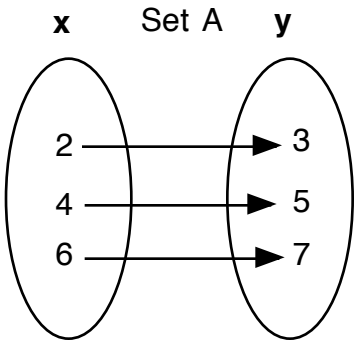
Section 6 – 4A: One To One Functions

Functions

A Function is a relation that requires that
for every x value
there is only one value of y related to that x

The definition of a function requires that each x value has only one y value related ot it. This is important to may algebraic operations . If you put **x = 2** into the equation **y = x + 1** then you would expect to get a y value of 8. This means that 2 is related to 3 by the function y = x + 1. Each time you put 2 in for x you would expect an outcome of 3.

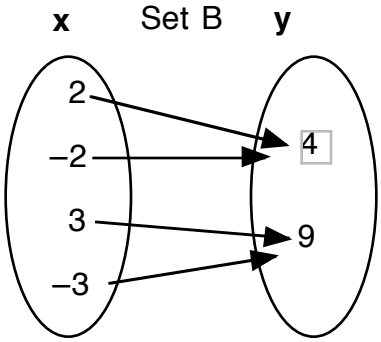
Set A = { (2 , 3) (4, 5) (6 , 7) }



Set A is a function because every x value is related to only one y value.

A function can have more than one x value related to the same y value

Set B = { (2 , 4) (2, – 4) (3 , 9) (3 , 9)}

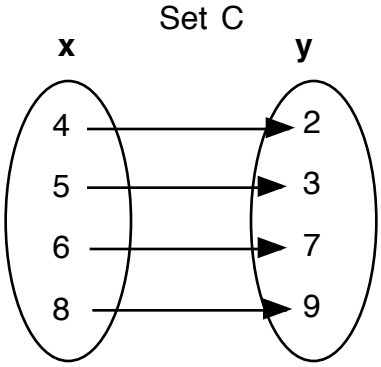


Set B is a function because every x value is related to only one y value.
The y values are related to more than one x value but that is allowed for functions.

If you think of the **x values as boys** and the **y values as girls** then
a function can be thought of as a rule that says
any one boy can only date one girl
but a girl can date more than one boy.

One To One Functions

Set C = { (4 , 2) (5 , 3) (6 , 7) (8 , 9)}



Set C is a function because every x value is related to only one y value

But Set C also has every y value related to only one x value

Functions where every x has only one y **AND** every y has only one x value are **special functions.**

These functions are called One to One Functions

One to One Functions

A One to One Function has each x value related to a single y value
and
that y value is related to only that x value.

Each x value is related to one y value each other and to **no other values.**

If you think of the x values as boys and the y values as girls
then a One To One Function can be thought of as a rule that says

any one boy can only date one girl
AND
that girl can only date that boy.

A One to One Function requires **total monogamy between x and y values.**

Determine if a Relation is a One To One Function

Step One: Test to see if the Relation is a Function
Test to see that **for every x value there is only one value of y related to that x.**

Step Two: Test to see if the Function from step 1 is One to One.
Test to see that **each x value is related to a single y value and that y value is related to only that x value.**

Example 1

Set A: (**2** , 3) (9 , 2) (**2** , 8) (0 , 6)

Set A is **Not a Function**
x = 2 is related to both
y = 3 and y = 8 values
Fails Step 1
Set A is NOT One to One

Example 2

Set B: (7 , 4) (2 , 3) (1 , 1) (3 , –3)

Set B **is a One to One Function**
each x value is related to a single y value and that y value is related to only that x value.

Example 3

Set C: (2 , 3) (9 , 2) (**2** , **6**) (5 , **6**)

Set C is **Not One to One**
y = 6 is related to both
both x = 2 and x = 5
Fails Step 2

Example 4

Set D: (1 , 4) (2 , 3) (5 , 7) (7 , 5)

Set D **is a One to One Function**
each x value is related to a single y value and that y value is related to only that x value.

Determine if a Table of Ordered pairs is A One To One Function

Example 5

Set E.

x	1	**2**	–4	6	**9**
y	3	**8**	–6	7	**8**

Set E is **Not One to One**
y = 8 is related to both
both x = 2 and x = 9
Fails Step 2

Example 6

Set F.

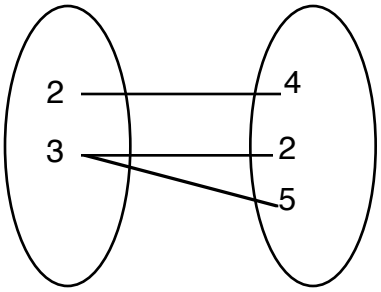
x	2	–2	–4	6	–5
y	–2	3	1	8	–5

Set F **is a One to One Function**
each x value is related to a single y value and that y value is related to only that x value.

Determine if a Mapping of Ordered pairs is a One To One Function

Example 7

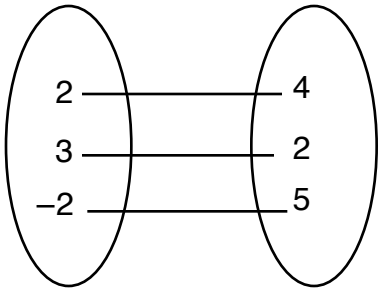
Set G



Set G is **Not a Function**
x = 2 is related to both
y = 3 and y = 8 values
Fails Step 1
Set G is NOT One to One

Example 8

Set H



Set H **is a One to One Function**
each x value is related to a single y value and that y value is related to only that x value.

Determine if a Graph Represents a One To One Function

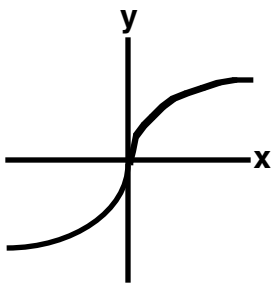
Use the Vertical Test to determine if a graph represents a function

Step 1: If a **vertical line** hits the graph at **more than one point** then the graph does **Not Represent A Function**

Step 2: After a graph has passed the Vertical Line test you can then use a **Horizontal Line Test to determine if the function is One to One**

If a **Horizontal line** hits the graph **of a Function** at **more than one point** then the graph does **Not Represent A One To One Function**

Example 1



First use the vertical line test
to see **if the graph is a function**

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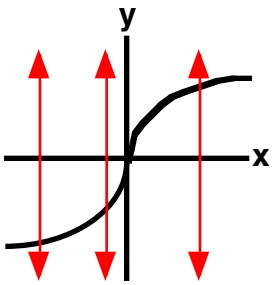
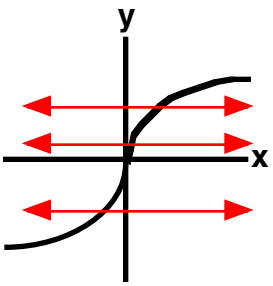
then use the Horizontal Line Test
to see if the function is One To One

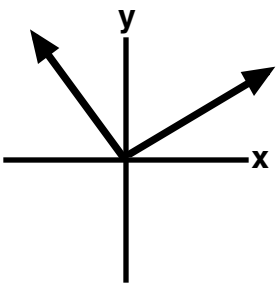


This graph passes the
Vertical Line Test
so it **IS a Function**



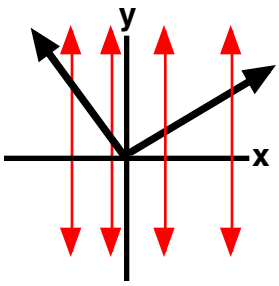
This graph passes the
Horizontal Line Test so the Function
IS a One To One Function

Example 2

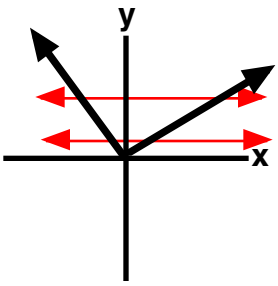


First use the vertical line test
to see **if the graph is a function**

<----------> then use the Horizontal Line Test
to see if the function is One To One

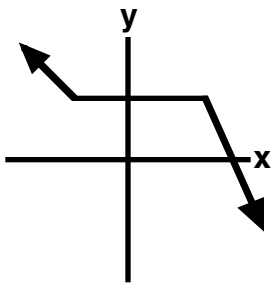


This graph passes the
Vertical Line Test
so it **IS a Function**

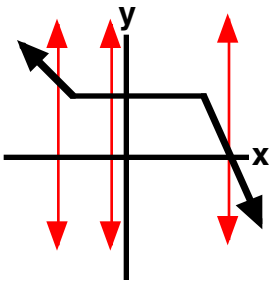


This graph **fails** the
Horizontal Line Test so it
IS NOT a One To One Function

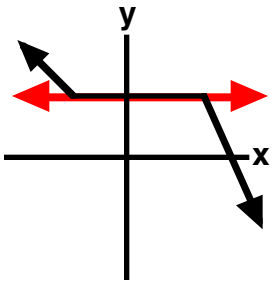
Example 3



First use the vertical line test to see **if the graph is a function** <----------> then use the Horizontal Line Test to see if the function is One To One

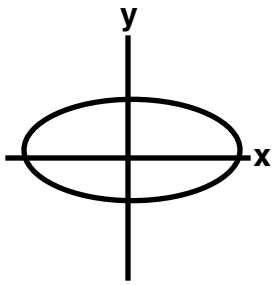


This graph passes the Vertical Line Test so it **IS a Function**



This graph **fails** the Horizontal Line Test so it **IS NOT a One To One Function**

Example 4



First use the vertical line test
to see if the graph is a function

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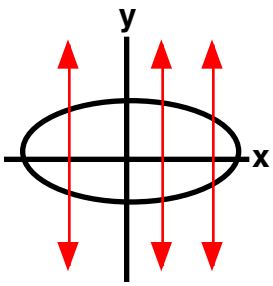
then use the Horizontal Line Test
to see if the function is One To One



This graph **Fails t**he
Vertical Line Test
so it **IS NOT a Function**

If a graph does not
represents a function then it
cannot be a
One to One Function

