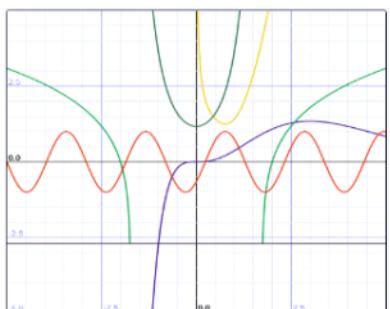


Lesson 1 Functions Basics

Date:

Chapter 4: Linear and Quadratic Functions:



Lesson 1: Functions Basics:

- ex.
- how far you have driven (y) depends on how long you have been driving (x)
 - distance depends on time
 - y depends on x

Words: The cost of an Escape Room party:

- \$40 base rate
- plus 18\$ for each participant

dependant on
the cost is related to how many people participate

y depends on x

y depends on x

Rule (equation):

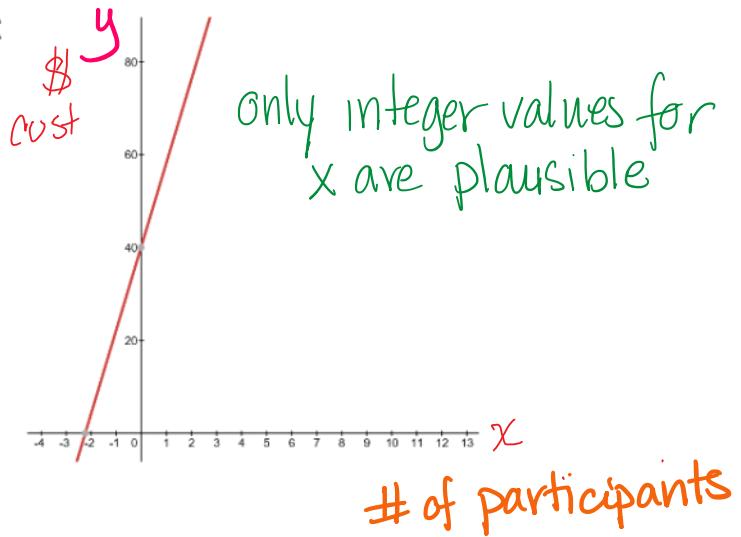
$$y = 18x + 40$$

Table of Values:

x	y
1	58
3	94
7	166
10	220

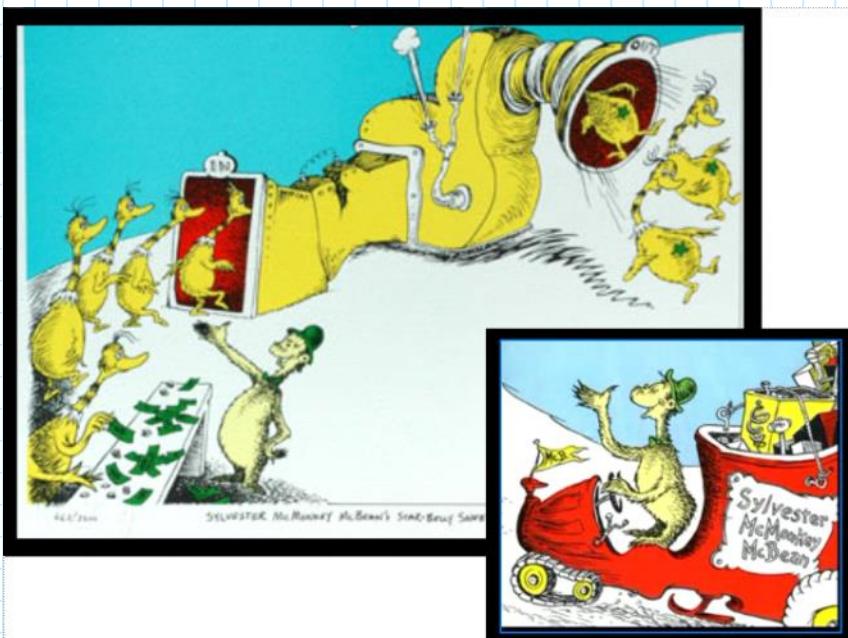
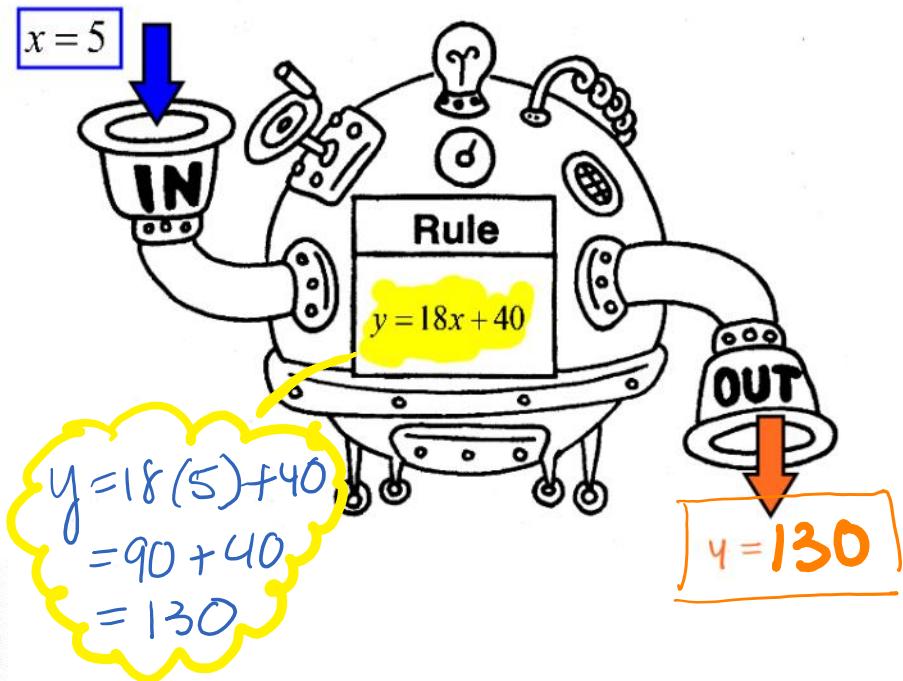
where x is # of participants
and y is total cost

Graph:



A **function** is a relation where each value of the independent variable (x) is associated with **one and only one** value of the dependent variable (y)

A function is like a machine....



Function

x	y
3	5
4	7
5	9
6	11

$$4 \rightarrow 7$$

$$2x - 1$$

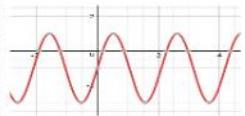
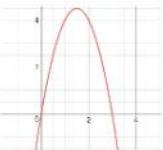
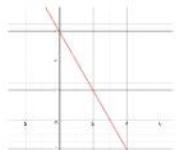
Not a function

x	y
3	5
4	7
4	9
6	11

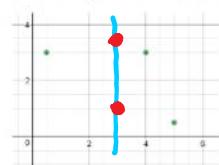
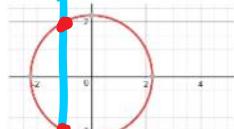
$$4 \rightarrow 7$$

$$4 \rightarrow 9$$

Function



Not a function



$$R_4 = \{(4, -2), (1, -1), (0, 0), (1, 1)\}$$

$$\begin{aligned} 1 &\rightarrow -1 \\ 1 &\rightarrow 1 \end{aligned}$$

Vertical line test:

a relation is a **function** if, when you pass a vertical line -moving across the graph-it only passes through the graph at one point.

Rule (equation)-requires functional notation

$y=3x-17$ will now become $f(x)=3x-17$

 this tells us that it is a **function**

sometimes we also use $g(x)$ or $h(x)$

 $y=3x-17$

 this is what we

SOMETIMES WE ALSO USE y OR $f(x)$

this is what we
asked last year

same

$$\begin{cases} y = 3x - 17 \\ f(x) = 3x - 17 \end{cases}$$

find y when $x = 10$

now we say: find $f(10)$

we let $x = 10$

$$\begin{aligned} f(10) &= 3(10) - 17 \\ &= 30 - 17 \\ &= 13 \end{aligned}$$

$$f(x) = 2x - 9$$

determine $f(0)$

determine $f(-3)$

determine $f(10)$

$$\begin{aligned} f(0) &= 2(0) - 9 & f(-3) &= 2(-3) - 9 \\ &= 0 - 9 & &= -6 - 9 \\ &= -9 & &= -15 \end{aligned}$$

$\boxed{(0, -9)}$

$\boxed{(-3, -15)}$

$$\begin{aligned} f(10) &= 2(10) - 9 \\ &= 20 - 9 \\ &= 11 \end{aligned}$$

$\boxed{(10, 11)}$

$$f(x) = 2x - 9$$

determine $f(x) = 17$ means let $f(x) = 17$ and solve for x

determine $f(x) = -1$ means let $f(x) = -1$ and solve for x

determine $f(x) = 51$ means let $f(x) = 51$ and solve for x

$$f(x) = 17$$

$$17 = 2x - 9$$

$$17 + 9 = 2x$$

$$26 = 2x$$

$$\boxed{x = 13}$$

$$f(x) = -1$$

$$-1 = 2x - 9$$

$$-1 + 9 = 2x$$

$$8 = 2x$$

$$\boxed{x = 4}$$

$$f(x) = 51$$

$$51 = 2x - 9$$

$$51 + 9 = 2x$$

$$60 = 2x$$

$$\boxed{x = 30}$$

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

determine $f(1)$

$$\begin{aligned} f(1) &= 2(1)^2 - 5 \\ &= 2(1) - 5 \\ &= 4 - 5 \\ &= -1 \end{aligned}$$

determine $f(x) = 45$

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

$$45 = 2x^2 - 5$$

$$0 = 2x^2 - 50$$

$$0 = (2)(x^2 - 25)$$

$$0 = (2)(x+5)(x-5)$$

$$\begin{array}{c|c} x+5=0 & x-5=0 \\ x=-5 & x=5 \end{array}$$

$$\boxed{f(1) = -1} \quad (-1, 1)$$

$$\boxed{\begin{aligned} f(-5) &= 45 \\ f(5) &= 45 \end{aligned}} \quad (-5, 45) \quad (5, 45)$$

$$x = \{-5, 5\}$$

A rule (or an equation) generates points.

Many points becomes a table of values

A table of values becomes a graph

$f(4) = 2$ means

there is a function and the point $(4, 2)$ is on graph

Given:

$$f(4) = 2$$

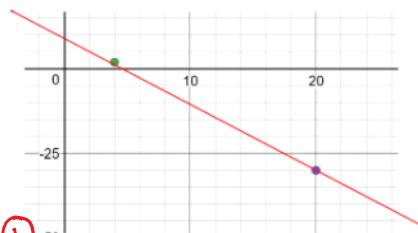
$\leftarrow \downarrow \rightarrow \uparrow \uparrow$

GIVEN

$$f(4) = 2$$

$$f(20) = -30$$

, find rule of $f(x)$



x	$f(x)$
4	2
20	-30

① SLOPE

$$a = \frac{2 + 30}{4 - 20} = \frac{32}{-16} = -2$$

②

$$y = ax + b$$

$$③ y = -2x + b$$

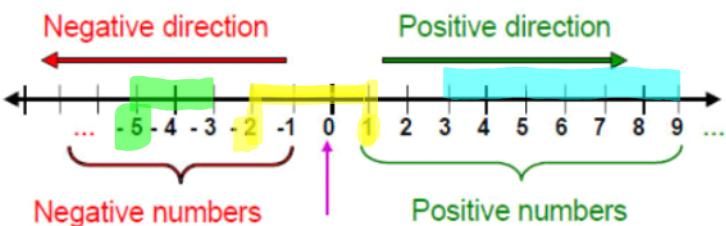
$$④ 2 = -2(4) + b$$

$$2 = -8 + b$$

$$⑤ 10 = b$$

$$⑥ \text{Rule } y = -2x + 10$$

Interval Notation: consider the REAL number line



$[-2, 1]$ include

$[3, 9]$ do not include

$[-5, -3]$ include one endpoint
but not the other



ex $[4, 19[$

always read left
to right

ex $] -3, 10 [$

ex $] -\infty, -8] \text{ or } -\infty, -8]$

- can either include the bracket at ∞ or not

ex $[2, 9]$

ex $[22, \infty \text{ or } [22, \infty [$