

16.1 Functions and Graphs

Relation: A set of ordered pairs.

Domain: The set of all x -values (first elements) for a relation.

Range: The set of all y -values (second elements) for a relation.

Function: A relation in which **every** value in the **domain** is paired with **exactly one** value in the **range**.

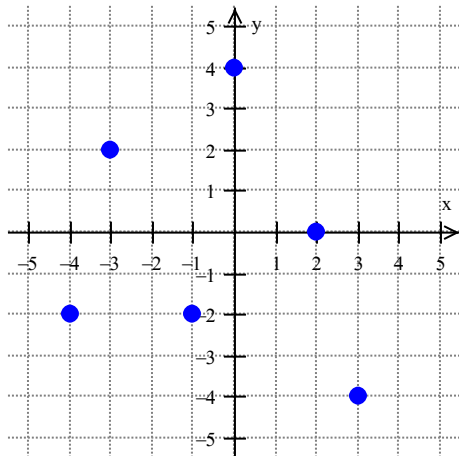
The Vertical Line Test

To determine whether a relation is a function from its graph, perform a vertical line test:

1. Draw or imagine vertical lines through each point in the domain.
2. If each vertical line intersects the graph at **only one point**, then the graph is **the graph of a function**.
3. If any vertical line intersects the graph **more than once**, then the graph is **not** the graph of a function.

Ex. Determine the domain and the range of the relation and determine whether it is a function.

a)

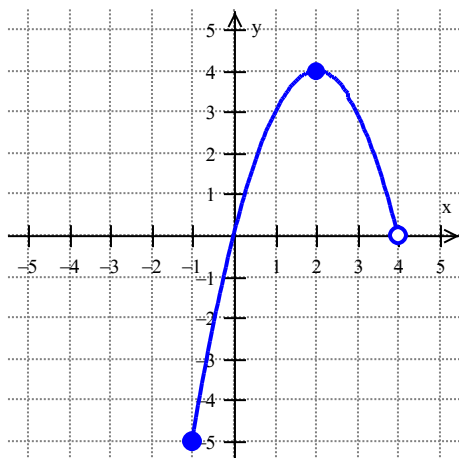


Domain: _____

Range: _____

Function? _____

b)

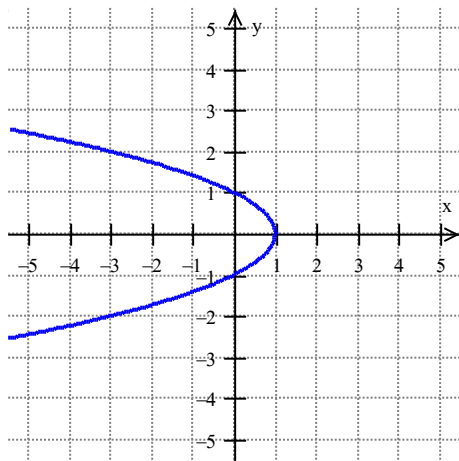


Domain: _____

Range: _____

Function? _____

c)



Domain: _____

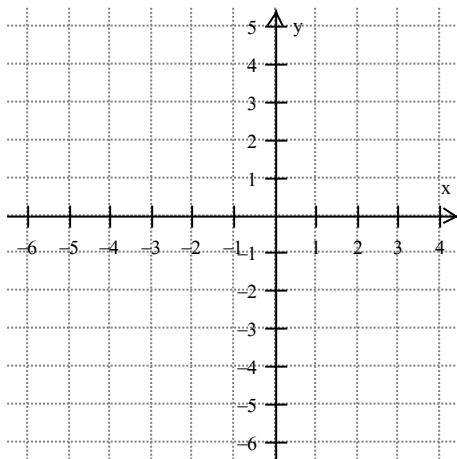
Range: _____

Function? _____

d) $y = 2 - |x + 1|$

(Window [-6, 4] scale 1 and [-6, 5] scale 1)

x	Y_1



Domain: _____

Range: _____

Function? _____

e) $\{(-1, 0), (-3, 0), (2, 6), (4, 5)\}$

Domain: _____

Range: _____

Function? _____

f) $\{(-3, 2), (4, 1), (-3, 5), (2, 8)\}$

Domain: _____

Range: _____

Function? _____

g) Top U.S. Last Names

Name	% of All Names
Smith	1.006%
Johnson	0.810%
Williams	0.699%
Brown	0.621%
Jones	0.621%

Domain: _____

Range: _____

Function? _____

Source: Russell Ash, *The Top 10 of Everything*

Ex. Which of the following equations are functions?

(a) $y = -x + 1$

(b) $x = -5$

(c) $y = x^2 - 4$

(d) $2y + 4 = 6$

Note: All linear equations are functions except those of the form $x = a$, which are vertical lines.

❖ FIND THE VALUE OF A FUNCTION

The **notation** of a function is: $f(x)$

read “ f of x ,” “ f at x ,” or “the value of f at x ”

Equation in two variables:

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

$$y = \frac{2}{3}x - 5$$

Function notation:

$$f(x) = -4x^2 + 1$$

$$f(x) = \frac{2}{3}x - 5$$

Ex. Find the function values.

$$f(x) = 2x^2 - 5$$

(a) $f(-1)$

(b) $f(3)$

(c) $f(a)$

Ex. Given $g(x) = |2 - x|$, find the values of the function.

(a) $g(-2)$

(b) $g(0)$

(c) $g(3)$