3.5 – Introduction to Functions

Defn: A relation is a set of ordered pairs.

$$A = \{(0,0),(1,1),(1,-1),(4,2),(4,-2)\}$$

Domain: The x values of the ordered pair.

$$domain(A): \ \{0, 1, 4\}$$

Range: The y values of the ordered pair.

$$range\,(A): \{-2, -1, 0, 1, 2\}$$

3.5 – Introduction to Functions

State the domain and range of each relation.

x	y
1	3
2	5
-4	6
1	4
3	3

$domain: \{-4, 1, 2, 3\}$

$range: \{3, 4, 5, 6\}$

x	y
4	2
-3	8
6	1
-1	9
5	6

$domain: \{-3, -1, 4, 5, 6\}$

$range: \{1, 2, 6, 8, 9\}$

x	y
2	3
5	7
3	8
-2	-5
8	7

$domain: \{-2, 2, 3, 5, 8\}$

$range: \{-5, 3, 7, 8\}$

3.5 – Introduction to Functions

Defn: A function is a relation where every x value has one and only one value of y assigned to it.

State whether or not the following relations could be a function or not.

x	y
4	2
-3	8
6	1
-1	9
5	6

function

x	y
1	3
2	5
-4	6
1	4
3	3

not a function

x	y
2	3
5	7
3	8
-2	-5
8	7

function

3.5 – Introduction to Functions

Functions and Equations.

State whether or not the following equations are functions or not.

$y = 2x - 3$

x	y
0	-3
5	7
-2	-7
4	5
3	3

function

$y = x^2$

x	y
2	4
-2	4
-4	16
3	9
-3	9

function

$x = y^2$

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

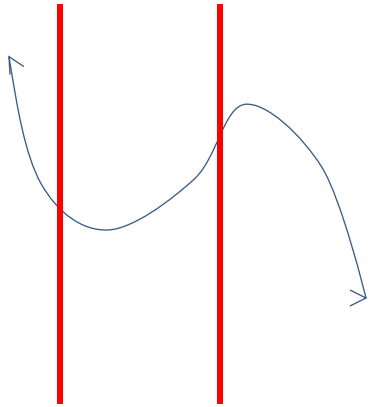
not a function

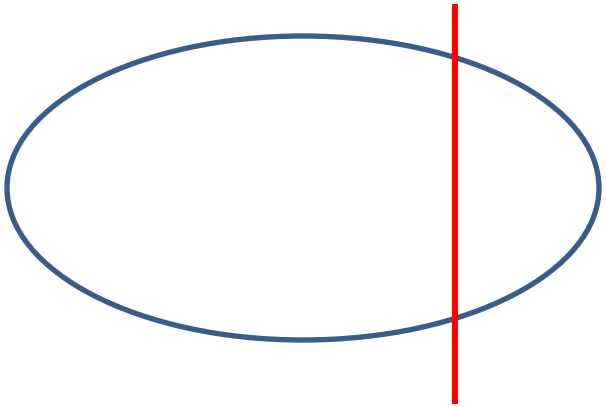
3.5 – Introduction to Functions

Graphs can be used to determine if a relation is a function.

Vertical Line Test

If a vertical line can be drawn so that it intersects a graph of an equation more than once, then the equation is not a function.



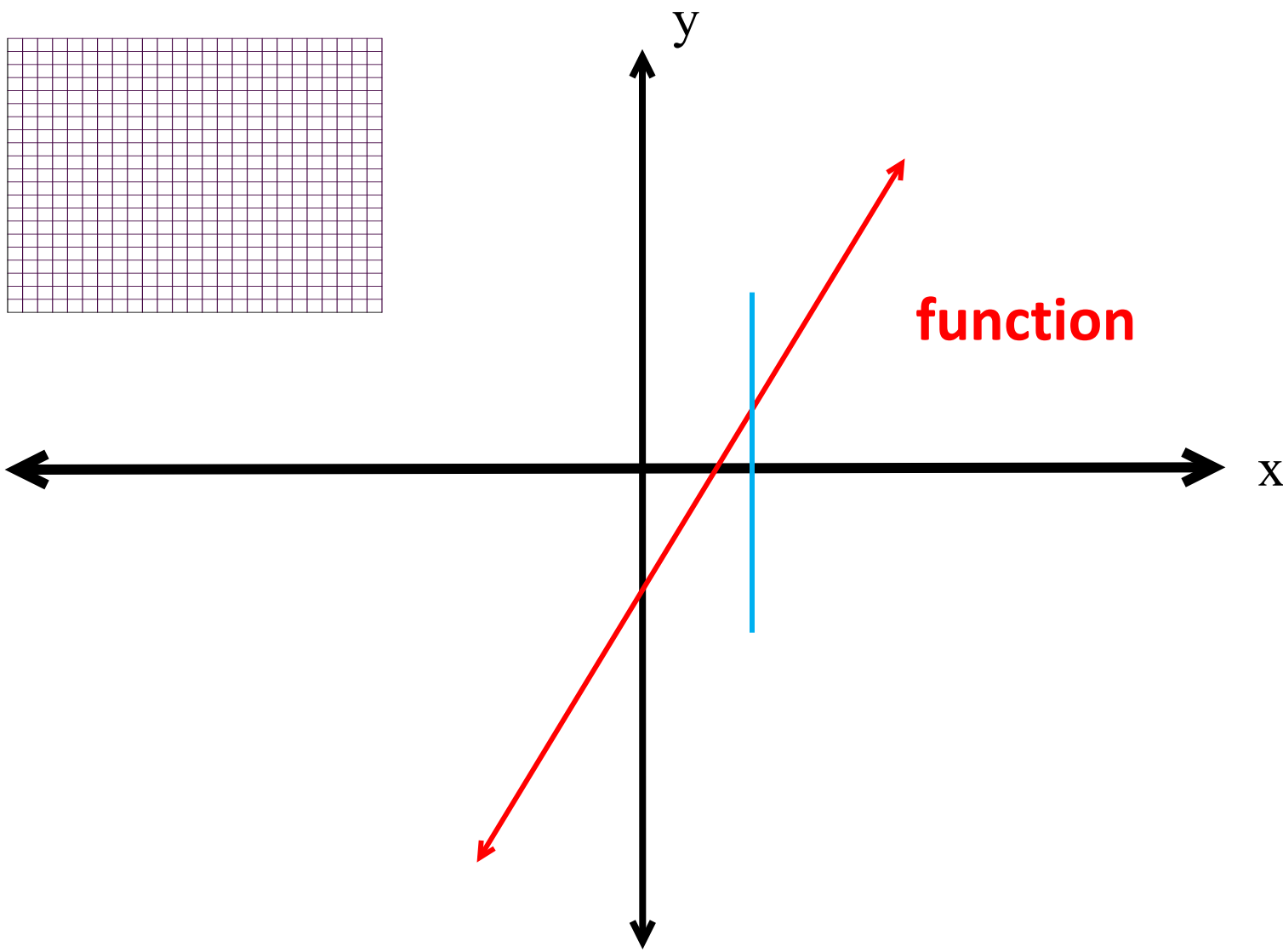


3.5 – Introduction to Functions

The Vertical Line Test

$y = 2x - 3$

x	y
0	-3
5	7
-2	-7
4	5
3	3

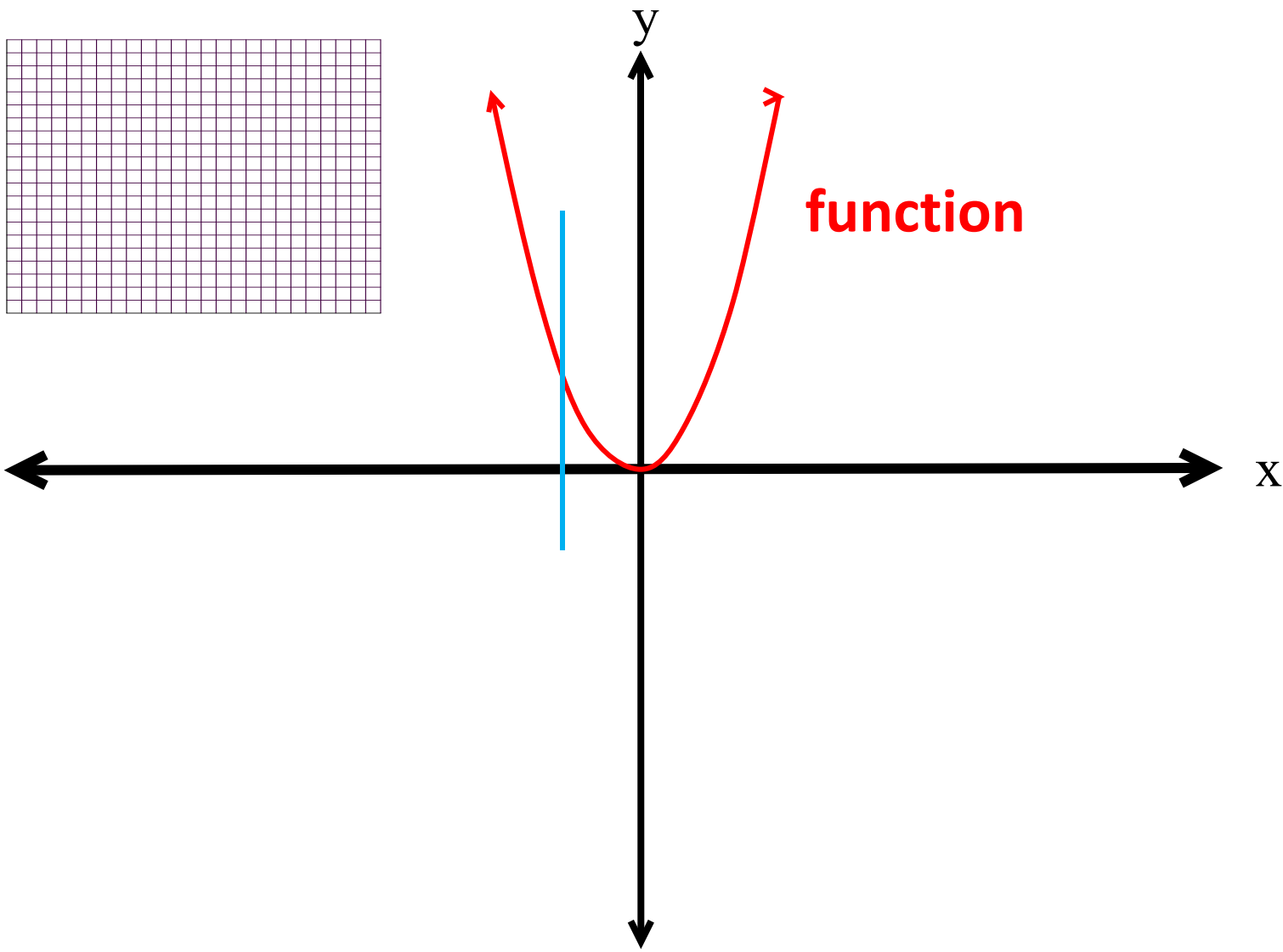


3.5 – Introduction to Functions

The Vertical Line Test

$y = x^2$

x	y
2	4
-2	4
-4	16
3	9
-3	9



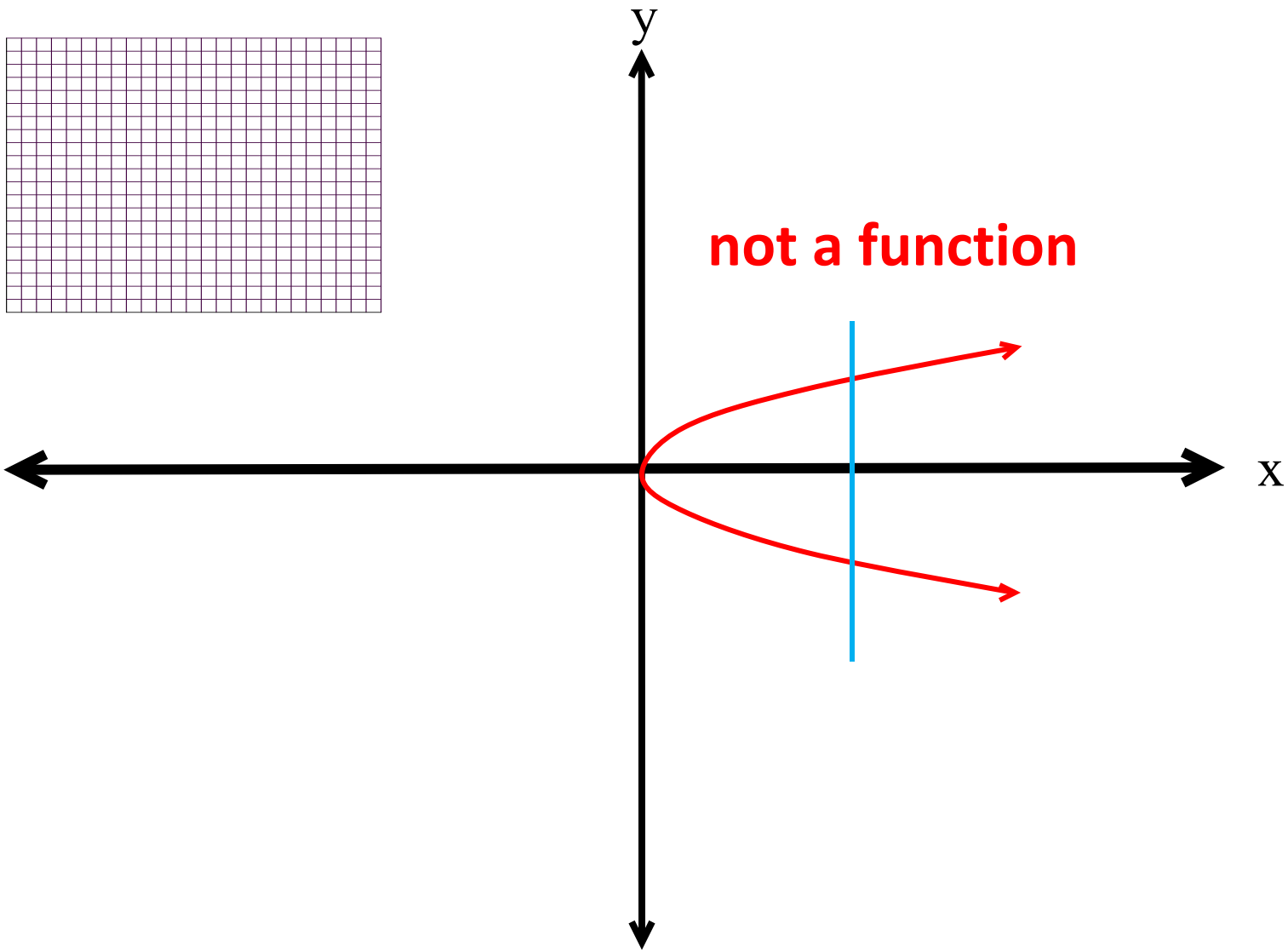
function

3.5 – Introduction to Functions

The Vertical Line Test

$$x = y^2$$

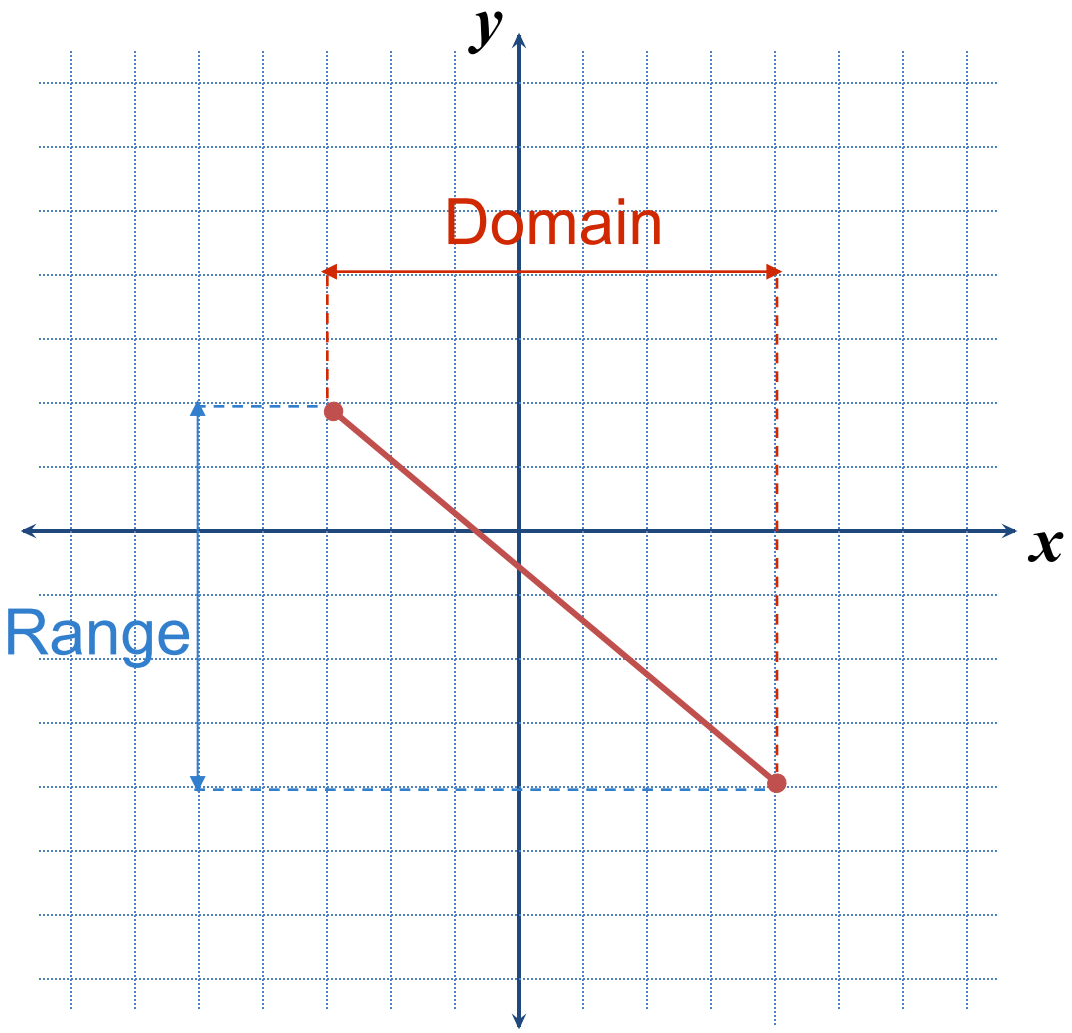
x	y
1	1
1	-1
4	2
4	-2
0	0



3.5 – Introduction to Functions

Domain and Range from Graphs

Find the domain and range of the function graphed to the right. Use interval notation.



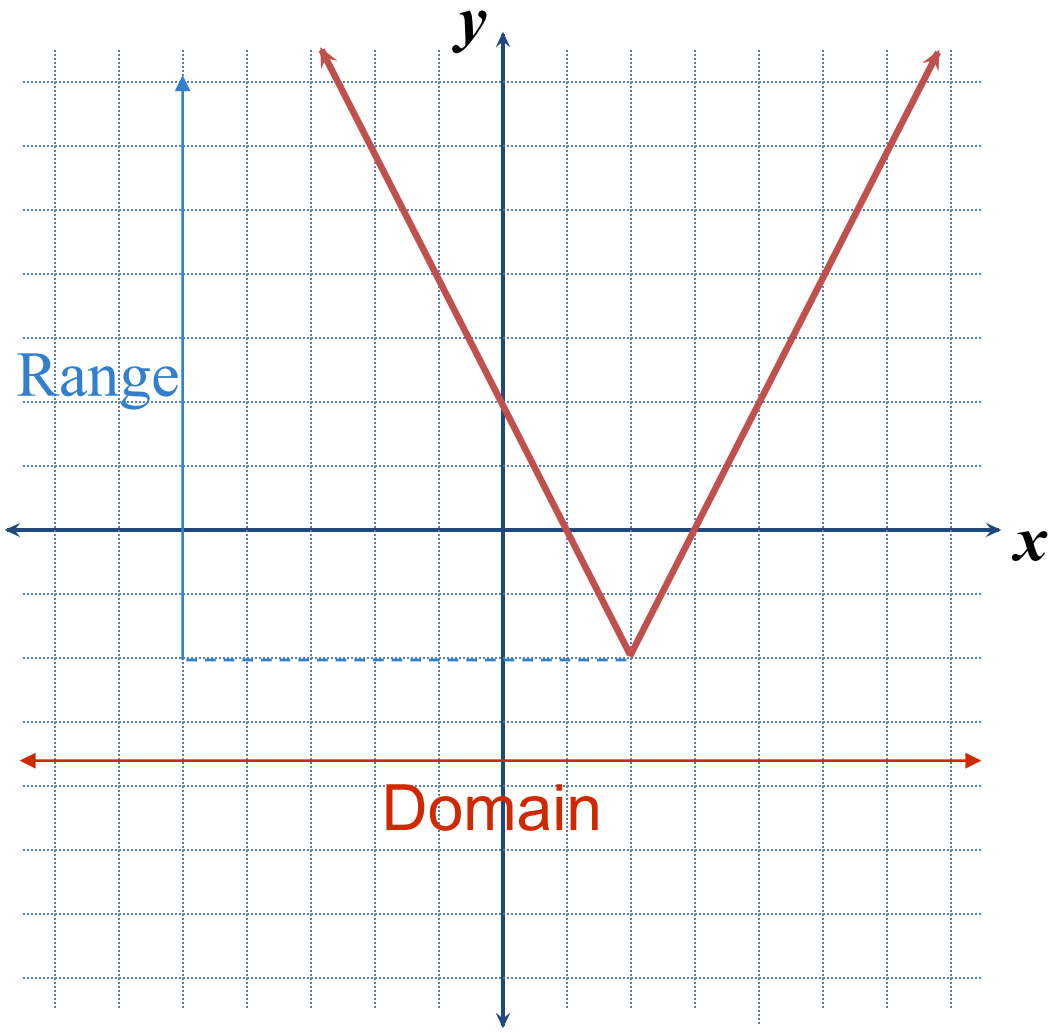
Domain: [–3, 4]

Range: [–4, 2]

3.5 – Introduction to Functions

Domain and Range from Graphs

Find the domain and range of the function graphed to the right. Use interval notation.



Domain: $(-\infty, \infty)$

Range: $[-2, \infty)$

3.6 – Function Notation

Function Notation

Shorthand for stating that an equation is a function.

Defines the independent variable (usually x) and the dependent variable (usually y).

$$y = 3x + 1 \qquad y(x) = 3x + 1 \qquad f(x) = 3x + 1$$

$$y = y(x) = f(x)$$

Function Notation

To denote that y is a function of x, we can write

$$y = \underbrace{f(x)}\ \text{(Read "}f\text{ of }x\text{")}$$

Function Notation

This notation means that ***y* is a function of *x*** or that *y depends on x*. For this reason, *y* is called the **dependent variable** and *x* the **independent variable.**

3.6 – Function Notation

Function notation also defines the value of x that is to be use to calculate the corresponding value of y.

$f(x) = 2x - 5$

find $f(3)$.

$f(3) = 2(3) - 5$

$f(3) = 1$

$(3, 1)$

$f(x) = 4x - 1$

find $f(2)$.

$f(2) = 4(2) - 1$

$f(2) = 8 - 1$

$f(2) = 7$

$(2, 7)$

$g(x) = x^2 - 2x$

find $g(-3)$.

$g(-3) = (-3)^2 - 2(-3)$

$g(-3) = 9 + 6$

$g(-3) = 15$

$(-3, 15)$

3.6 – Function Notation

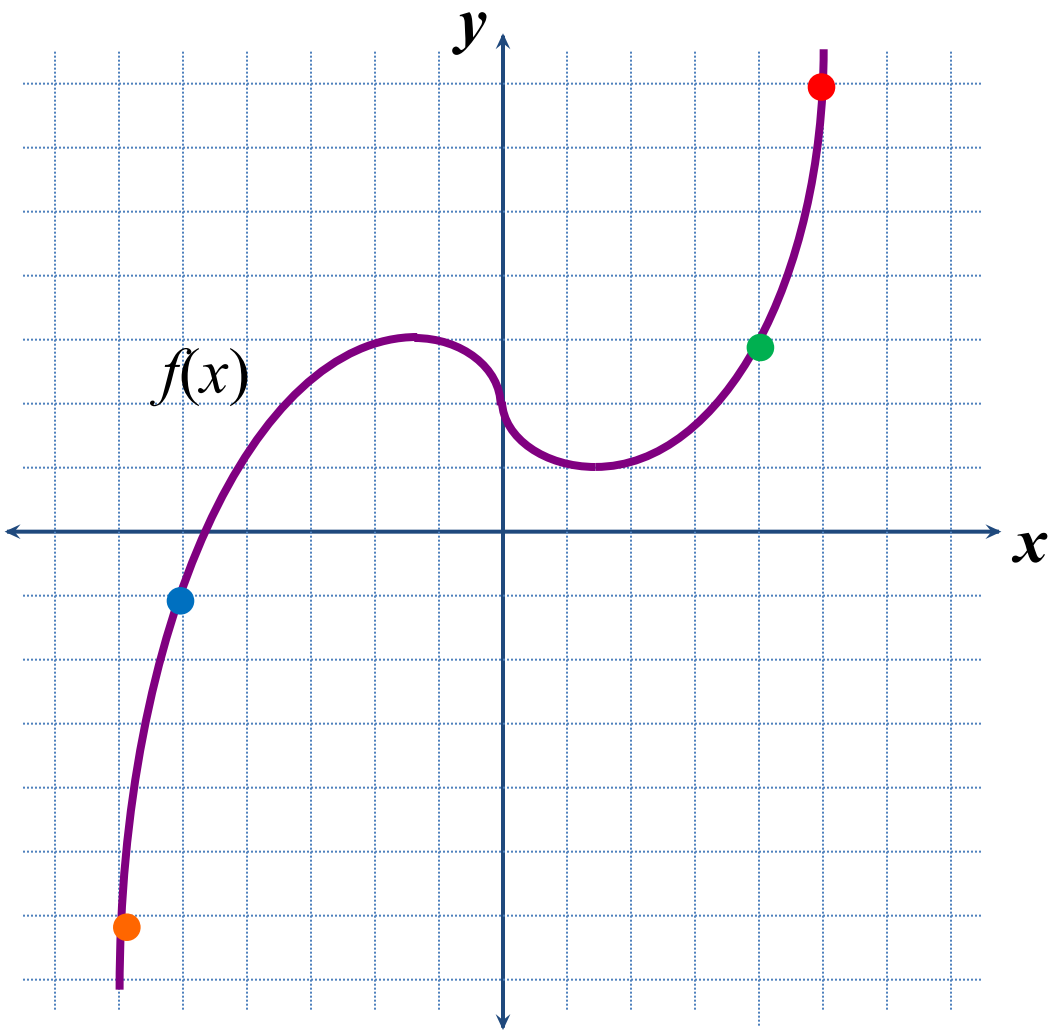
Given the graph of the following function, find each function value by inspecting the graph.

$f(5) = 7$

$f(4) = 3$

$f(-5) = -1$

$f(-6) = -6$



3.6 – Function Notation