

To find a rule for a linear equation from an input/output table:

$$y = mx + b \quad \text{or} \quad f(x) = mx + b$$

- Does the table **give you a y-intercept** (when $x = 0$)?
 - If it does then plug in the y-value for b
 - Find the slope by picking two points
 - Find the change in y over the change in $x \rightarrow \frac{y_2 - y_1}{x_2 - x_1}$
- If **no y-intercept is given** (no 0 for an x-value) then find the slope first.
 - Find the slope by picking two points
 - Find the change in y over the change in $x \rightarrow \frac{y_2 - y_1}{x_2 - x_1}$
 - Plug in the slope for m
 - Plug in any ordered pair for x and y ($y=mx+b$) and solve for b

Linear and Non-Linear Functions

Vocabulary

nonlinear function

To determine if a relationship is a function, verify that each input has exactly one output.

Function: Relationship in which each member of the domain is paired with exactly **ONE** member of the range.

Function

- Each INPUT has ONE OUTPUT
- only one x-value
 - you can have more than 1 y-value listed
- vertical line test= if you draw a vertical line on any graph and it goes through only one point, then it is a function

Linear Function

- straight line
- the difference between each input value is constant and output value is constant

Nonlinear Function

- not a straight line
- the difference between each input value is constant and each output value VARIES

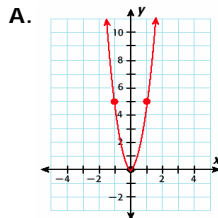
Is this a function?

1. $\{ (0,1) (1,2) (1,3) (2,4) \}$

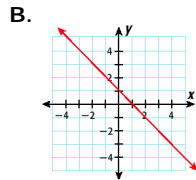
2. $\{(0,1) (1,2) (2,2) (3,4) \}$

Additional Example 1A & 1B: Identifying Graphs of Nonlinear Functions

Tell whether the graph is linear or nonlinear.



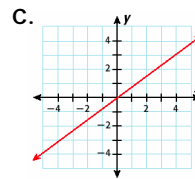
The graph is not a straight line, so it is **nonlinear**.



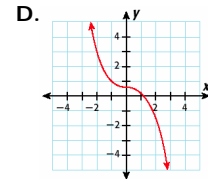
The graph is a straight line, so it is **linear**.

Additional Example 1C & 1D: Identifying Graphs of Nonlinear Functions

Tell whether the graph is linear or nonlinear.



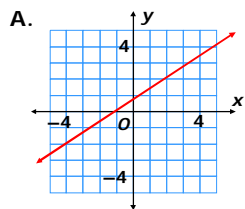
The graph is a straight line, so it is **linear**.



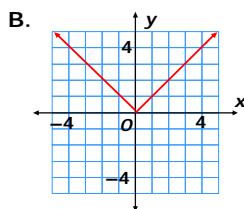
The graph is not a straight line so, it is **nonlinear**.

Try This: Example 1A & 1B

Tell whether the graph is linear or nonlinear.



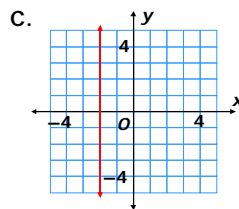
The graph is a straight line, so the graph is **linear**.



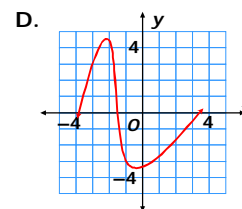
The graph is not a straight line, so it is **nonlinear**.

Try This: Example 1C & 1D

Tell whether the graph is linear or nonlinear.



The graph is a straight line, so the graph is **linear**.



The graph is not a straight line, so it is **nonlinear**.

You can use a function table to determine whether ordered pairs describe a linear or nonlinear relationship.

For a function that has a **linear relationship**, when the difference between each successive **input** value is **constant**, the difference between each corresponding **output** value is **constant**.

For a function that has a **nonlinear relationship**, when the difference between each successive **input** value is **constant**, the difference between each corresponding **output** value *varies*.

Additional Example 2A: Identifying Nonlinear Relationships in Function Tables

Tell whether the function in the table has a linear or nonlinear relationship.

A.

Input	Output
1	2
2	5
3	11

difference = 1
difference = 1

difference = 3
difference = 6

The difference between consecutive input values is constant.

The difference between consecutive output values is not constant.

The function represented in the table is **nonlinear**.

Additional Example 2B: Identifying Nonlinear Relationships in Function Tables

Tell whether the function in the table has a linear or nonlinear relationship.

A.

Input	Output
1	3
2	6
3	9

difference = 1

difference = 1

difference = 3

difference = 3

The difference between consecutive input values is constant.

The difference between consecutive output values is constant.

The function represented in the table is **linear**.

Try This: Example 2A

Tell whether the function in the table has a linear or nonlinear relationship.

A.

Input	Output
1	1
2	4
3	9

difference = 1

difference = 1

difference = 3

difference = 5

The difference between consecutive input values is constant.

The difference between consecutive output values is not constant.

The function represented in the table is **nonlinear**.

Try This: Example 2B

Tell whether the function in the table has a linear or nonlinear relationship.

A.

Input	Output
1	2
2	4
3	6

difference = 1

difference = 1

difference = 2

difference = 2

The difference between consecutive input values is constant.

The difference between consecutive output values is constant.

The function represented in the table is **linear**.