.



function
(Each value in A corresponds to exactly one value in B.)

each x is used exactly 1 time



not a function
(x4 in C corresponds to two values in D.)

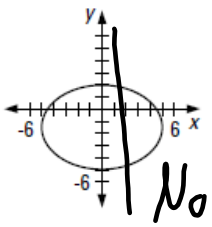
x_4 used twice

Alternative Definition of Function

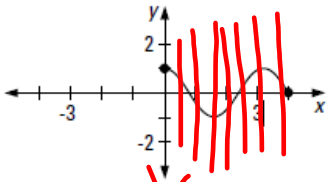
A **function** f: $A \rightarrow B$ is a set of ordered pairs (x, y) with x in A and y in B such that every element of A is in an ordered pair in f and no two different ordered pairs in f have the same first component.

{ (2, 4), (-3, 5), (-1, 5), (-2, 8), (5,0)} Yes - function

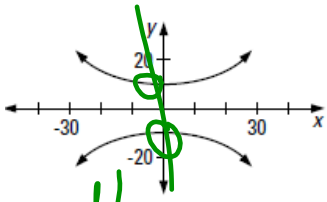
{ (4, 2), (5, -3), (5, -1), (8, -2), (0,5)} Not a function



No

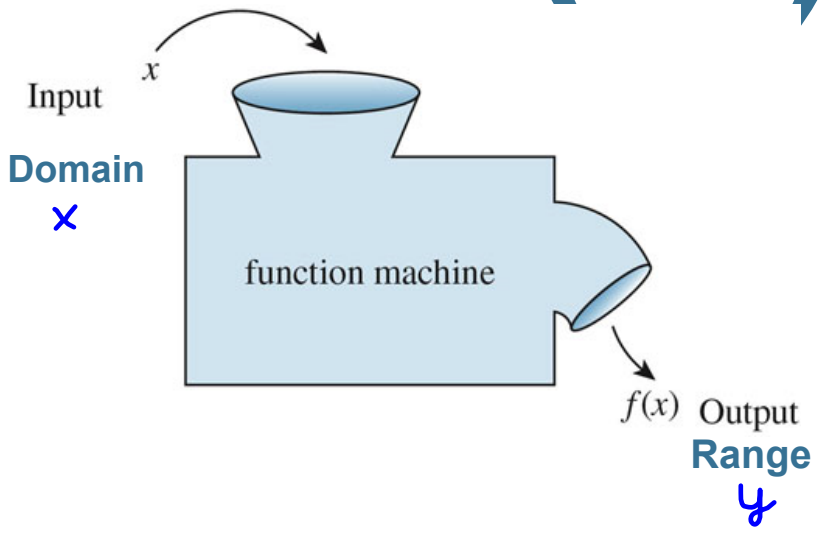


Yes



No

y = f(x)



domain: x variable
independent

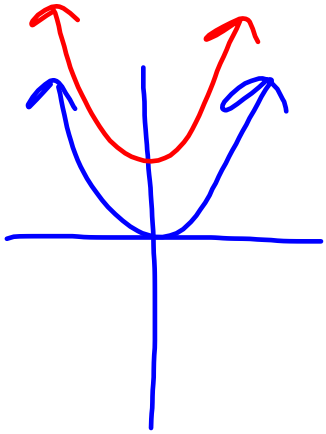
range: y variable
dependent

$y = 2x + 1$ y depends on x

choose x at will

Defining a Function

Does the formula $y = x^2$ define as a function?



yes - passes the vertical line test

$f(x) = x^2 + 4$ D: $(-\infty, \infty)$ $\mathbb{R}$'s

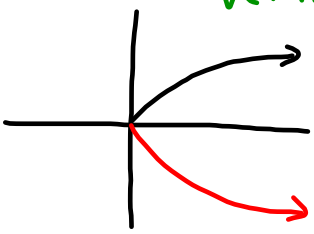
3. Determine whether the formula determines y as a function of x. If not, explain why.

$x = 2y^2$

$\frac{x}{2} = y^2$

$\pm\sqrt{\frac{x}{2}} = y$

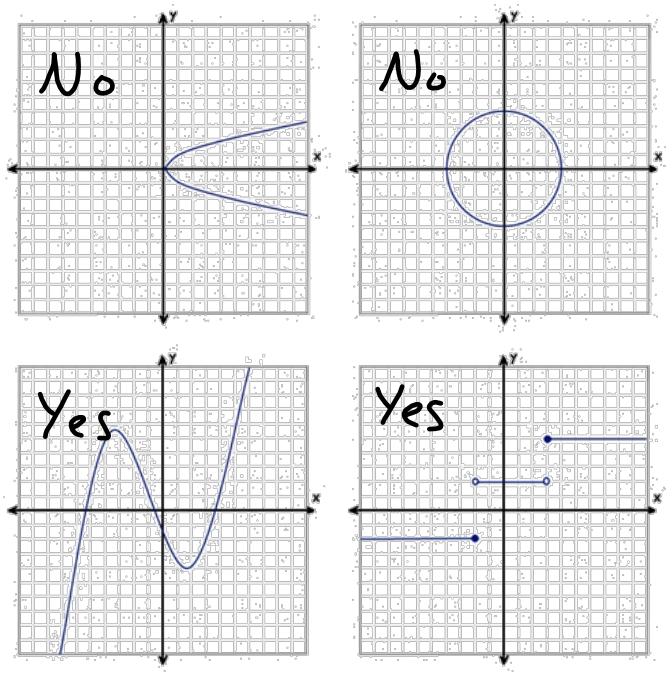
No - doesn't pass vertical line test



$y = +\sqrt{\frac{x}{2}}$ $y = -\sqrt{\frac{x}{2}}$

Seeing a Function Graphically

Of the four graphs below, which are *not* graphs of a function? How can you tell?



#5

5. Use the vertical line test to determine whether the curve is the graph of a function.

Vertical line test - 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

Finding the Domain & Range of a Function Graphically

http://www.mathdemos.org/mathdemos/domainrange/domainrange.html

Interval Notation

Intervals whose graphs are segments:	Interval notation	Set notation
Closed intervals from *a* to *b* (endpoint included)	**[*a*, *b*]**	{*x*: *a* ≤ *x* ≤ *b*}
Open interval from *a* to *b* (endpoints not included)	**(*a*, *b*)**	{*x*: *a* < *x* < *b*}
Half-open interval from *a* to *b*, including *a* (one endpoint included)	**[*a*, *b*)**	{*x*: *a* ≤ *x* < *b*}
Intervals whose graphs are rays: **Closed infinite intervals**	**[*b*, ∞)**	{*x*: *b* ≤ *x*}
Open infinite interval	**(-∞, *a*)**	{*x*: *x* < *a*}

[ ] include the #

( ) does not include the #

∞ always be ( )

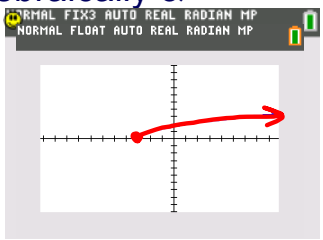
$(-\infty, \infty)$

Finding the Domain of a Function

Find the domain of the following functions algebraically & graphically.

$f(x) = \sqrt{x+3}$ $x + 3 = 0$, $x = -3$

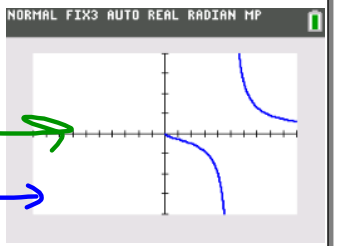
D: $[-3, \infty)$



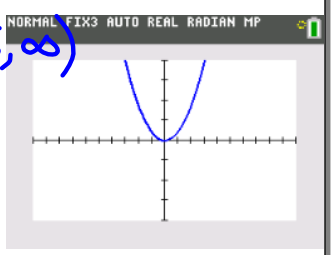
$g(x) = \dfrac{\sqrt{x}}{x-5}$ $x = 0$, $x \neq 5$

0, 5

D: $[0,5) \cup (5,\infty)$



$A(s) = \left(\dfrac{\sqrt{3}}{4}\right)s^2$ D: $\mathbb{R}$'s $(-\infty, \infty)$



11. Find the domain of the function algebraically.

$$f(x)=\frac{3x-1}{(x+3)(x-1)}$$

D: ℝ's ⟷

$x=-3 \quad x=1$

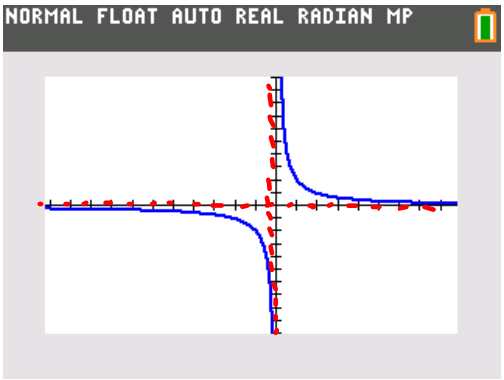
D: $(-\infty,-3)\cup(-3,1)\cup(1,\infty)$

Finding the Range of a Function

Find the range of the function $f(x)=\frac{2}{x}$ algebraically and graphically.

undef @ $x=0$

D: $(-\infty,0)\cup(0,\infty)$



R: $0=\frac{2}{x}$

$x\cdot 0=2$

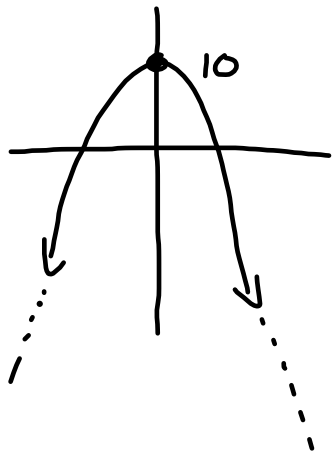
$0\neq 2$

Range → y's bottom to top

R: $(-\infty,0)\cup(0,\infty)$

17. Find the range of the function.

y's $f(x) = 10 - x^2$



R: $(-\infty, 10]$

HW: Pg 94 #'s 3-33 by 3's, 42 and 45