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Patterns and Nonlinear Functions

Unit 4 Lesson 3

Students will be able to:

Identify the linear and non-linear functions using their graphs and write the rules representing the data

Key Vocabulary:

- Patterns
- Linear Function
- Nonlinear Function
- Function Rule

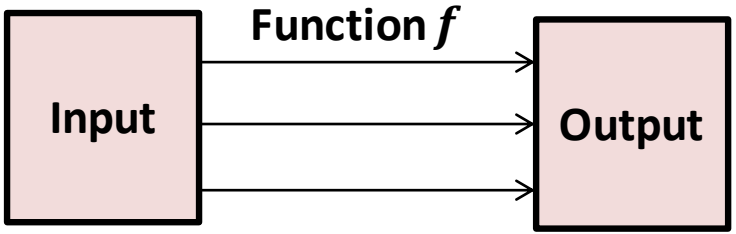
Patterns and their Representations

In mathematics, anything arranged following a certain rule or a set of rules represent a pattern. The relation represented in a pattern can be represented in the following ways:

- **Table**
- **Graph**
- **Ordered Pairs**
- **Words**
- **Equation**

Function

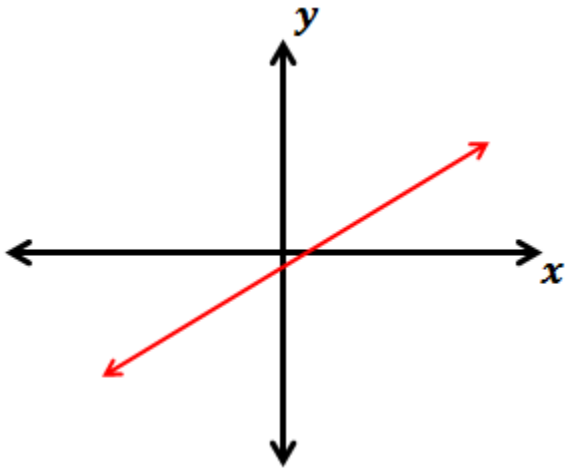
A function is a relation in which each input is related to one and only one output.

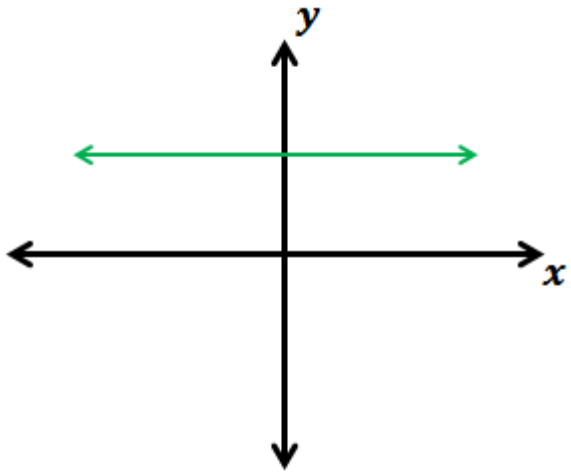


Linear Function

A function is a linear function whose graph makes a straight line.

Examples:

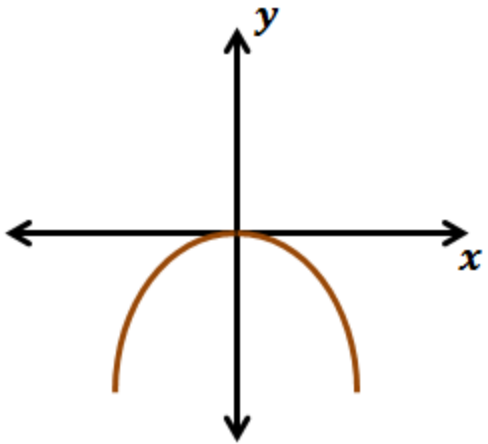


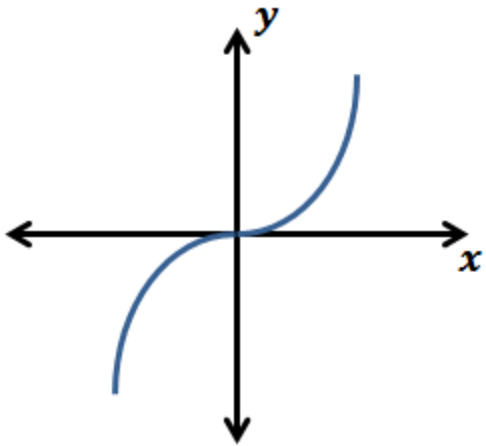


Nonlinear Function

A function is a nonlinear function whose graph does not a straight line.

Examples:





Problem 1: Graph the function shown by the table given below. Also tell whether the function is linear or nonlinear.

x	y
0	−1
1	0
2	3
3	8

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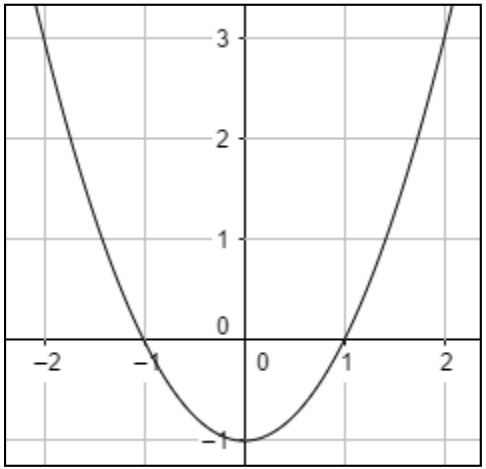

Graph

Since the graph is not a straight line, the data in the table represents a **nonlinear** function.

Function Rule

A function rule is a mathematical rule that can be used to describe the general trend of the function. A rule can be taken as an **equation** representing any relationship.

Finding a function rule is like solving a puzzle. When we are given a list of function values and asked to find the rule representing the function, it's like solving a puzzle. In finding the rules, we need to identify the operation involved in relating the data. The operations can be multiplication, addition, subtraction, division, power, square root etc.

Problem 2: The set of ordered pairs represent the function. Write a rule that represents the function.

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The trend in the values of x and y shows that each value of y is a **square** of the value of x. We can check it as:

$x = 0 \Rightarrow y = (0)^2 = 0$

$x = 1 \Rightarrow y = (1)^2 = 1$

$x = 2 \Rightarrow y = (2)^2 = 4$

$x = 3 \Rightarrow y = (3)^2 = 9$

$\Rightarrow y = x^2$