Introduction to Functions: Notes

Patterns and Linear Functions

Independent variable: A variable that provides the input value of a function

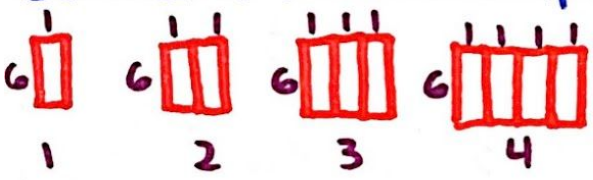
Dependent variable: A variable that provides the output value of a function

Input: A value of the independent variable

Output: A value of the dependent variable

To represent a relationship, you must first identify the independent & dependent variables which become the input and the output.

Geometric Relationship:



Independent variable (x): # of rectangles

Dependent variable (y): perimeter

Rectangles	Perimeter
1	14
2	16
3	18
4	20

$y = 2x + 12$ →

b/c lengths are always 2 · 6 (12) and widths are the same as 2 rectangles

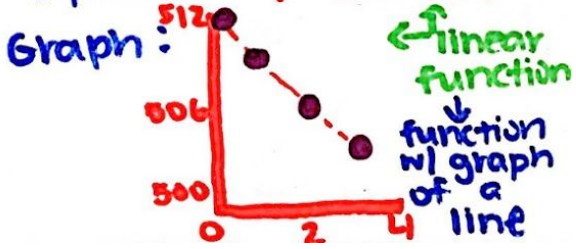
Function: one input & one output

# of photos (x)		Memory (MB) (y)
+1	0	512
+1	1	509
+1	2	506
+1	3	503
		-3
		-3
		-3

1 for 1

Equation: $y = 512 - 3x$

Graph:



← linear function

↓

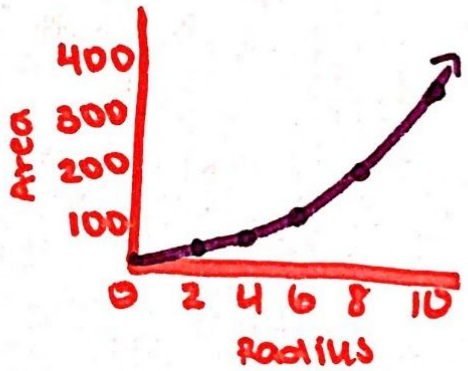
function w/ graph of a line

Patterns and Non-Linear Functions:

Non-Linear Function: a function whose graph is not a line or part of a line

*Linear and Non-Linear Functions can be represented using words, tables, and graphs

Pizza Type	Radius (in)	Area
Personal	2	12.57
Small	4	50.27
Medium	6	113.10
Large	8	201.06
X-Large	10	314.16



This would be a non-linear relationship because the graph between the radius and area doesn't form a straight line.

Easy way to classify graphs as linear or non-linear:

Linear: Line

Non-Linear: NOT a line

Graphing a Function Rule:

*To graph a function, you need to be able to determine if the graph is linear or non-linear and then find some of the points that make up the function.

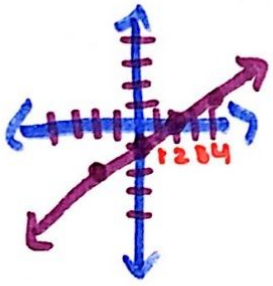
↳ First to determine if it is linear or not, look for an exponent or other symbol such as absolute value or square root. If there are none of these, then it is linear.

To graph a linear/non-linear function, you need to find at least 3 points on the line.

↳ choose 3 input values (x's) and plug them in to find the corresponding y values.

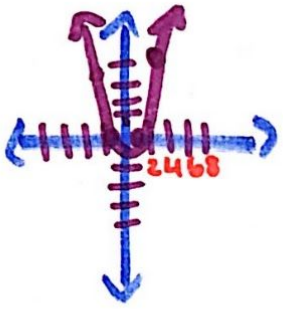
Graph $y = \frac{1}{2}x - 1$

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



Graph $y = x^2 + 1$

x	y
1	2
2	5
0	1
-1	2



Non-Linear Functions:

↳ If the exponent is even then the graph will have a U shape

↳ If the exponent is odd and ≠ 1 then the shape is a U with 1/2 of it turned the other way (S)

↳ If it has an absolute value then the graph will have a V shape

Writing a function rule:

* We can write a function rule basically in the same way we write expressions and equations.
  - By looking for key words and changing them to operations and symbols
  - The difference is having 2 variables in the rule

y is 5 less than the product of 4 and x → $y = 4x - 5$

c is 8 more than half of n → $c = 8 + \frac{1}{2}n$

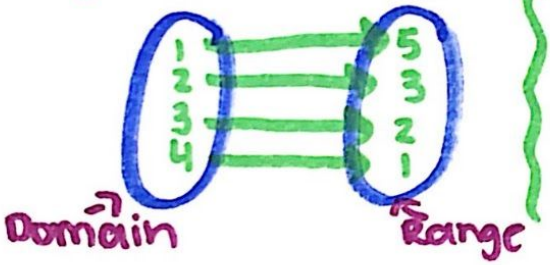
Formalizing relations and functions:

Domain: The set of all possible input values of a function (x values)

Range: The set of all possible output values of a function (y values)

Mapping Diagram: Used to represent a function

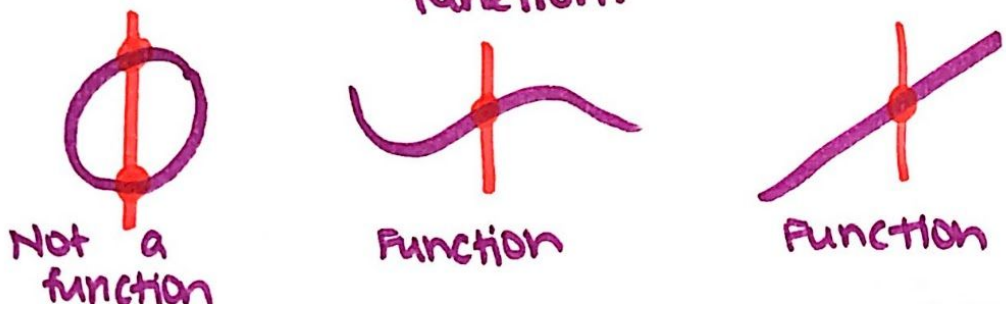
ordered pairs: {(1,5), (2,3), (3,2), (4,1)}



This is a function because each input has one output.

If one input has more than one output, then it is not a function.

Vertical Line Test: If a vertical line can pass through a graphed line and touch only 1 point at one time, then it is a function.



Not a function

Function

Function