2-1 Functions

Set & Interval Notation

Function or Not?

Function notation

Domain & Range

Increasing & Decreasing

Rate of Change

1 Set Notation

- notation used to represent a group of values (elements)
- used with discrete &/or continuous functions

2 ways to use set notation

1. {list each element in the set}

examples:

Who are the students sitting in your row?

{Preston, Jessica, Miranda, Shelbi, Eric, Will}

What are the shoe sizes of the students in your row?

{10, 9, 8, 9, 2 ½, 8}

using inequalities, equal, or not equal signs

< > ≤ ≥ = ≠

2. {variable being defined | variable description}

| means "such that"

$\{x \mid x \geq 5\}$

examples:

~~How much money can a person earn in a lifetime?~~

All numbers less than 7.

$\{x \mid x < 7\}$

Notations used when working with sets

and intersection ∩

{kyra} ∩ {Preston}

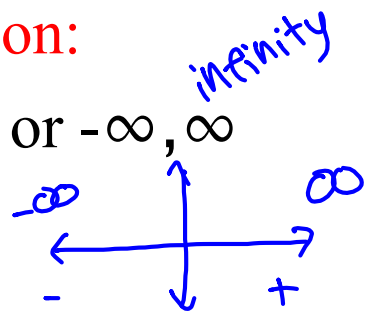
or union ∪

{-3,-2,-1} ∪ {3,2,1}

element ∈

Interval Notation:

() not included $< >$ or $-\infty, \infty$



[ ] included $\leq \geq$

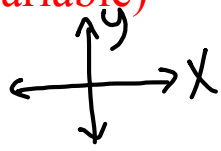
- used to represent an interval (a space in between 2 objects, pts, or units)

- used with continuous functions

	Set	Interval
All real numbers greater than or equal to -3 but less than 5.	$\{x \mid -3 \leq x < 5\}$	$[-3, 5)$
All real numbers greater than or equal to -100.	$\{n \mid -100 \leq n\}$ $\{n \mid n \geq -100\}$	$[-100, \infty)$
All real numbers greater than -36 and less than or equal to 14	$\{x \mid -36 < x \leq 14\}$	$(-36, 14]$

Domain & Range

Domain: x-values (input or independent variable)
read x's from left to rt. (smallest to largest)



Range: y-values (output or dependent variable)

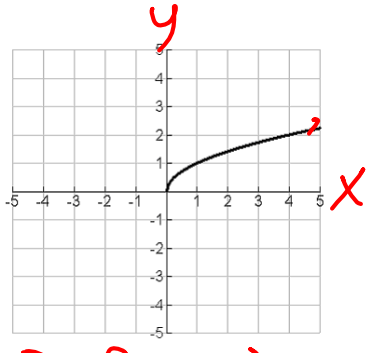
read y's from bottom to top (smallest to largest)

distance vs. time

d vs. t

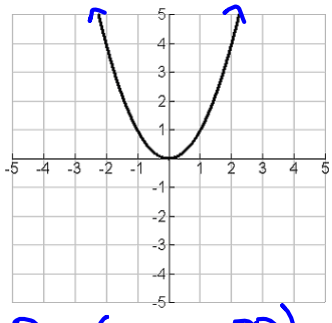
when using versus it is always: dependent vs independent

Find the D & R:



D: $[0, \infty)$

R: $[0, \infty)$



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

R: $[0, \infty)$

What are the dependent and independent variables? What is a realistic D & R, write it in set or interval notation?

A person gains 225 calories for each sandwich they eat.

calories vs. sandwiches

dependent
y
range

independent
x
domain

D: [0, 12]

R: [0, 2700]

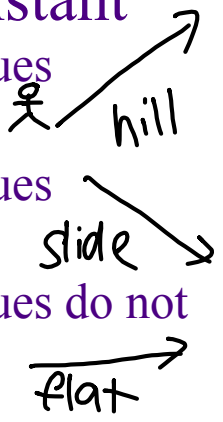
The initial fee for an electrician to come to your home is $60. Each additional hour is $10.

$f(x) = 60 + 10x$

X = # of hours

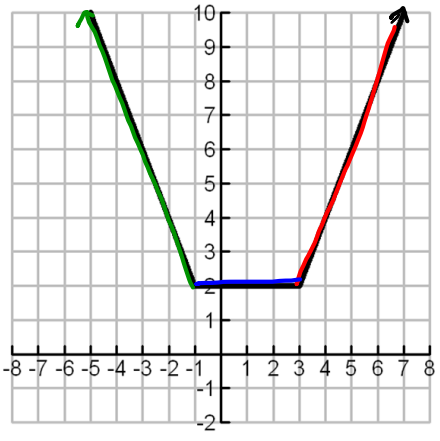
Increasing, Decreasing and Constant

- as you move from left to right the y-values increase (the graph is going up)
- as you move from left to right the y-values decrease (the graph is going down)
- as you move from left to right the y-values do not change (the graph is flat)



this behavior is reported using interval notation for the x-values where the graph has a given behavior

Give the intervals for increasing, decreasing, and constant behavior:



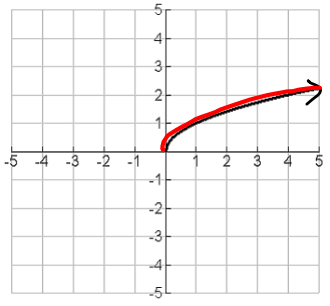
I : [3, ∞)

D : (-∞, -1]

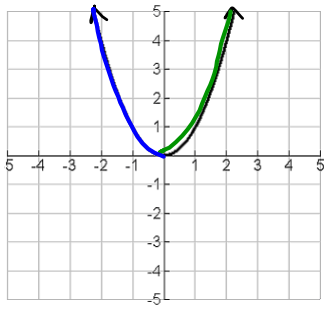
C : [-1, 3]

x	y1(x) abs(x-
-7	14
-6	12
-5	10
-4	8
-3	6
-2	4
-1	2
0	2
1	2
2	2
3	2
4	4
5	6
6	8
7	10
8	12
9	14
10	16
11	18
12	20
13	22
14	24
15	26
16	28

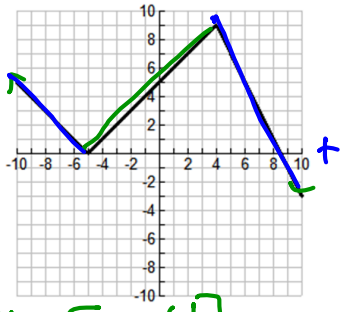
Give the intervals for increasing, decreasing, and constant behavior:



I: [0, ∞)



I: [0, ∞)
D: (-∞, 0]



I: [-5, 4]
D: (-∞, -5] ∪ [4, ∞)

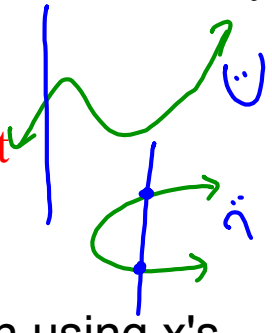
Function:

X → y
X → y
X → y

Function: when each domain value is paired with only one range value (no repeating x's)

y

- graphically: passes the vertical line test



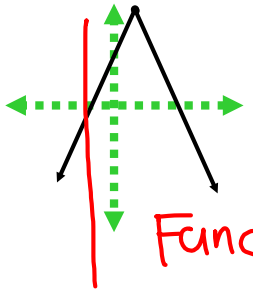
Function notation: f(x) "f of x"

means: function named f is written using x's

f(x) = y

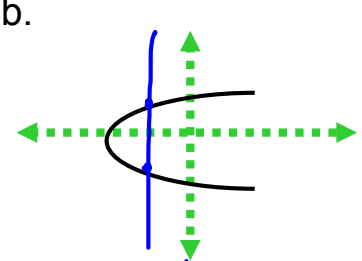
input output

a.



Function

b.



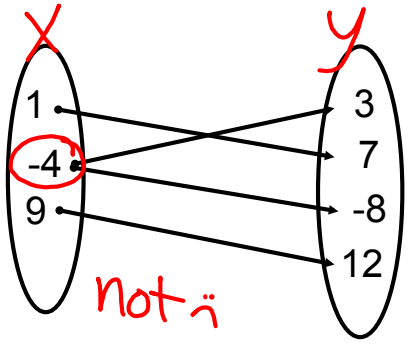
not ƒ

c.

x	y
2	1
4	2
6	3
8	4

function.

d.



not ƒ

e.

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

function ☺

Evaluate for a specific value:

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

$x = -2$ $\quad 3(-2)-5 = -6-5 = \boxed{-11}$

$f(3) = 3(3)-5 = 9-5 = \boxed{4}$

$f(-4) = 3(-4)-5 = -12-5 = \boxed{-17}$

Slope

graph — 2 points — (x_1, y_2) (x_2, y_2)

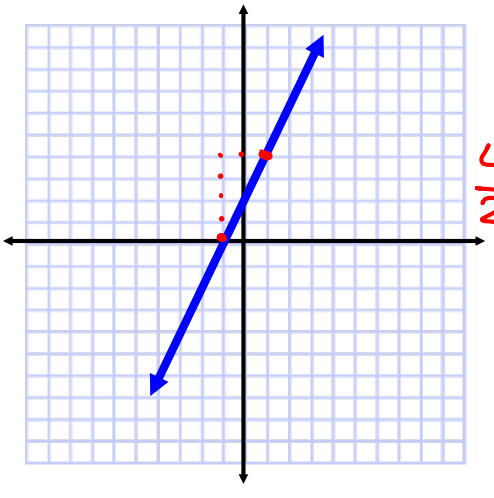
$$m = \frac{rise}{run} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$x_2 \neq x_1$ or the slope is undefined

rate of change $\frac{\$}{hr.}$ $\frac{miles}{gallon}$ mph

What is the slope of the line?

a.



$\frac{4}{2} = 2$

b. (-2,3) and (-4,-3)

x_1, y_1 x_2 y_2

$\frac{-3-3}{-4+2} = \frac{-6}{-2} = 3$

Describe the rate of change: