

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

### Introduction



**Today's Lesson**

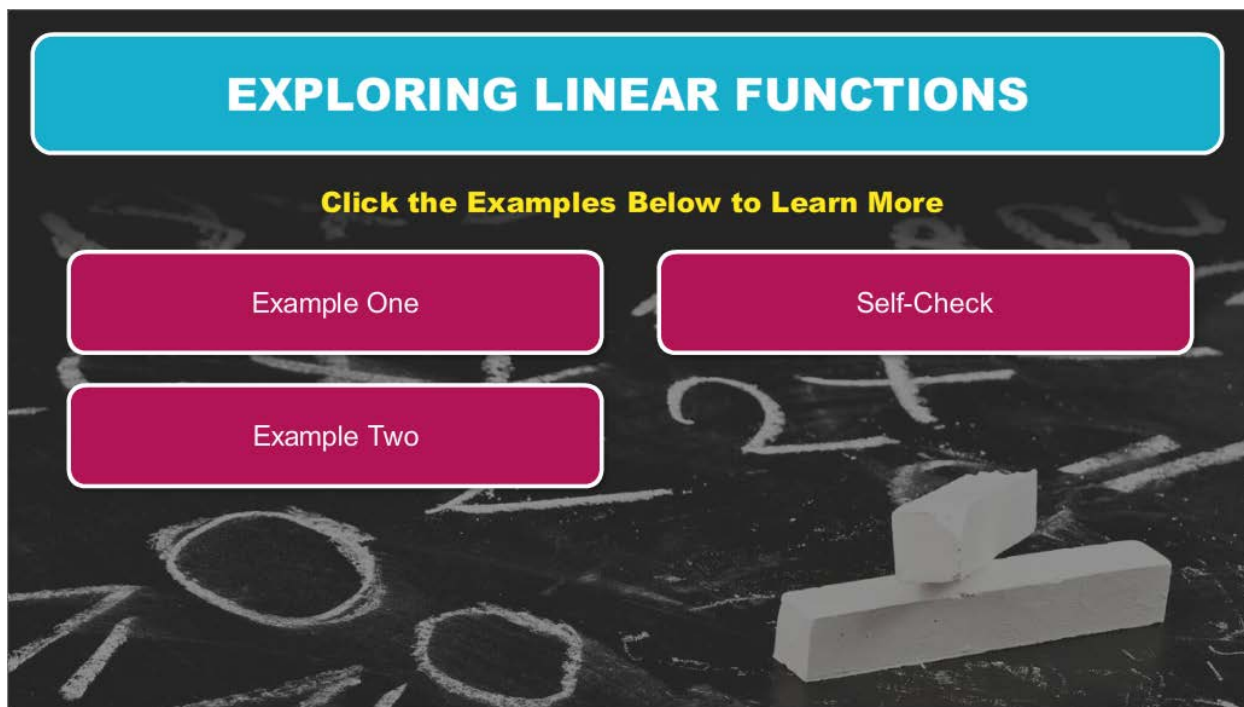
- You will investigate the linear function family.
- You will learn how transformations of its parent function affect the domain and range.

Hi there! I'm so glad you could join me for this lesson in Algebra I, where you will investigate the linear function family and discover how transformations of its parent function affect the domain and range.

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

#### Exploring Linear Functions

A graphic with a dark background featuring faint chalkboard drawings of circles and lines. At the top, a blue rounded rectangle contains the text "EXPLORING LINEAR FUNCTIONS" in white. Below this, yellow text reads "Click the Examples Below to Learn More". Three pink rounded rectangles are arranged in two rows: "Example One" and "Self-Check" in the top row, and "Example Two" in the bottom row. In the bottom right corner, there is a photograph of a white rectangular block with a smaller white cube on top of it.

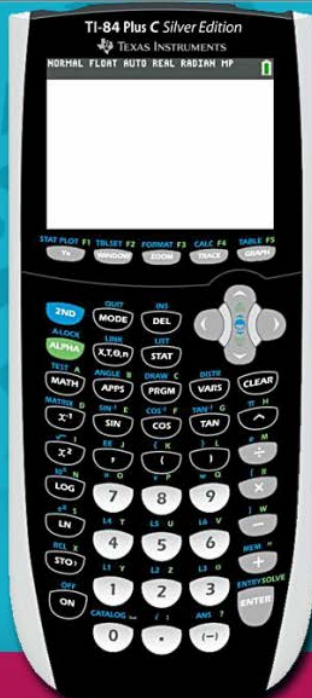
Click the examples below to learn more.

- [Example One](#)
- [Example Two](#)
- [Self-Check](#)

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

### Example One



A TI-84 Plus C Silver Edition graphing calculator is shown on the left. The screen is blank. To the right of the calculator is a white box with a grey border containing the text for Example 1.

**Example 1**

Use the graphing calculator to investigate the parent function of the linear function family.

$$f(x) = x$$

Images used with permission by Texas Instruments Incorporated.

Use the graphing calculator to investigate the parent function of the linear function family.

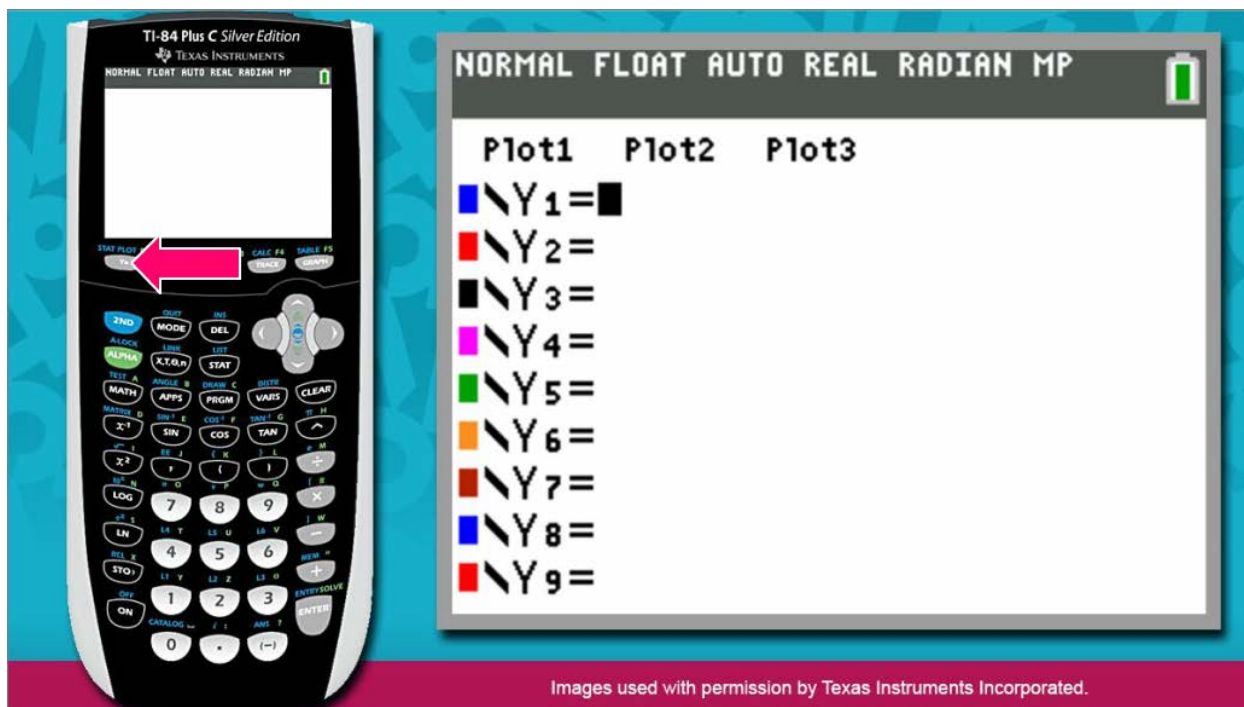
$$f(x) = x$$

The parent function of the linear function family is  $f(x) = x$ . Enter this function into the graphing calculator.

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## Topic 1 Content: Exploring Linear Functions Notes

### Example One (continued)

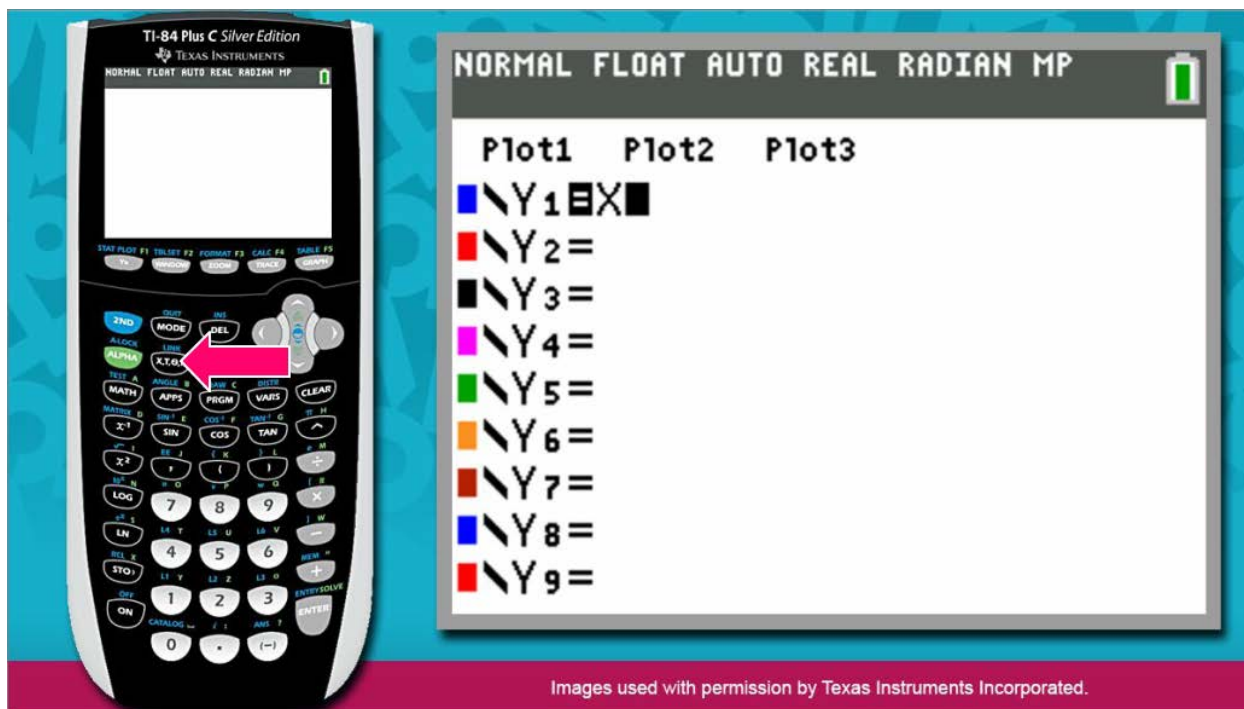


Press the Y= key.

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## Topic 1 Content: Exploring Linear Functions Notes

### Example One (continued)

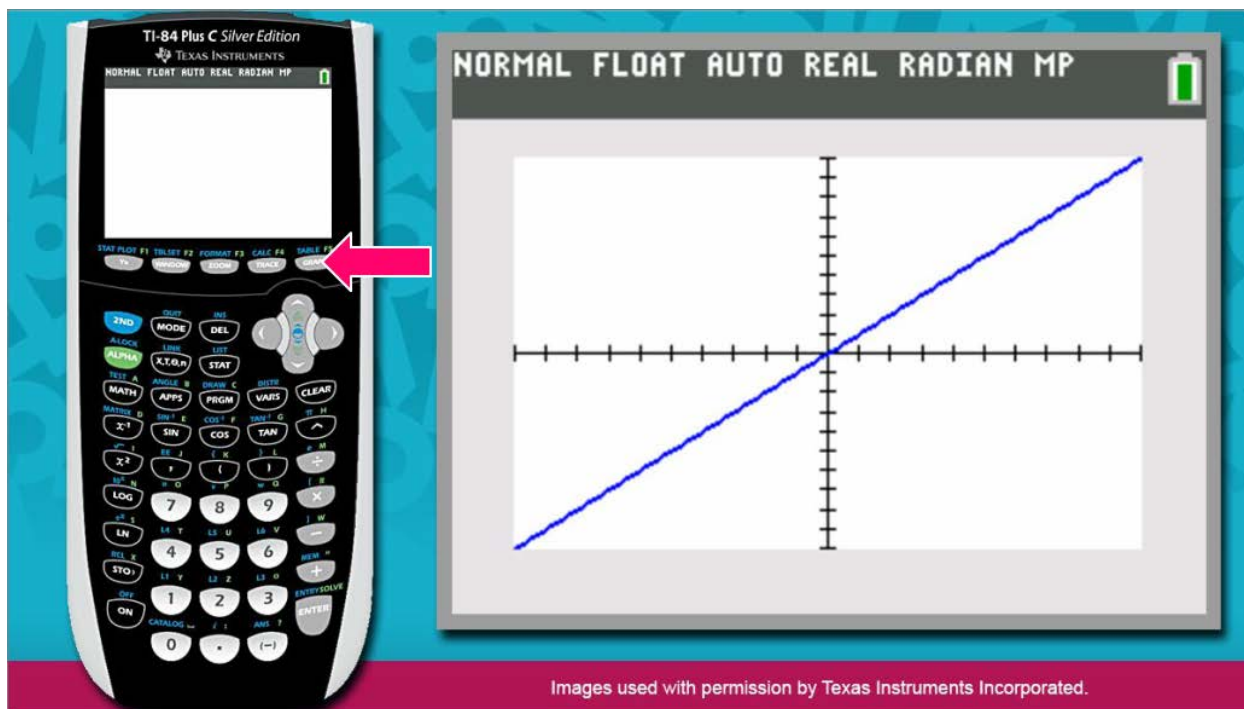


Now, press the  $x$  key, located to the right of the green ALPHA key.

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

Example One (continued)

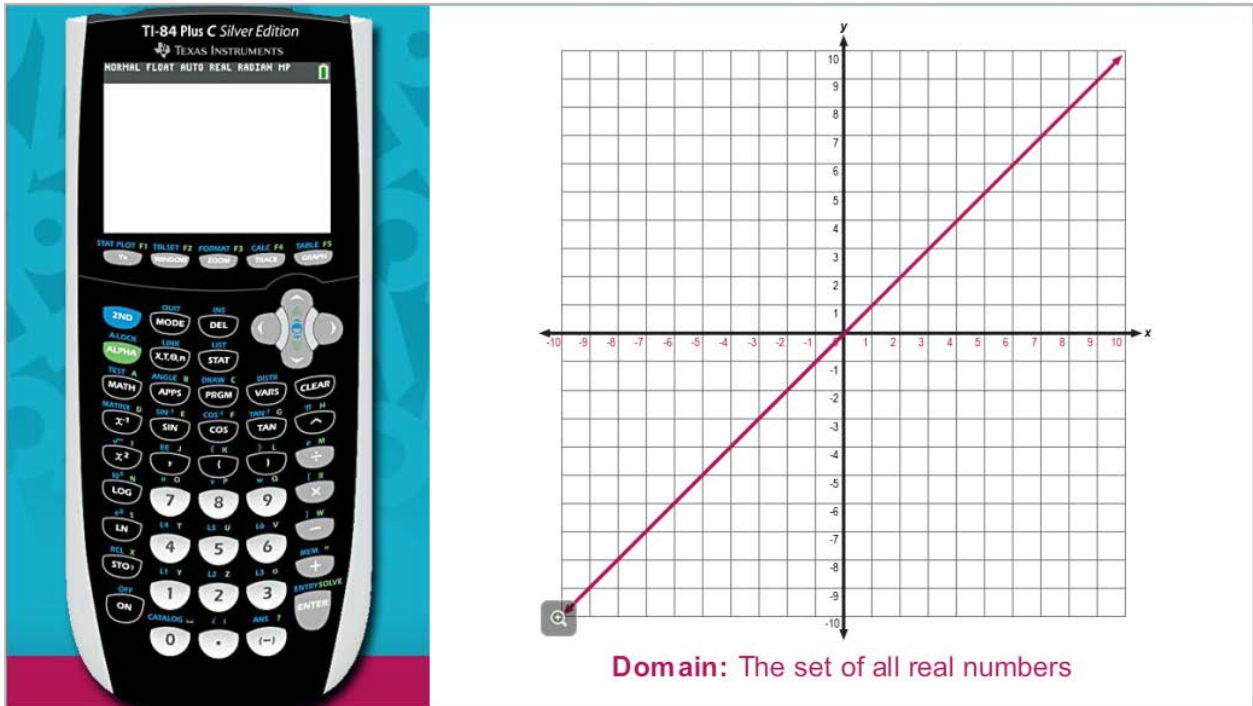


Then, press GRAPH.

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

### Example One (continued)

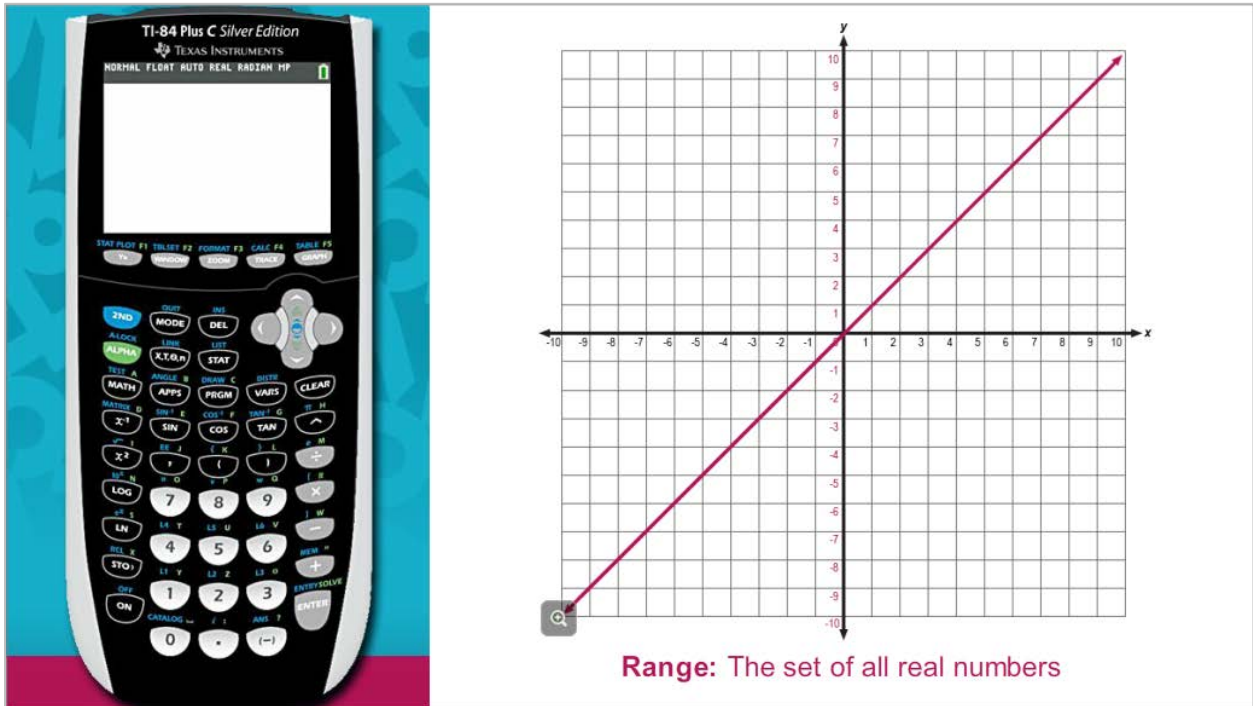


Notice that the function is defined for all values of  $x$ . Or in other words, a  $y$ -value exists of all values of  $x$  – all negative values, 0, and all positive values. Therefore, the domain of the linear parent function is the set of all real numbers.

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

### Example One (continued)



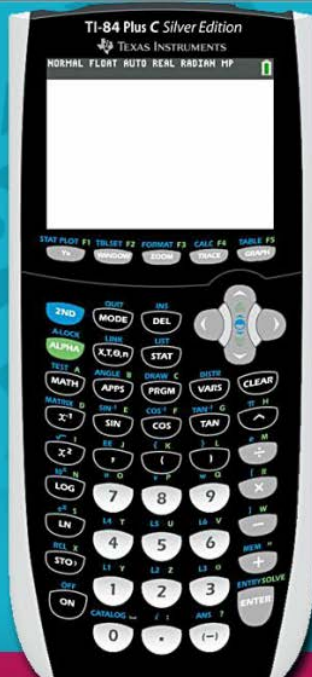
Notice that for the function  $f(x) = x$ , there exists negative  $y$ -values, a  $y$ -value of 0, and positive  $y$ -values. Therefore, the range of the function is also the set of all real numbers.



## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

#### Example 2



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### Example 2

Use the graphing calculator to discover how transformations of the parent function affect the domain and range.

$$j(x) = -8x$$

Use the graphing calculator to discover how transformations of the parent function affect the domain and range.

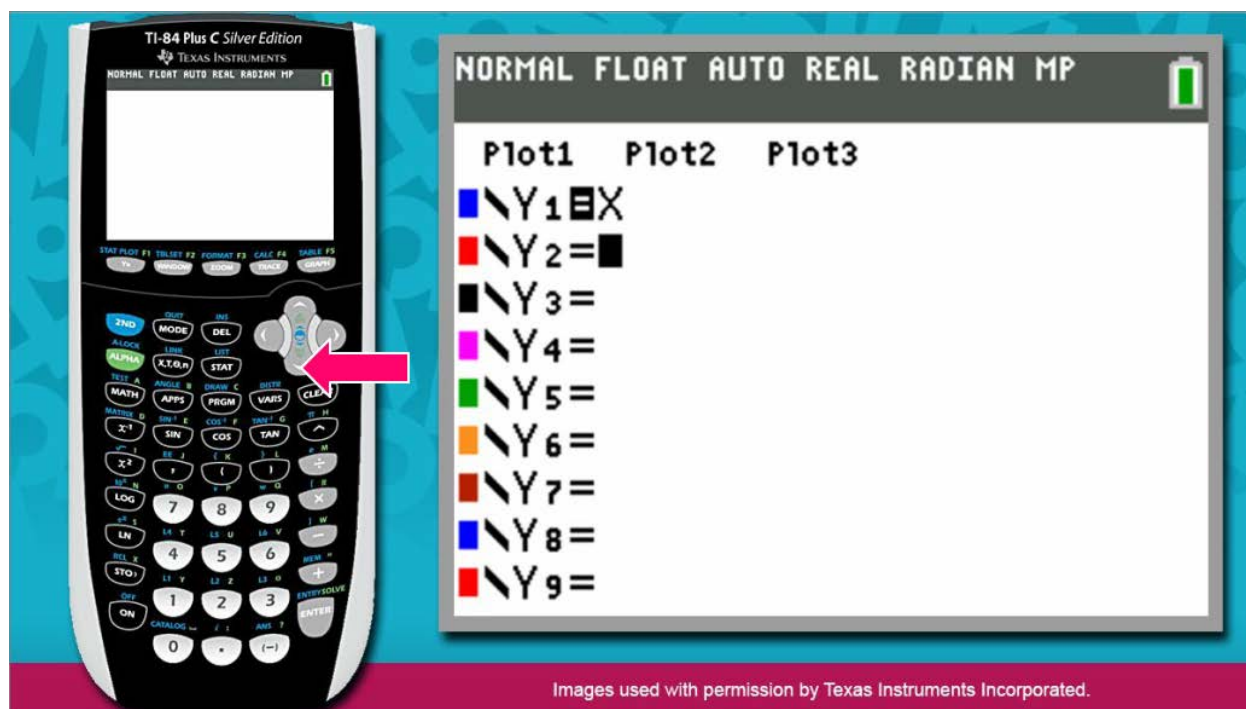
$$j(x) = -8x$$

Enter this function into the graphing calculator.

# Module 10: Linear and Quadratic Function Families

## Topic 1 Content: Exploring Linear Functions Notes

### Example 2 (continued)

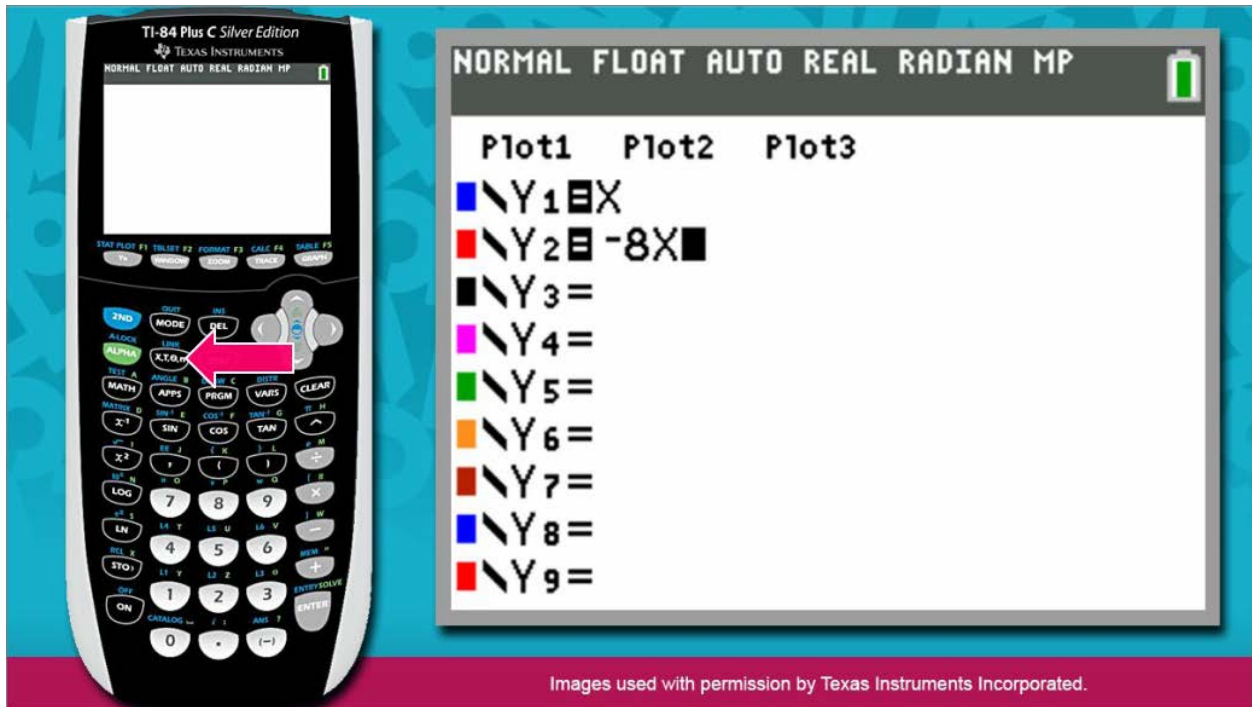


Press the Y= key. Then, press the down arrow so that the cursor is blinking to the right of Y2.

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## Topic 1 Content: Exploring Linear Functions Notes

### Example 2 (continued)

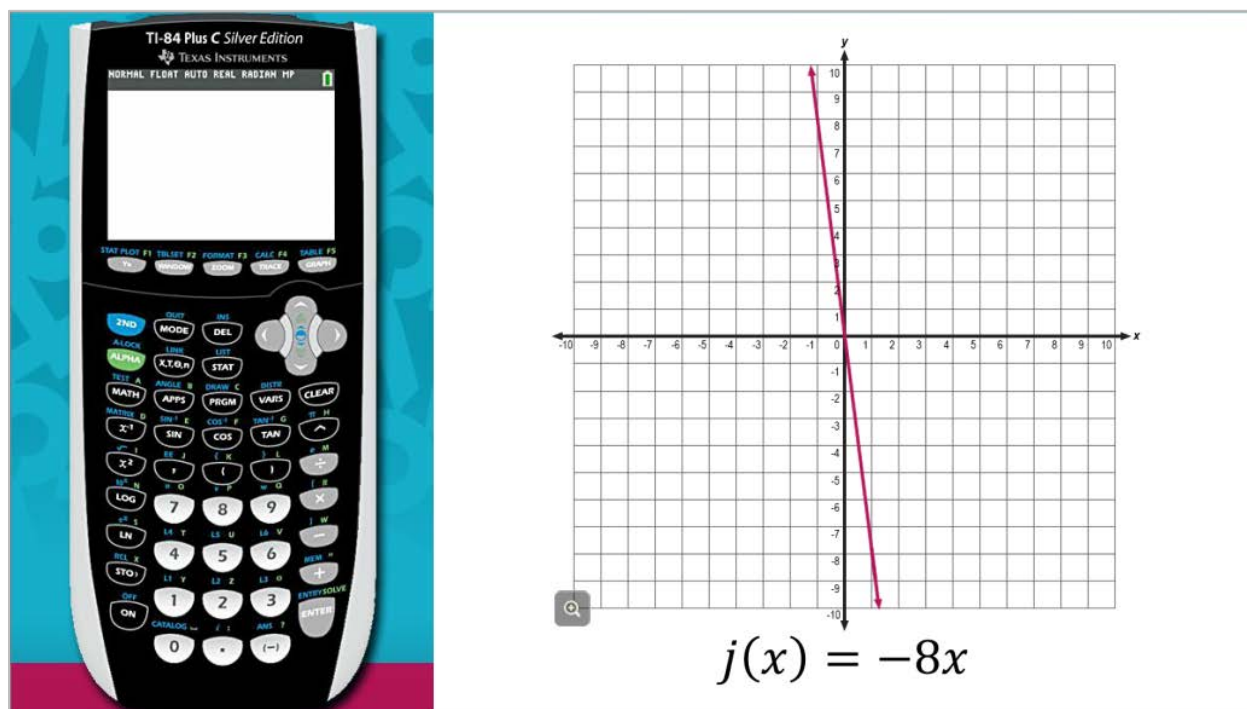


Now, enter the expression  $-8x$  to the right of  $Y_2$ . Press the negative sign key, located beneath the 3 key. Then, press the 8 key, and then the  $x$  key.

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Example 2 (continued)



Now, press GRAPH.

Notice that the function  $j(x) = -8x$  represents a composite transformation of the linear parent function. The graph of  $j(x)$  represents a reflection of the linear parent function, as well as a stretch by a factor of 8.

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**Example 2 (continued)**

How did the transformations of the parent function affect the domain?

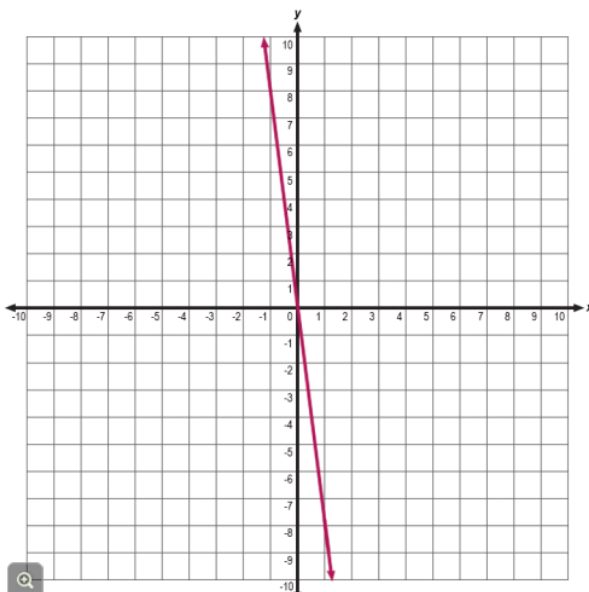
What is the domain of  $j(x) = -8x$ ?

**All real numbers**

$\{x: x \leq -2\}$

$\{x: x \geq -2\}$

$\{x: x \geq 0\}$



$j(x) = -8x$

How did the transformations of the parent function affect the domain?

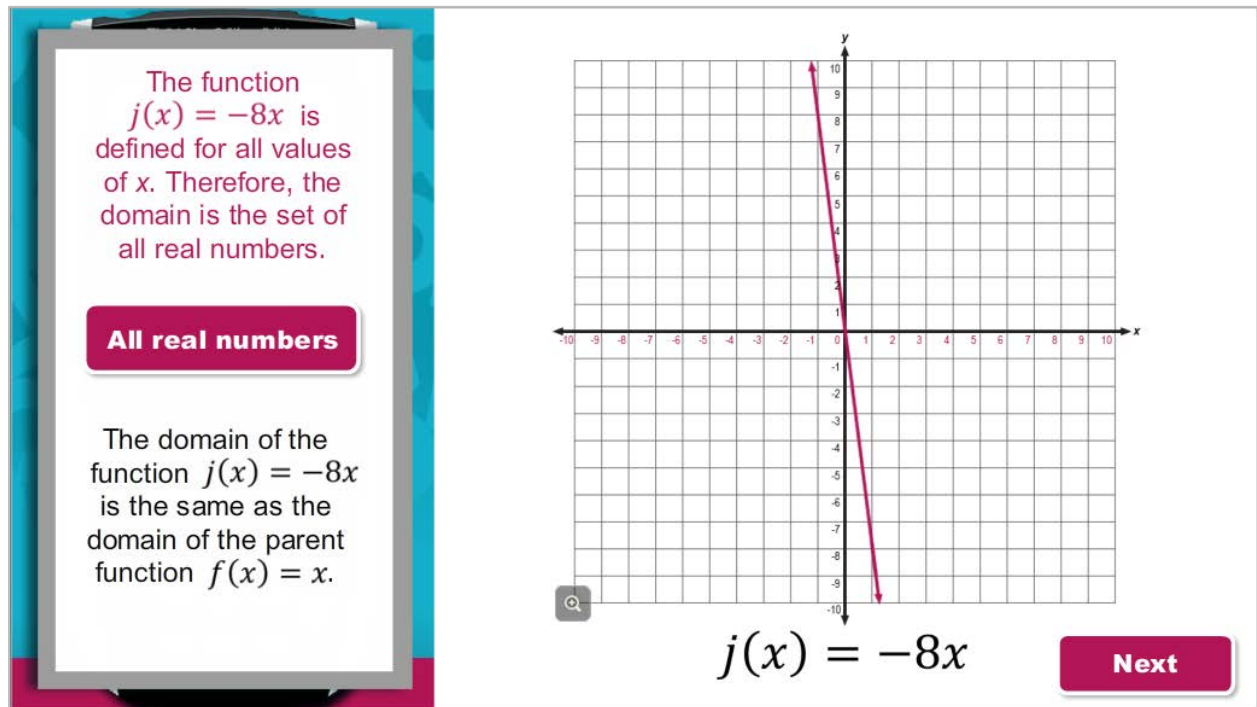
What is the domain of  $j(x) = -8x$ ?

- A) all real numbers
- B)  $\{x: x \leq -2\}$
- C)  $\{x: x \geq -2\}$
- D)  $\{x: x \geq 0\}$

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

#### Example 2 (continued)

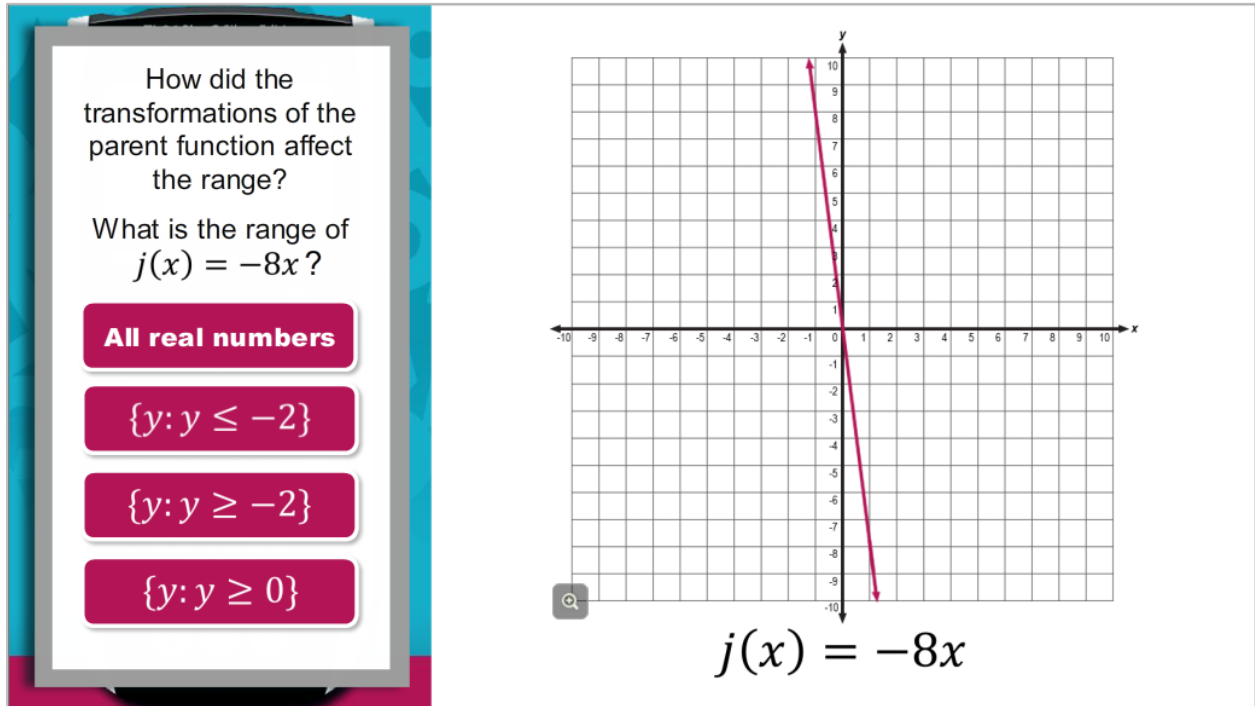


The function  $j(x) = -8x$  is defined for all values of  $x$ . Therefore, the domain is the set of all real numbers.

The domain of the function  $j(x) = -8x$  is the same as the domain of the parent function  $f(x) = x$ .

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Example 2 (continued)



How did the transformations of the parent function affect the range?

What is the range of  $j(x) = -8x$ ?

**All real numbers**

$\{y: y \leq -2\}$

$\{y: y \geq -2\}$

$\{y: y \geq 0\}$

$j(x) = -8x$

The graph shows a coordinate plane with x and y axes ranging from -10 to 10. A red line passes through the origin (0,0) and has a negative slope. The line is labeled  $j(x) = -8x$  below the graph.

How did the transformations of the parent function affect the range?

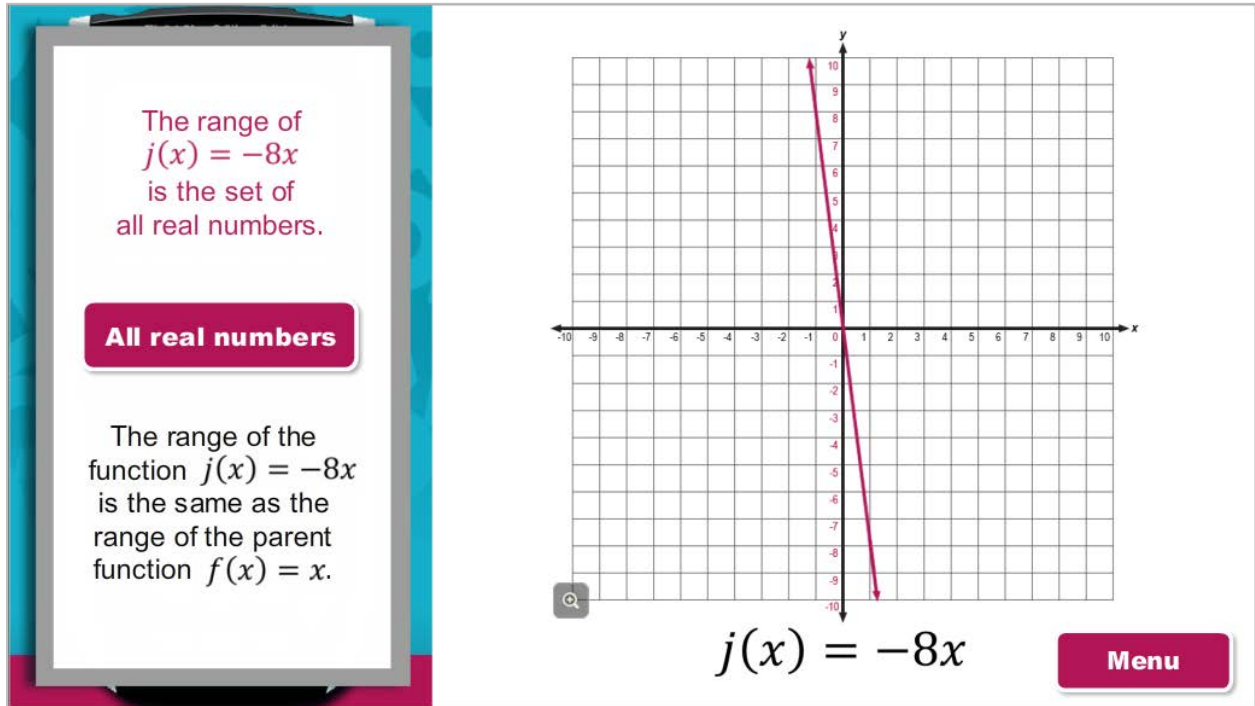
What is the range of  $j(x) = -8x$ ?

- A) the set of all real numbers
- B)  $\{y: y \leq -2\}$
- C)  $\{y: y \geq -2\}$
- D)  $\{y: y \geq 0\}$

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

#### Example 2 (continued)



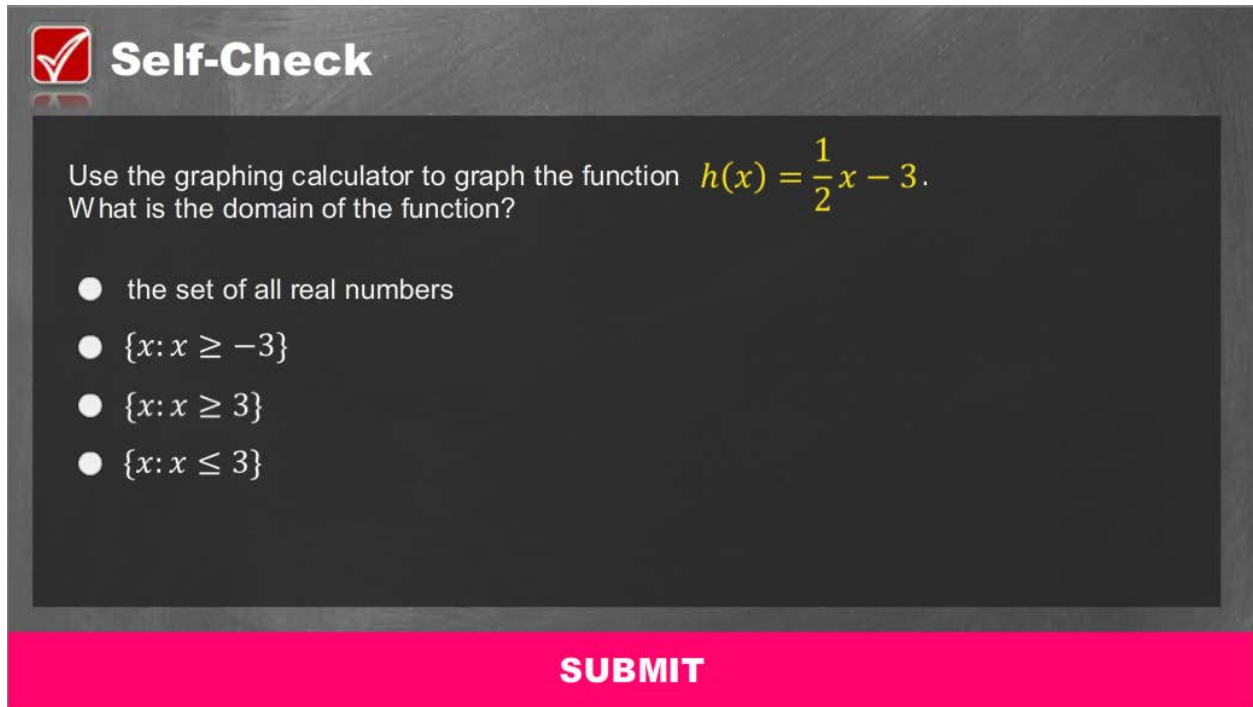
The range of  $j(x) = -8x$  is the set of all real numbers.

The range of the function  $j(x) = -8x$  is the same as the range of the parent function  $f(x) = x$ .



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**Topic 1 Content: Exploring Linear Functions Notes**

**Self-Check 1**

A digital interface for a self-check exercise. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a question is posed in white text: "Use the graphing calculator to graph the function  $h(x) = \frac{1}{2}x - 3$ . What is the domain of the function?". Four radio button options are listed in white: "the set of all real numbers", " $\{x: x \geq -3\}$ ", " $\{x: x \geq 3\}$ ", and " $\{x: x \leq 3\}$ ". At the bottom, a bright pink bar contains the word "SUBMIT" in white capital letters.

**Self-Check**

Use the graphing calculator to graph the function  $h(x) = \frac{1}{2}x - 3$ .  
What is the domain of the function?

- the set of all real numbers
- $\{x: x \geq -3\}$
- $\{x: x \geq 3\}$
- $\{x: x \leq 3\}$

**SUBMIT**

Solve the problem in the image above to check your understanding of the content.

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

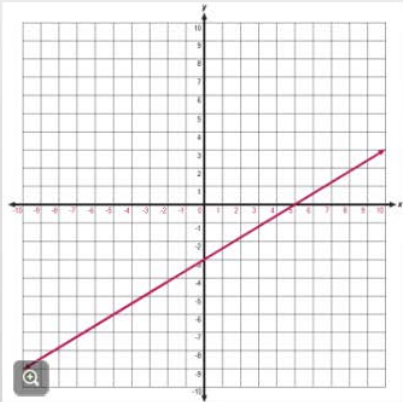
#### Self-Check 1: Answer

**Correct**

That's correct!

The function  $h(x) = \frac{1}{2}x - 3$  is defined for all values of  $x$ .

Therefore, the domain is the set of all real numbers.



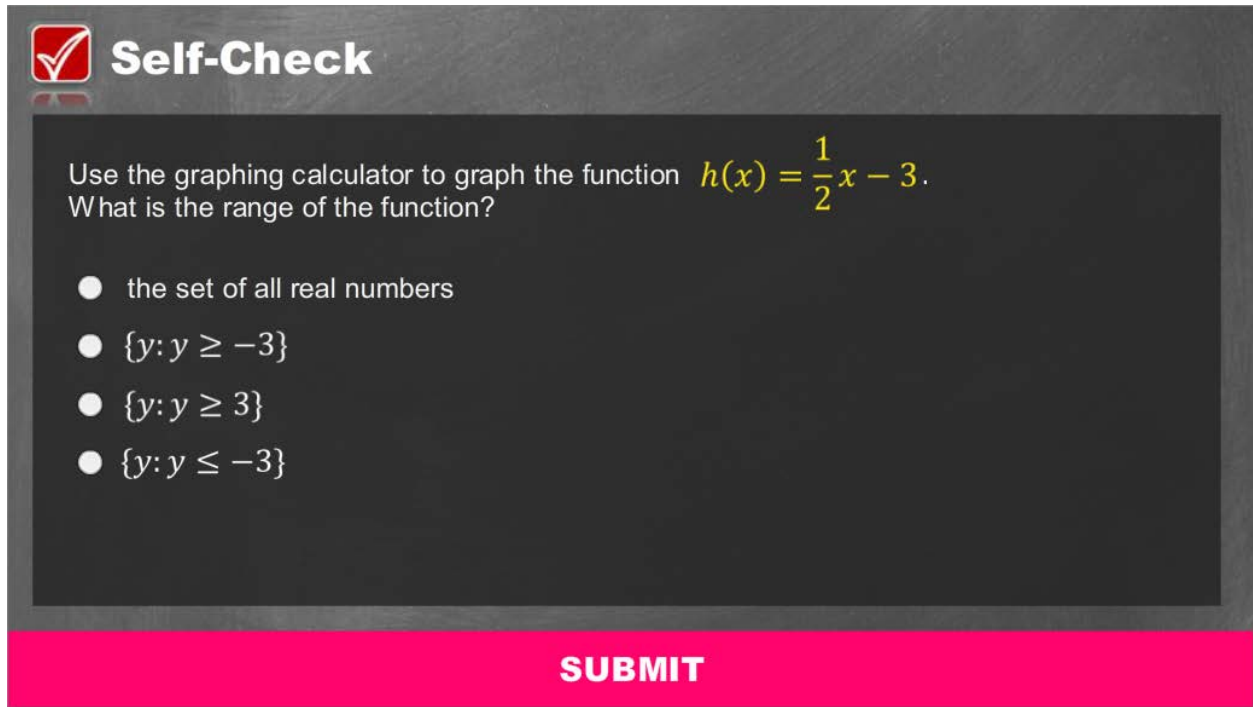
Continue

**SUBMIT**

For your reference, the image above shows the correct solution to the self-check problem.

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**Self-Check 2**

A digital interface for a self-check exercise. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a question is posed in white text: "Use the graphing calculator to graph the function  $h(x) = \frac{1}{2}x - 3$ . What is the range of the function?". The function is written in yellow. Four radio button options are listed in white: "the set of all real numbers", " $\{y: y \geq -3\}$ ", " $\{y: y \geq 3\}$ ", and " $\{y: y \leq -3\}$ ". At the bottom, a bright pink bar contains the word "SUBMIT" in white capital letters.

**Self-Check**

Use the graphing calculator to graph the function  $h(x) = \frac{1}{2}x - 3$ .  
What is the range of the function?

- the set of all real numbers
- $\{y: y \geq -3\}$
- $\{y: y \geq 3\}$
- $\{y: y \leq -3\}$

**SUBMIT**

Solve the problem in the image above to check your understanding of the content.

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

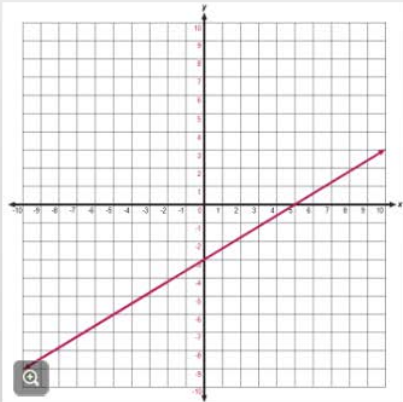
#### Self-Check 2: Answer

**Correct**

That's correct!

Notice that for the function  $h(x) = \frac{1}{2}x - 3$ , there exist negative  $y$ -values, a  $y$ -value of 0, and positive  $y$ -values.

Therefore, the range of the function is also the set of all real numbers.



Continue

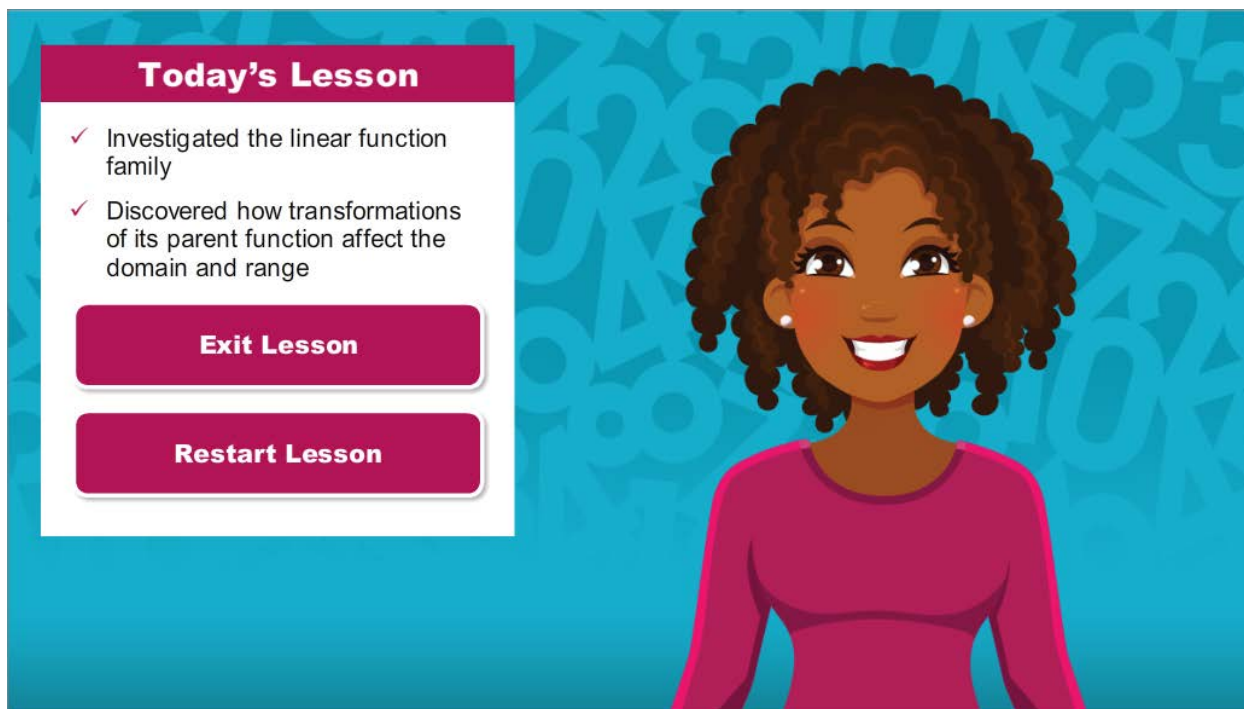
**SUBMIT**

For your reference, the image above shows the correct solution to the self-check problem.

## Module 10: Linear and Quadratic Function Families

### Topic 1 Content: Exploring Linear Functions Notes

#### Conclusion



The image shows a digital interface for a lesson conclusion. On the right is a cartoon illustration of a young woman with dark skin, curly hair, and a pink top, smiling. On the left is a white box with a pink header titled "Today's Lesson". Inside the box, there are two bullet points with checkmarks, followed by two pink buttons labeled "Exit Lesson" and "Restart Lesson". The background is a blue pattern of mathematical symbols.

**Today's Lesson**

- ✓ Investigated the linear function family
- ✓ Discovered how transformations of its parent function affect the domain and range

**Exit Lesson**

**Restart Lesson**

You have reached the conclusion of this lesson where you investigated the linear function family and discovered how transformations of its parent function affect the domain and range.