2.1 - Basics of Functions and their graphs - Part 2

Tuesday, September 10, 2019 9:37 AM

Recall: $f(x) = 3x + 1$

f of x

Evaluate the function at 2; i.e., evaluate $f(2)$

$$f(2) = 3(2) + 1 = 7$$

Evaluate $f(x+5)$:

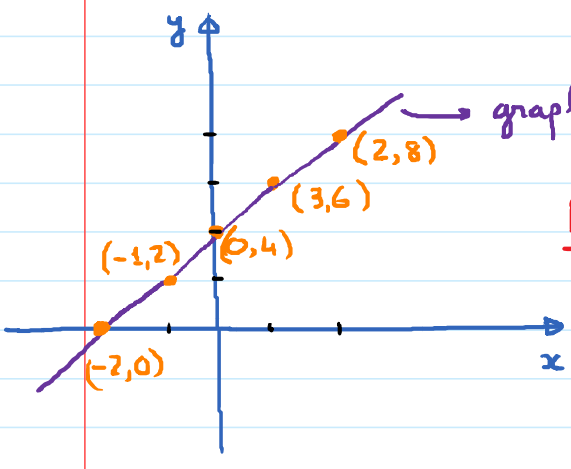
$$f(x+5) = 3(x+5) + 1 = 3x + 15 + 1 = 3x + 16$$

Objective: Graphs of Functions

Definition: The graph of a function is the graph of its ordered pairs

E.g. $f(x) = 2x + 4$.

x	$y = f(x) = 2x+4$	Ordered pair (x, y)
-2	0	$(-2, 0)$
-1	2	$(-1, 2)$
0	4	$(0, 4)$
1	6	$(1, 6)$
2	8	$(2, 8)$



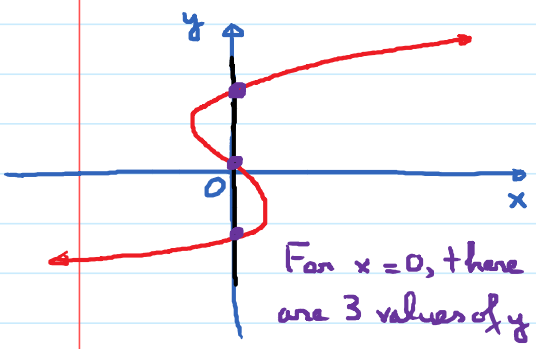
graph of $y = 2x + 4$

Note: This function has the form $f(x) = mx + b$.
The graph is a straight line.

So, we really just need 2 ordered pairs

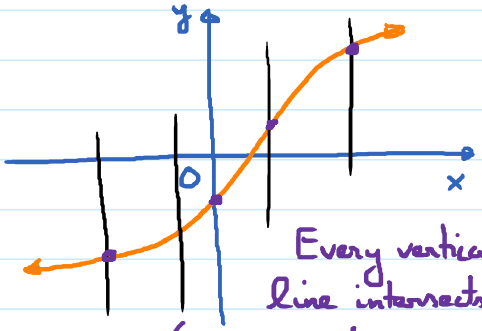
Objective 2: Use the vertical line test.

E.g.



For $x = 0$, there are 3 values of y

This is NOT a function



Every vertical line intersects once.

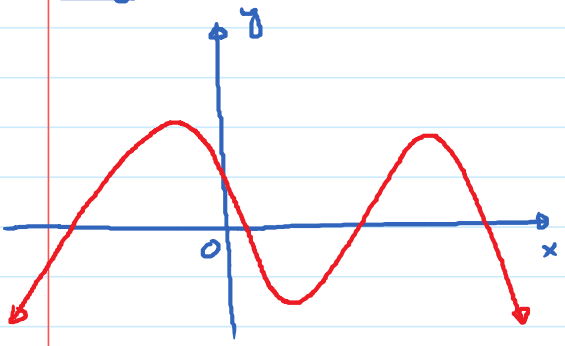
(Every x, there is only 1 y)

This is a function

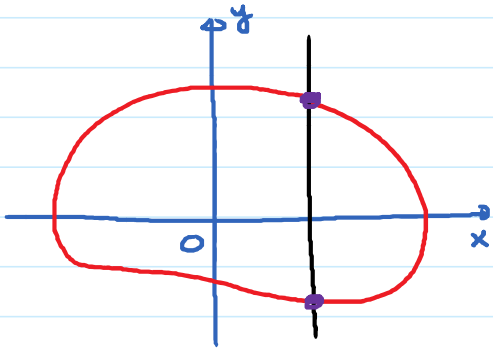
Vertical line Test:

If any vertical line intersects a graph in more than one point, then the graph does not define y as a function of x

E.g.



This is a function

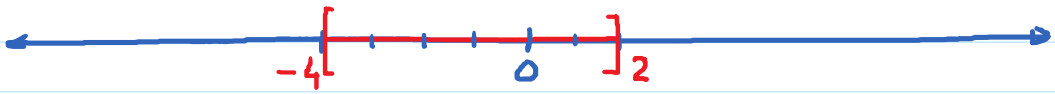


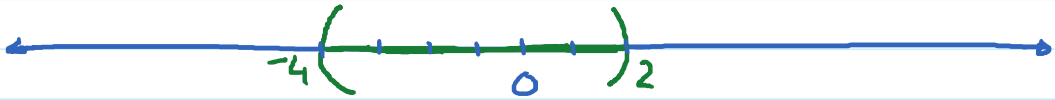
This is NOT a function

Objective 3: Identify Domain and Range from the graph of a function:

Reminder: Interval notation:

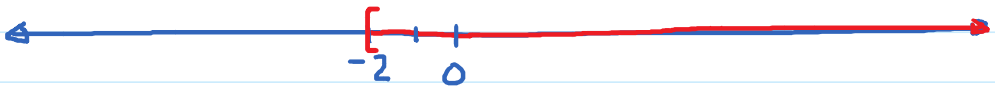
$[-4, 2]$ $\quad$ $(-4, 2)$



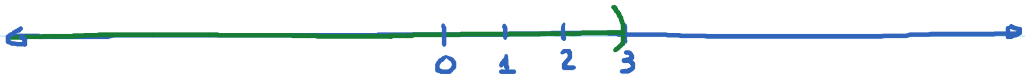


$[-4, 2]$: set of real numbers x such that $-4 \leq x \leq 2$

$(-4, 2)$: set of real numbers x such that $-4 < x < 2$



Interval notation: $[-2, \infty)$

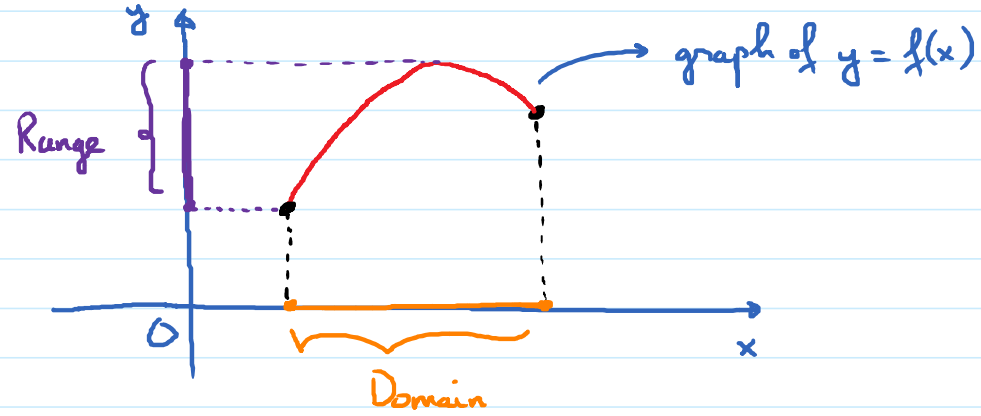


Interval notation: $(-\infty, 3)$

* Set Builder notation:

$$\underbrace{[-4, 2]}_{\text{interval notation}} = \underbrace{\{x \mid -4 \leq x \leq 2\}}_{\text{set builder notation}}$$

* Domain and Range of a function from its graph.

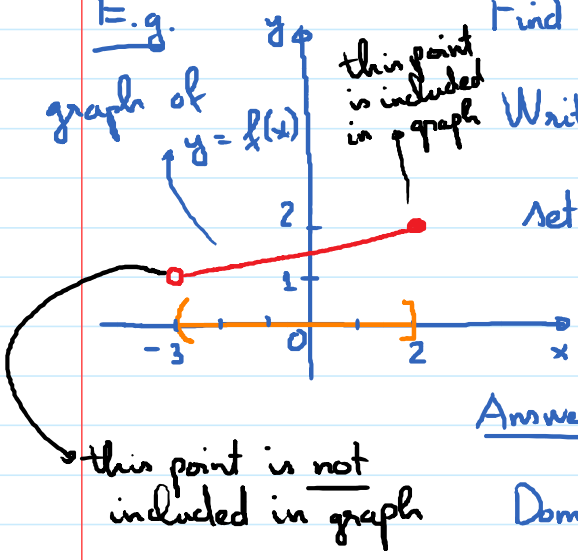


Domain: set of inputs (found on x-axis from the leftmost point to the rightmost point)

Range: set of outputs (found on y-axis from the lowest point to the highest point)

E.g. Find domain and range.

Write answer in interval notation and set builder notation.



Answer:

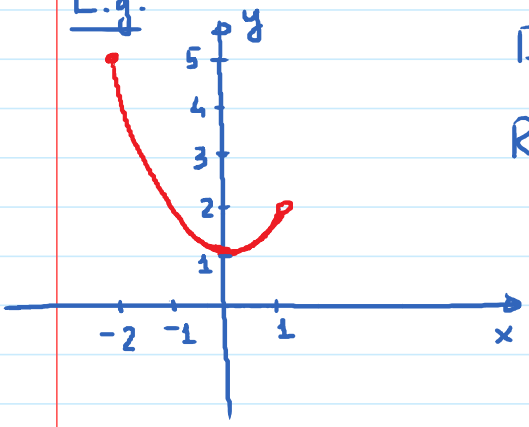
Domain = $(-3, 2] = \{x \mid -3 < x \leq 2\}$

interval notation — set builder notation

Range = $(1, 2] = \{y \mid 1 < y \leq 2\}$

interval notation — set builder notation

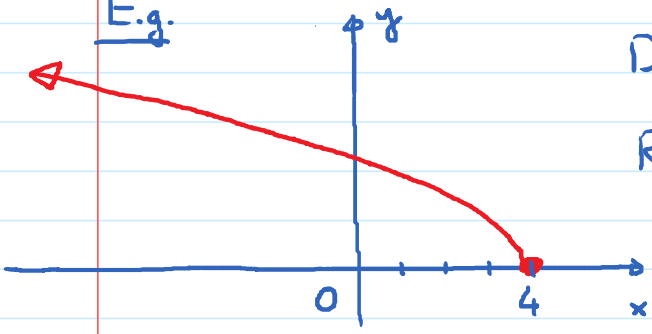
E.g.



Domain: $[-2, 1)$

Range: $[1, 5]$

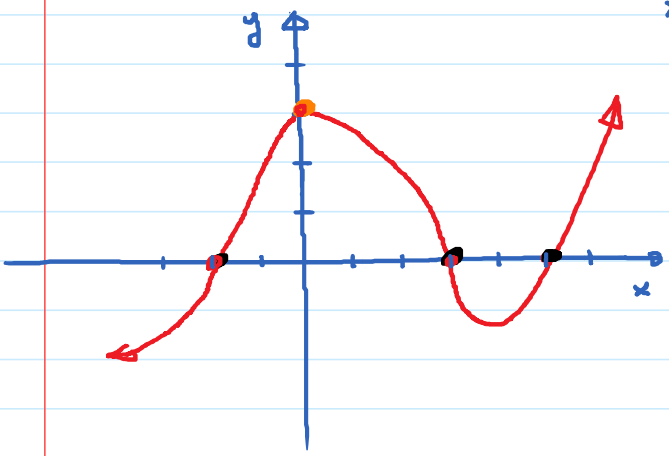
E.g.



Domain: $(-\infty, 4]$

Range: $[0, \infty)$

Obj 4: Find x-intercepts and y-intercept and other information from the graph.



x-intercepts: point(s) at which the graph crosses x-axis.

y-intercept: point at which the graph crosses y-axis.

x-intercepts: $(-2, 0)$; $(3, 0)$; $(5, 0)$

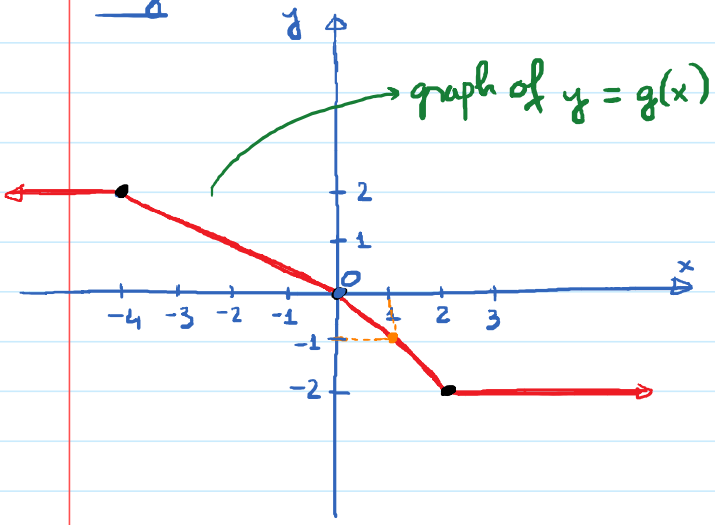
Note: y-coordinate of x-intercept $= 0$

Hence, the x-coordinate of an x-intercept is often called a zero of the function

y-intercept: $(0, 3)$

Note: x-coordinate of y-intercept $= 0$.

E.g.



(a) $g(-4) = 2$

(b) $g(2) = -2$

(c) $g(-10) = 2$

(d) $g(10) = -2$

Find the x-intercept(s): $(0, 0)$

Find the y-intercept: $(0, 0)$

For what value(s) of x is $g(x) = -1$?

$x = 1$