

# Unit 2 Lesson 1

## Transformations

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Unit 2 – Quadratic Functions  
Lesson 1 – Transformations

Date \_\_\_\_\_ Pd \_\_\_\_\_


➤ Review:

- A Relation is any set of ordered pairs.
- Domain: set of all x values in a relation
- Range: set of all y values in a relation
- A Function is a relation in which each element of the domain is paired with exactly one element of the range.
- Graphically, a function must pass the Vertical Line Test (VLT) in order to be classified as a function.

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1  
Passes

2  
Fails

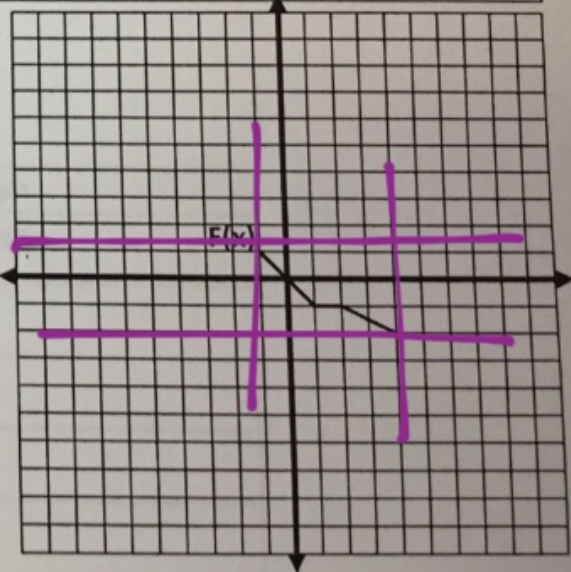
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➤ Examine the graph of  $F(x)$  to the right:

- Is  $F(x)$  a function? Why or why not?  
 Yes, Passes VLT
- What is the domain of  $F(x)$ ?  
 $[-1, 4]$
- What is the range of  $F(x)$ ?  
 $[-2, 1]$
- Evaluate each of the following key points on  $F(x)$ :  
 $F(1) = \frac{-1}{y}$      $F(2) = \frac{-1}{y}$      $F(\frac{4}{x}) = -2$      $F(\frac{-1}{y}) = 1$

❖ Remember that  $F(x)$  is another name for the  $y$ -values → the equation of the function is  $y = F(x)$ .

<del>x</del>	<del>F(x)</del>
-1	1
1	-1
2	-1
4	-2



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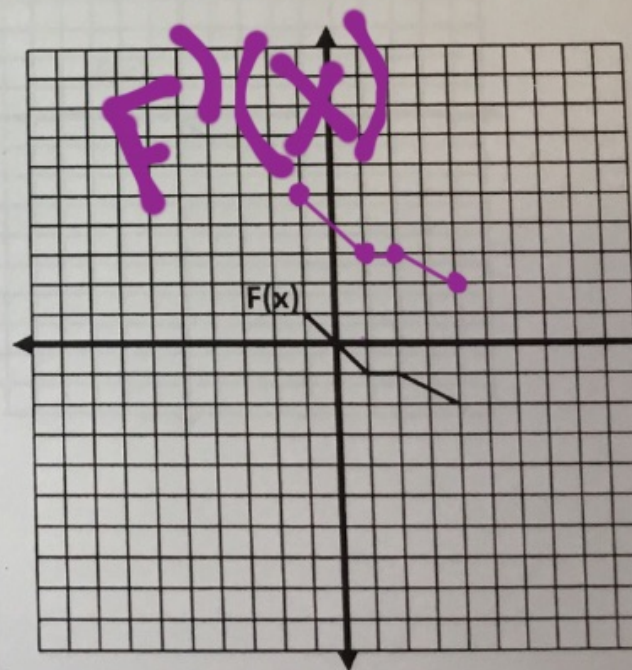


- Now let's try graphing:  $y = F(x) + 4$ .
- Complete the table below for this new function and then graph on the coordinate.

$x$	$y$
-1	$1 + 4 = 5$
1	$-1 + 4 = 3$
2	$-1 + 4 = 3$
4	$-2 + 4 = 2$

Describe the transformation:

translate up 4  
Did the transformation affect the domain  
or the range of the function? Range

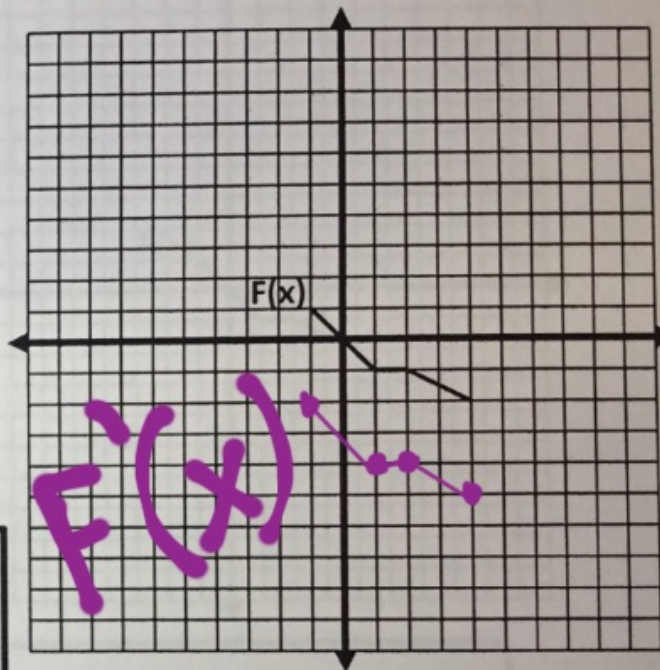


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Graph:  $y = F(x) - 3$ .

$x$	$y$
-1	$1 - 3 = -2$
1	$-1 - 3 = -4$
2	$-1 - 3 = -4$
4	$-2 - 3 = -5$



Describe the transformation:

translate down 3

Did the transformation affect the domain or the range of the function?

Range

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**Checkpoint:** Describe the affect for the following functions.

Equation	Effect to the graph
Example: $y = F(x) + 18$	Translate up 18 units
1. $y = F(x) - 10$	down 10
2. $y = F(x) + 3$	up 3
3. $y = F(x) + 32$	up 32
4. $y = F(x) - 1$	down 1

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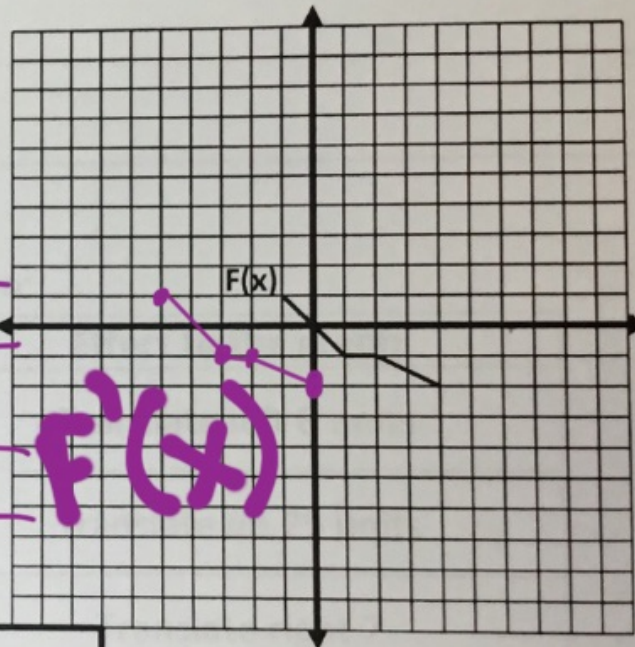


➤ Graph:  $y = F(x + 4)$ .

Complete the table.

$x$	$x + 4$	$y$
-5	-1	1
-3	1	-1
-2	2	-1
0	4	-2

$x + 4 = -1 \implies x = -5$   
 $x + 4 = 1 \implies x = -3$   
 $x + 4 = 2 \implies x = -2$   
 $x + 4 = 4 \implies x = 0$



Describe the transformation:

translate left 4

Did the transformation affect the domain or the range of the function?

Domain

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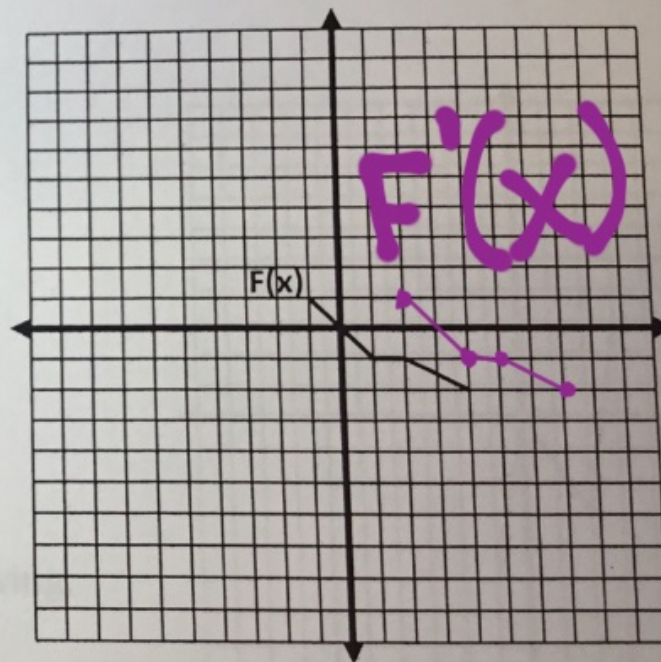


➤ Graph:  $y = F(x - 3)$ .

Complete the table.

$x$	$x - 3$	$y$
2	-1 <sup>+3</sup>	1
4	1 <sup>+3</sup>	-1
5	2 <sup>+3</sup>	-1
7	4 <sup>+3</sup>	-2

$x - 3 = -1$     $x = 2$   
 $+3$     $+3$



Describe the transformation:

translate right 3

Did the transformation affect the domain or the range of the function?

Domain

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❖ **Checkpoint:** Describe the affect for the following functions.

Equation	Effect to the graph
Example: $y = F(x + 18)$	Translate left 18 units
1. $y = F(x - 10)$	right 10
2. $y = F(x) + 7$	up 7
3. $y = F(x + 48)$	left 48
4. $y = F(x) - 22$	down 22
5. $y = F(x + 30) + 18$	left 30 up 18

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❖ **Checkpoint:** Write the equation for each translation:

	Equation	Effect to the graph
Example:	$y = F(x + 8)$	Translate left 8 units
1.	$y = f(x) + 29$	Translate up 29 units
2.	$y = f(x - 7)$	Translate right 7
3.	$y = f(x + 45)$	Translate left 45
4.	$y = f(x + 5) + 14$	Translate left 5 and up 14
5.	$y = f(x - 6) - 2$	Translate down 2 and right 6

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➤ Now let's look at a new function.  
Its notation is  $H(x)$ .

1. What are the key points?

$(-1, -5) (0, 0) (2, -3) (3, 3)$

2. Describe the effect on the graph for each of the following.

a.  $H(x - 2)$

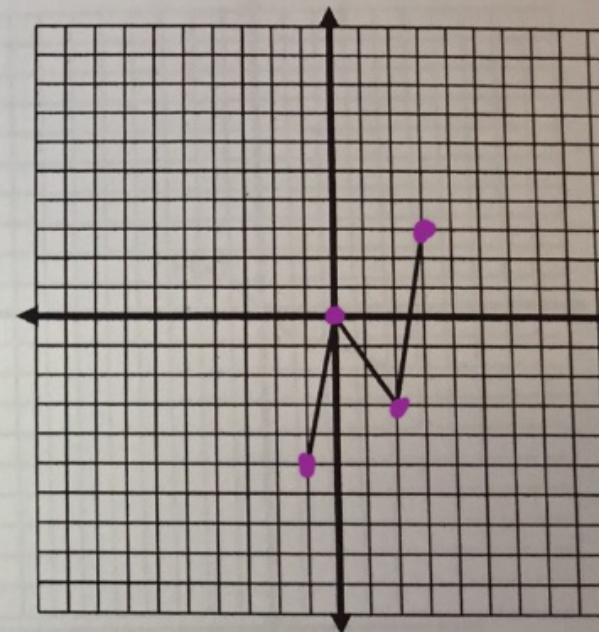
right 2

b.  $H(x) + 7$

up 7

c.  $H(x + 2) - 3$

left + 2 down 3

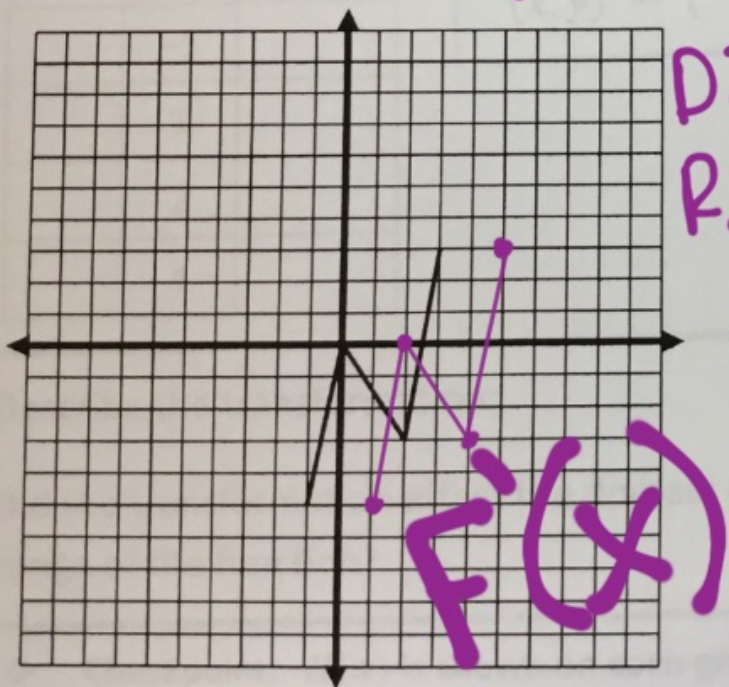


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3. Use your answers to questions 1 and 2 to help you sketch each graph without using a table. Then state the **DOMAIN & RANGE** of the image.

a.  $y = H(x - 2)$  right 2

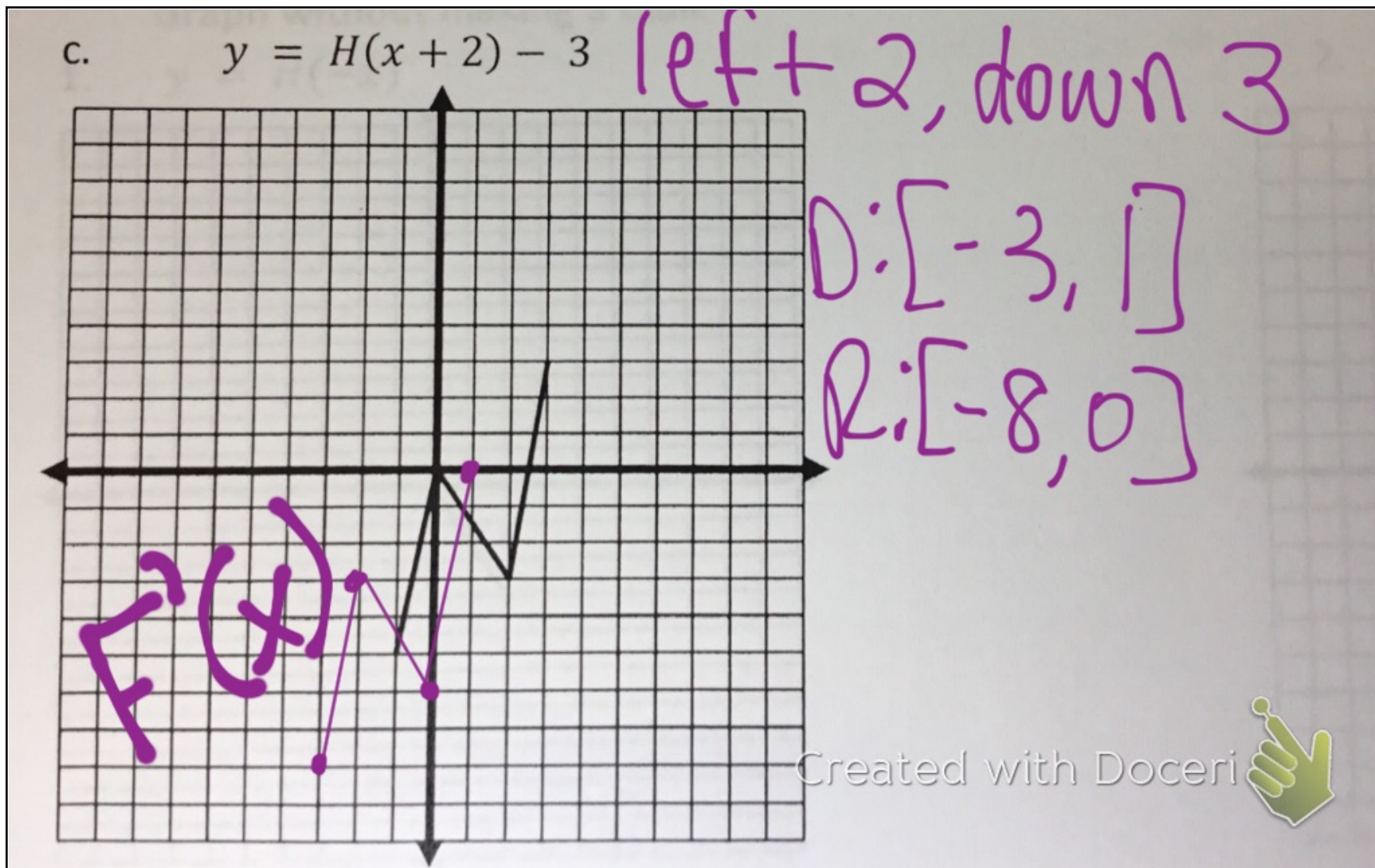


b.  $y = H(x) + 7$  up 7



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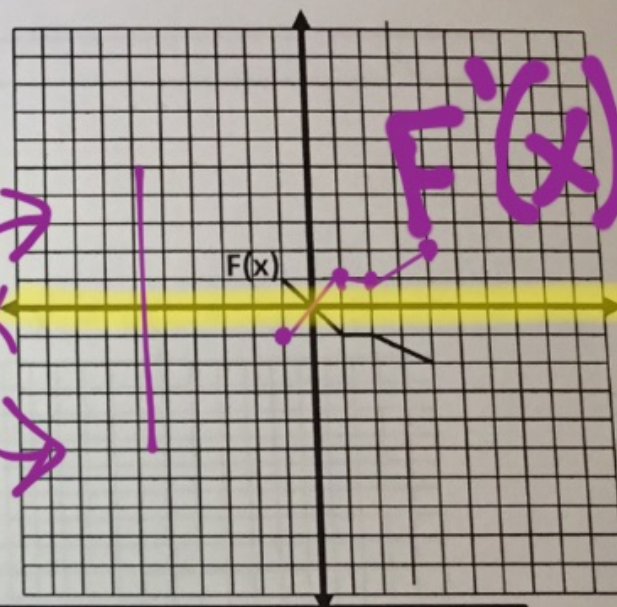


Recall that the equation:  $y = F(x)$

➤ Now let's graph:  $y = -F(x)$

$x$	$F(x)$	$y$
-1	1	-1
1	-1	1
2	-1	1
4	-2	2

$(x, y) \rightarrow (x, -y)$



Describe the transformation:

$R_{x\text{-axis}}$

Did the transformation affect the domain or the range of the function?

Range

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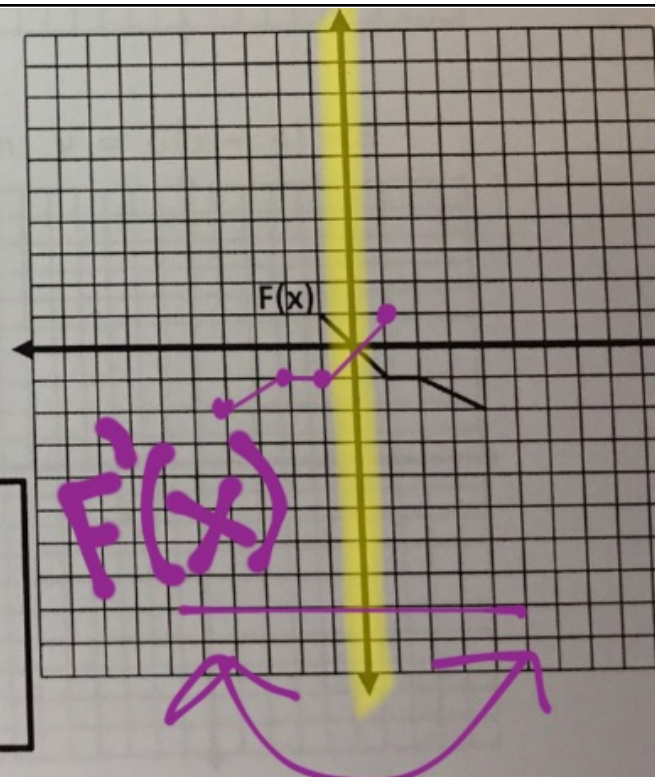
➤ Graph:  $y = F(-x)$

$x$	$-x$	$y$
1	-1	1
-1	1	-1
-2	2	-1
-4	4	-2

Horizontal

$$(x, y) \rightarrow (-x, y)$$

Ry-axis



Describe the transformation:

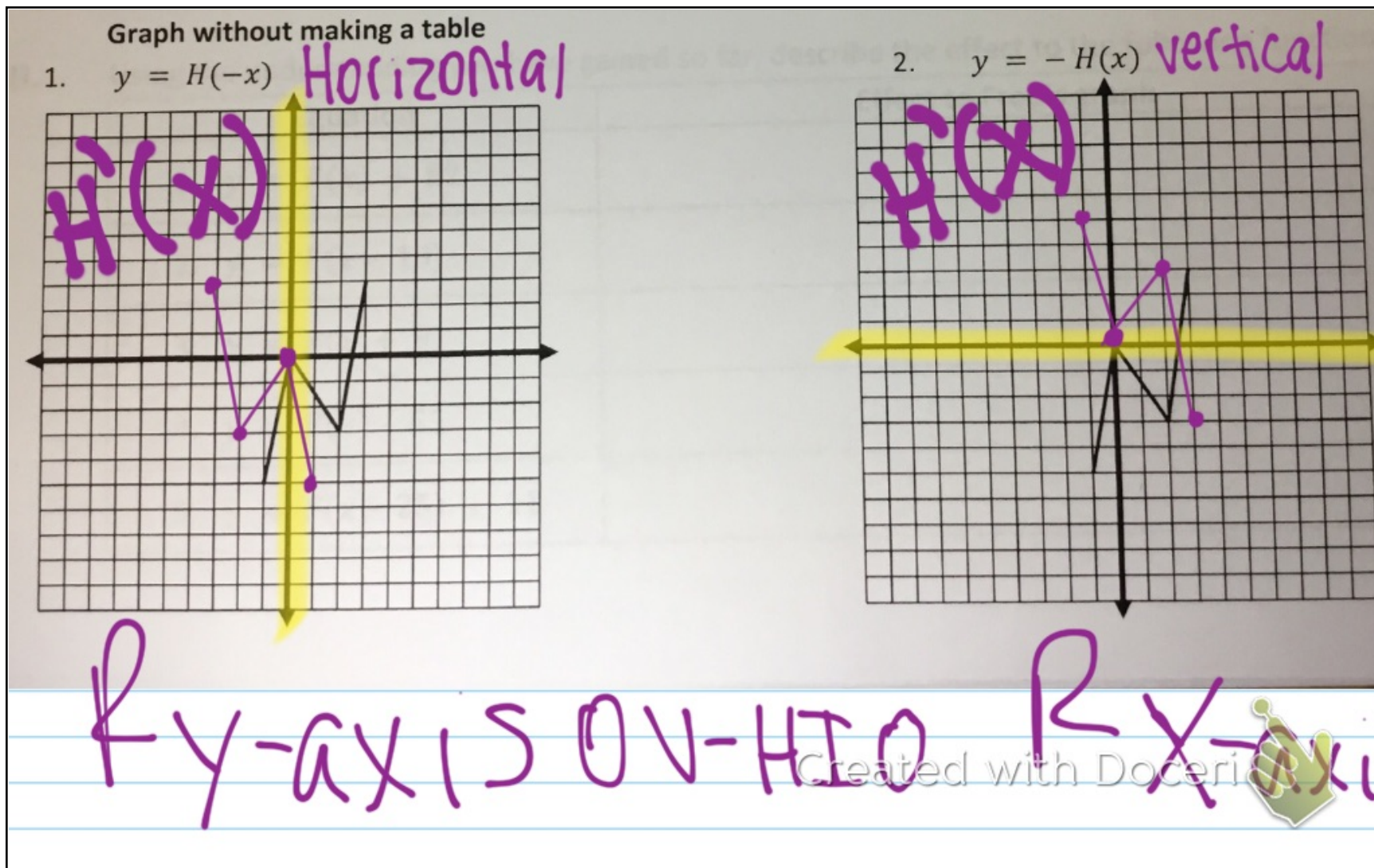
Ry-axis

Did the transformation affect the domain or the range of the function?

Domain

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Page 6-7

Homework

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