

Functions → mathematical relationships
predictable
input → output

For a function, every input must have one, and only one, output.

$\{(0, 3), (0, -3), (-3, 0), (3, 0)\}$

input output
independent dependent

$[f(x) = x^2]$ function f with respect to x vertical

$$f(x) = y$$

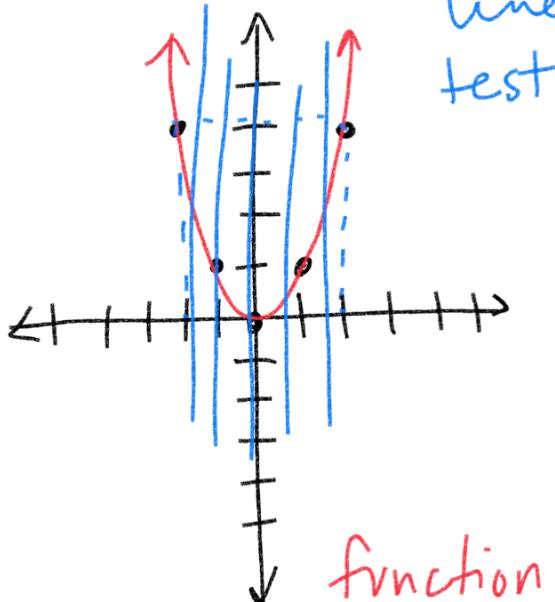
$$f(-2) = (-2)^2 = 4$$

$$f(-1) = (-1)^2 = 1$$

$$f(0) = (0)^2 = 0$$

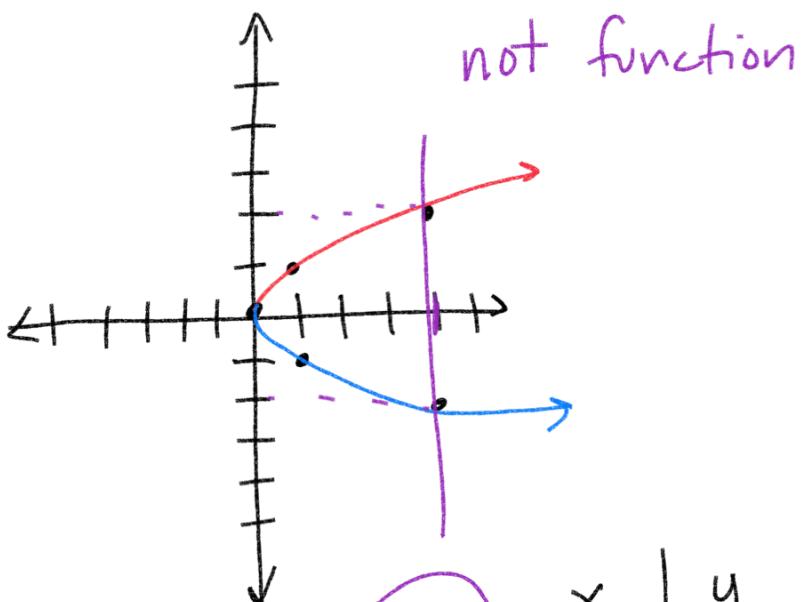
$$f(1) = (1)^2 = 1$$

$$f(2) = (2)^2 = 4$$



input	x	y
0	0	3
-3		-3
3		0

x	y
-2	4
-1	1
0	0
1	1
2	4



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

$$y^2 = x$$

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

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

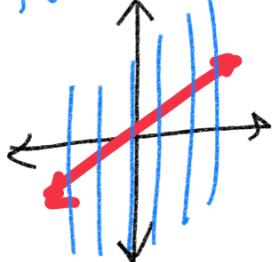
x	y
4	2
1	1
0	0
-1	i
-4	$2i$

x	y
4	-2
1	-1
0	0
-1	$-i$
-4	$-2i$

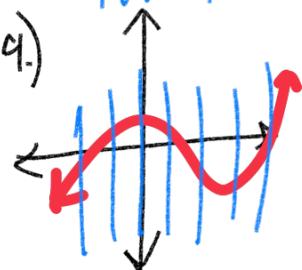
1.) $(0,0), (-1,-1), (-2,-8), (1,1), (2,8)$ function

2.) $(2,-2), (2,2), (5,-5), (5,5)$ not function

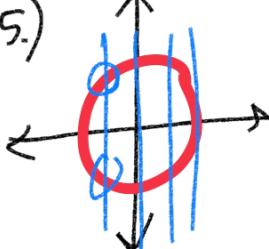
3.) function



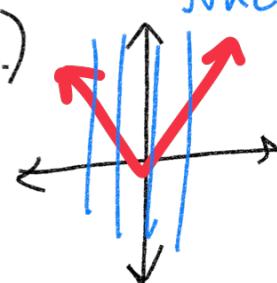
4.) function



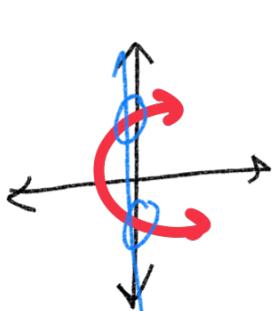
5.) not function



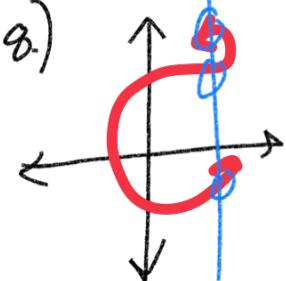
6.) function



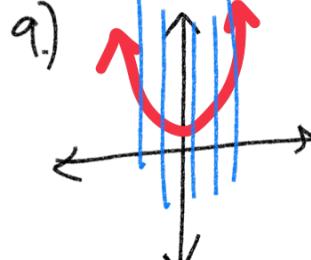
7.)



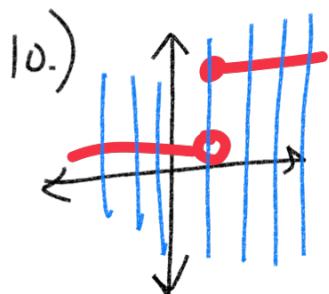
not function



not function



function



function

$$x = -3 \quad y = 1$$

$$f(-3) = 1$$

$$f(0) = -4$$

$$f(3) = -2$$

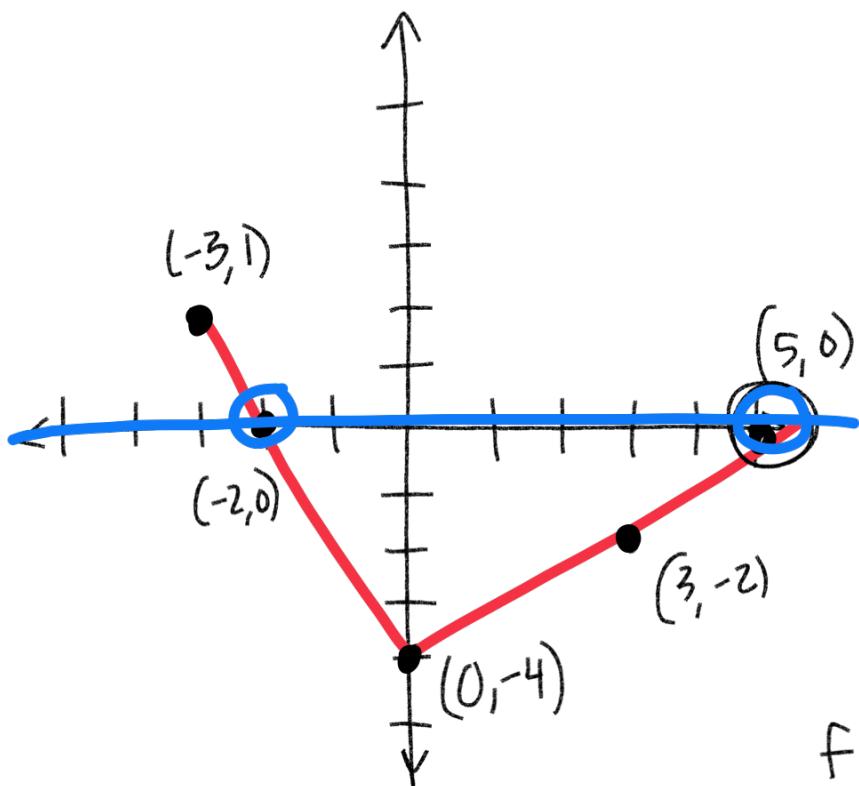
$$f(5) = 0$$

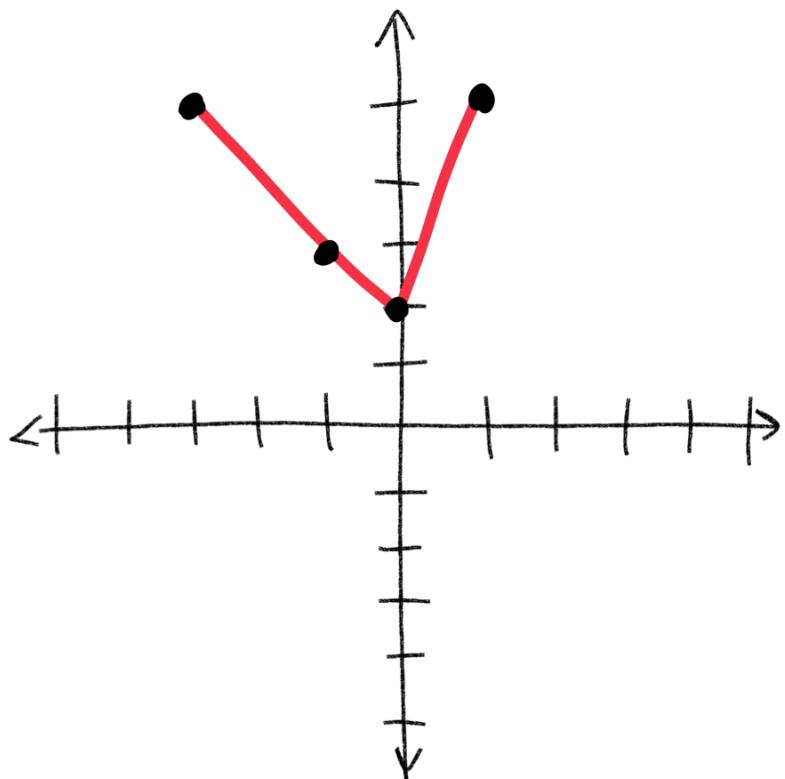
$$f(x) = 1 \quad x = -3$$

$$f(x) = 0 \quad x = -2, 5$$

$$y = 0$$

$$f(f(5)) = f(0) = \boxed{-4}$$





$$1.) f(-1) = 3$$

$$2.) f(0) = 2$$

$$3.) f(1) = 5$$

$$4.) f(x) = 5$$

$$\boxed{x = -3, 1}$$

$$\boxed{f(x) = 2x - 3}$$

$$\boxed{\downarrow g(x) = 4 - x^2}$$

$$1.) \quad \begin{matrix} \downarrow \\ f(-2) = 2(-2) - 3 \end{matrix}$$

$$f(-2) = -7 \quad (-2, -7)$$

$$\uparrow \quad -4 - 3 = \boxed{-7}$$

$$2.) \quad \begin{matrix} \uparrow \\ f(3) + \downarrow g(1) = \boxed{6} \end{matrix}$$

$$3.) \quad \frac{f(8)}{g(6)} = \frac{2(8) - 3}{4 - (6)^2}$$

restrictions? $\frac{16 - 3}{4 - 36}$

$$2(3) - 3 + 4 - (1)^2$$

$$\begin{matrix} 6 - 3 + 4 - 1 \\ 3 + 3 = \boxed{6} \end{matrix}$$

$$g(x) \neq 0$$

$$\begin{matrix} 4 - x^2 \neq 0 \\ +x^2 +x^2 \end{matrix}$$

$$\boxed{-\frac{13}{32}}$$

$$\sqrt{4} \neq \sqrt{x^2} \quad \boxed{x \neq \pm 2}$$

$$f(x) = 2x - 3 \quad g(x) = 4 - x^2$$

$$f(x) + g(x)$$

$$\downarrow$$

$$2x - 3 + 4 - x^2 = \boxed{-x^2 + 2x + 1}$$

$$f(x) = 2x - 3 \quad g(x) = 4 - x^2$$

$$f(g(x)) = f \circ g$$

$$2(g(x)) - 3 \quad f(g(x)) = -2x^2 + 5$$

$$2(4 - x^2) - 3$$

$$8 - 2x^2 - 3 = \boxed{-2x^2 + 5}$$

$$f(x) = 2x - 3 \quad g(x) = 4 - x^2 \quad \underline{f(g(x)) = -2x^2 + 5}$$

$$f(g(0)) \quad g(0) = 4 - (0)^2$$

$$= \boxed{4}$$

$$-2x^2 + 5$$

$$x = 0$$

$$-2(0)^2 + 5$$

$$f(4) = 2(4) - 3 = 8 - 3 = \boxed{5}$$

$$\boxed{5}$$

$$f(g(0)) = 5$$

$$f(x) = 2x - 3 \quad g(x) = 4 - x^2$$

$$g(f(x)) = g \circ f$$

$$4 - (2x - 3)^2$$

$$4 - (2x - 3)(2x - 3)$$

$$4 - 4x^2 - 6x - 6x + 9$$

$$4 - 4x^2 - 12x + 9$$

$$g(f(x)) = \boxed{4 - 4x^2 - 12x + 13}$$