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Lesson 1.3 - Definition of a Function, evaluating functions using equations, graphs and charts.

I. Identifying Functions

Recall from your previous math courses, what is your definition of a **function**? How do you test if something is a **function**?

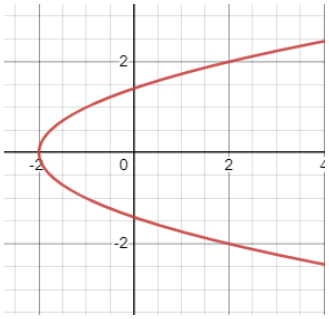
Something with an "input" and "output"

Your Definition: a mapping of the elements of one set called the domain to the elements of a second set called the range.

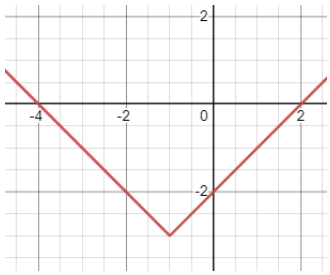
A function will only have one unique output for a given input. Visually, a mathematical relationship is a function if it passes the vertical line test.

1. Which of the following graphed relationships describe 'y' as a function of 'x'?

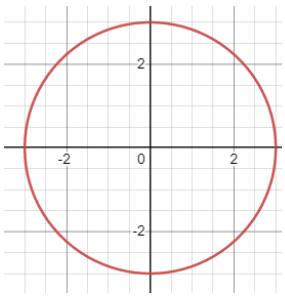
$y^2 = x + 2$



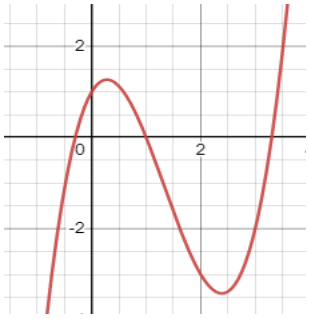
$y = |x + 1| - 3$



$x^2 + y^2 = 9$



$y = x^3 - 4x^2 + 2x + 1$



II. Analyzing functions with equations, graphs, and charts

2. $f(t) = t^2 - 2t$

a. Evaluate $f(3)$

Plug a number as input
$f(3) = 3^2 - 2(3)$
$f(3) = 9 - 6;$
$f(3) = 3$

b. Find all t such that $f(t) = 3$

Apply zero product property
$f(t) = t^2 - 2t = 3$
$t^2 - 2t - 3 = 0$
$(t - 3)(t + 1) = 0$
$t = 3; t = -1$

c. Evaluate $f(2x)$

Plug an expression as input
$f(2x) = (2x)^2 - 2(2x)$
$f(2x) = 4x^2 - 4x$

d. If $x = 2$, find $f(2x)$

$f(2x) = 4x^2 - 4x$
$f(2(2)) = 4(2)^2 - 4(2)$
$f(4) = 16 - 8 = 8$

e. Find all x such that $f(x) = 0$

Apply zero product property. $t^2 - 2t = 0 \rightarrow t(t - 2) = 0; \rightarrow t = 0, t = 2$

3. $g(t) = 1 - \sqrt{t+5}$

a. Evaluate $g(-1)$

Plug in number as input.

$g(-1) = 1 - \sqrt{-1+5}$

$g(-1) = 1 - \sqrt{4}$

$g(-1) = -1$

b. If $x = -3$, find $g(2x+5)$

If $x = -3$, $2x + 5 = -1$

$g(-1) = -1$

c. Evaluate $g(3x-1)$

Plug in expression as input.

$g(3x-1) = 1 - \sqrt{(3x-1)+5}$

$g(3x-1) = 1 - \sqrt{3x+4}$

d. Find all x such that $g(x) = 4$

$g(x) = 1 - \sqrt{x+5} = 4$

$-\sqrt{x+5} = 3$

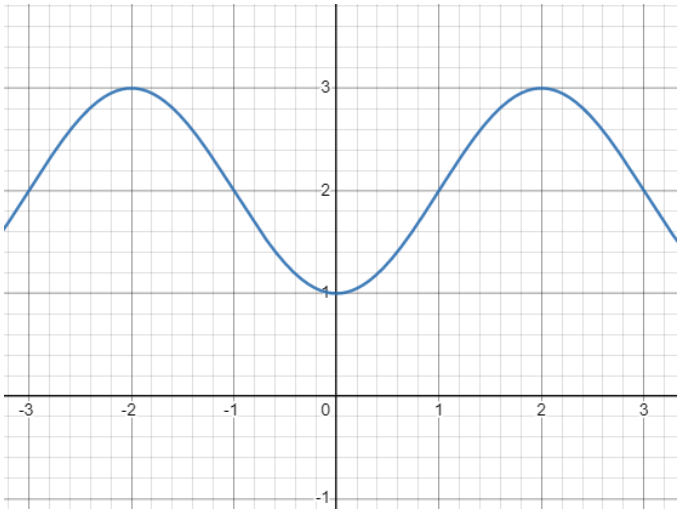
$\sqrt{x+5} = -3$

No Solution

e. Find all x such that $g(x) = 0$

$1 - \sqrt{x+5} = 0 \rightarrow -\sqrt{x+5} = -1 \rightarrow x + 5 = 1 \rightarrow x = -4$

4. $h(x)$ is graphed to the right.



a. Find $h(1) = 2$

b. Find $h(2) = 3$

c. Find all x such that $h(x) = 1$

$x = 0$

d. Find $h(2x)$ if $x = -1$

$h(-2) = 3$

5. Use the charts of $f(x)$and $g(x)$ to the right.

x	f(x)	g(x)
-3	3	2
-2	0	1
-1	1	-3
0	2	2
1	-1	1
2	4	3
3	-2	-1

a. Evaluate $f(-1) = 1$

b. Evaluate $g(2) = 3$

c. Evaluate $f(3x)$ if $x = -1$

$f(-3) = 3$

d. Find all x such that $f(x) = 0$

$x = -2$

e. Find all x such that $g(x+1) = 1$

$x + 1 = -2$ and $x + 1 = 1$

$x = -3$ and $x = 0$

6. Find values for x for which $f(x) = g(x)$ if $f(x) = x^4 - 2x^2$ and $g(x) = 2x^2$.

$x^4 - 2x^2 = 2x^2$

$x^4 - 4x^2 = 0$

$x^2(x^2 - 4) = 0$

$x^2(x - 2)(x + 2) = 0$

$x = 0, x = 2, x = -2$

7. Let $f(x)$ be defined as $f(x) = 6x^2 - 7x$. Find values of x for which $f(x) = 20$

$6x^2 - 7x = 20$

$6x^2 - 7x - 20 = 0$

$6x^2 - 15 + 8x - 20 = 0$

$3x(2x - 5) + 4(2x - 5) = 0$

$(3x + 4)(2x - 5) = 0$

$x = -\frac{4}{3}, x = \frac{5}{2}$

8. Let $h(x)$ be defined as $h(x) = \sqrt{x + 1} - 2$. Find all values of x for which $h(x) = x - 3$.

$\sqrt{x + 1} - 2 = x - 3$

$\sqrt{x + 1} = x - 1$

$x + 1 = (x + 1)^2$

$x + 1 = x^2 - 2x + 1$

$0 = x^2 - 3x$

$0 = x(x - 3)$

$x = 0, x = 3$