

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Introduction



**Today's Lesson**

- You will learn how to determine the zero of a linear function.
- You will learn how to find the intercepts of a linear function.

Hello and welcome! I'm so glad you could join me for this lesson of Algebra I. In this lesson, you will learn how to determine the zero of a linear function. You will also learn how to find its intercepts.

**Module 10: Linear and Quadratic Function Families**  
**Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes**

**Finding Zeros and Intercepts of Quadratic Functions**

**FINDING ZEROS AND INTERCEPTS  
OF LINEAR FUNCTIONS**

**Click the Examples Below to Learn More**

Example One

Example Two

Example Three

Example Four

Self-Check

Click the examples below to learn more.

- Example One
- Example Two
- Example Three
- Example Four
- Self-Check

**Module 10: Linear and Quadratic Function Families**  
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**Example One**

**EXAMPLE 1**

Find the zero of the function  $f(x) = -3x + 6$ .

The zero of a linear function is the input value that results in an output of 0.

$x$  is an **input** value.  
 $f(x)$  is an **output** value.

$f(x) = -3x + 6$   
 $0 = -3x + 6$

What is the solution to  $0 = -3x + 6$  ?

$x =$

**Submit**

**Find the zero of the function  $f(x) = -3x + 6$ .**

The zero of a linear function is the input value that results in an output of 0.

$x$  is an input value.

$f(x)$  is an **output** value.

$$f(x) = -3x + 6$$

$$0 = -3x + 6$$

To determine the zero of the given function, begin by setting  $f(x) = 0$ . Then, solve for  $x$ .

What is the solution to  $0 = -3x + 6$  ?

$$x = ?$$

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Example One (continued)

**EXAMPLE 1**

Find the zero of the function  $f(x) = -3x + 6$ .

The zero of a linear function is the input value that results in an output of 0.

$x$  is an input value.  
 $f(x)$  is an output value.

$$f(x) = -3x + 6$$

$$0 = -3x + 6$$

The zero of the function is 2.

$$x = 2$$

[View Work](#)

[Menu](#)

Find the zero of the function  $f(x) = -3x + 6$ .

Your work is complete. The zero of the function is 2.

$$x = 2$$

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Example One (continued)

**EXAMPLE 1**

Find the zero of the function  $f(x) = -3x + 6$ .

$$f(x) = -3x + 6$$

$$0 = -3x + 6$$

$$\begin{array}{r} -6 \qquad -6 \\ \hline \end{array}$$

Subtract 6 from both sides.

$$-6 = -3x$$

$$\begin{array}{r} -6 \qquad -6 \\ -3 \qquad -3 \\ \hline \end{array}$$

Divide each side by  $-3$ .

$$2 = x$$

Menu

Find the zero of the function  $f(x) = -3x + 6$ .

$$f(x) = -3x + 6$$

$$0 = -3x + 6$$

$$\begin{array}{r} -6 \qquad -6 \\ \hline \end{array}$$

Subtract 6 from both sides.

$$-6 = -3x$$

$$\begin{array}{r} -6 \qquad -6 \\ -3 \qquad -3 \\ \hline \end{array}$$

Divide by 3.

$$2 = x$$

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**Example Two**

**EXAMPLE 2**

Verify graphically that the zero of  $f(x) = -3x + 6$  is 2.

Given:  $f(x) = -3x + 6$

$$0 = -3x + 6$$

$$\begin{array}{r} -6 \qquad -6 \\ \hline \end{array}$$

$$\begin{array}{r} -6 = -3x \\ \hline \end{array}$$

$$\begin{array}{r} -3 \qquad -3 \\ \hline \end{array}$$

$$2 = x$$

If  $x = 2$ , then the function has a value of 0.

Verify graphically that the zero of  $f(x) = -3x + 6$  is 2.

Given:  $f(x) = -3x + 6$

$$0 = -3x + 6$$

$$\begin{array}{r} -6 \qquad -6 \\ \hline \end{array}$$

$$\begin{array}{r} -6 = -3x \\ \hline \end{array}$$

$$\begin{array}{r} -3 \qquad -3 \\ \hline \end{array}$$

$$2 = x$$

If  $x = 2$ , then the function has a value of 0.

In Example 1, you determined algebraically that the zero of the given function is 2, because it is the input value that results in an output of 0.

Another characteristic of the zero is that it informs you of location of the function's  $x$ -intercept.

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Example Two (continued)

**EXAMPLE 2**

Verify graphically that the zero of  $f(x) = -3x + 6$  is 2.

The **zero** of  $f(x) = -3x + 6$  is 2.

The **x-intercept** of the function is 2.

Graphically, it is located at the point **(2, 0)**.

Verify graphically that the zero of  $f(x) = -3x + 6$  is 2.

The **zero** of  $f(x) = -3x + 6$  is 2.

The **x-intercept** of the function is 2.

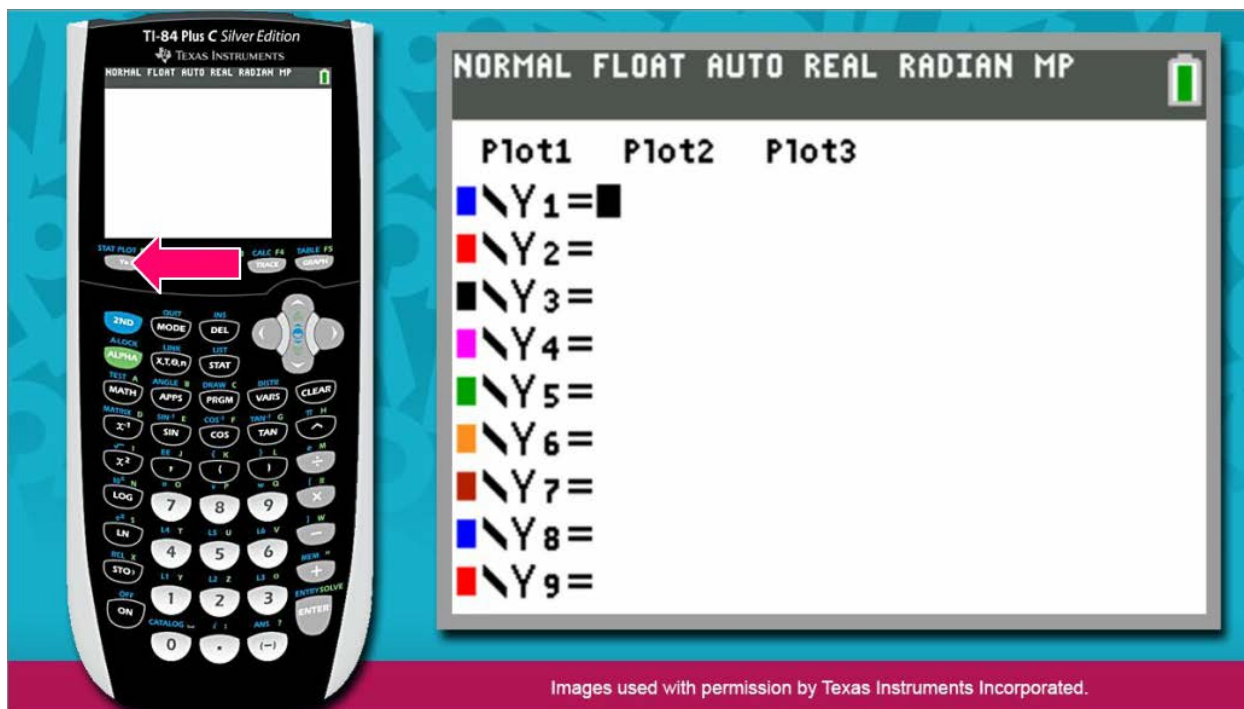
Graphically, it is located at the point **(2, 0)**.

Because the zero of the function is 2, you can conclude that the x-intercept of the function is also 2. Graphically, it is the point located at (2, 0). You can use the graphing calculator to verify this.

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Example Two (continued)



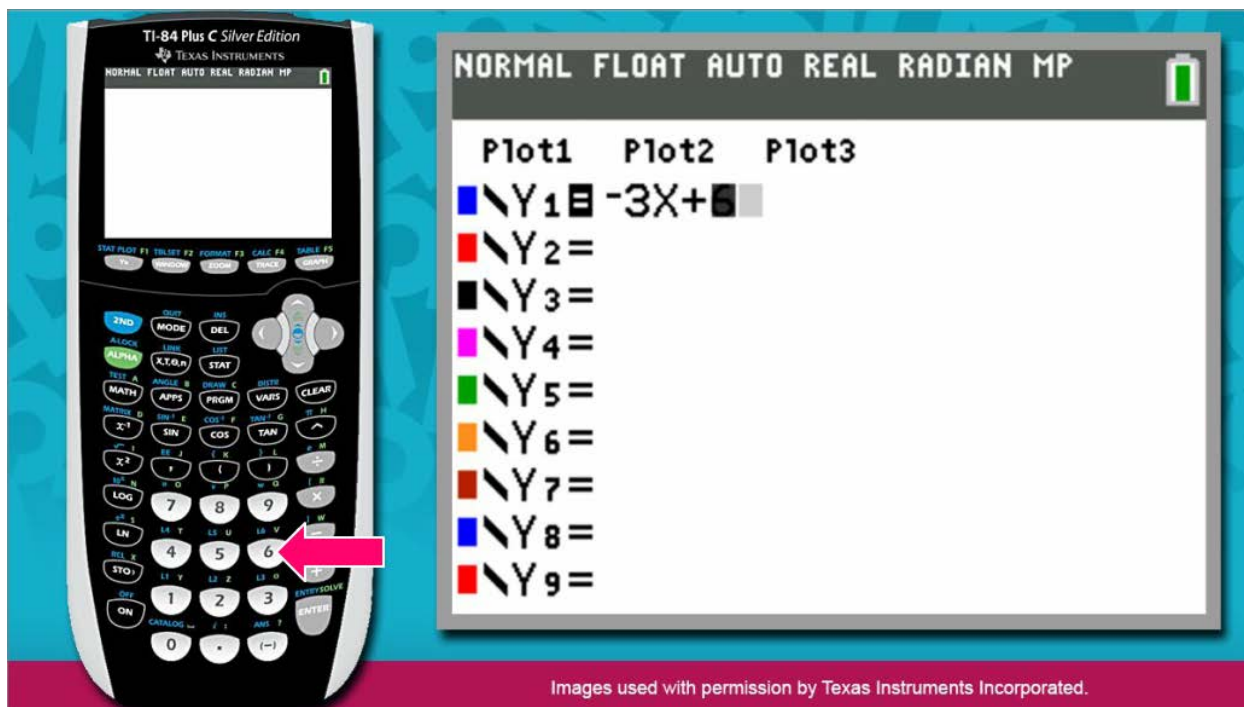
Press the Y= key.



## Module 10: Linear and Quadratic Function Families

### Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

#### Example Two (continued)



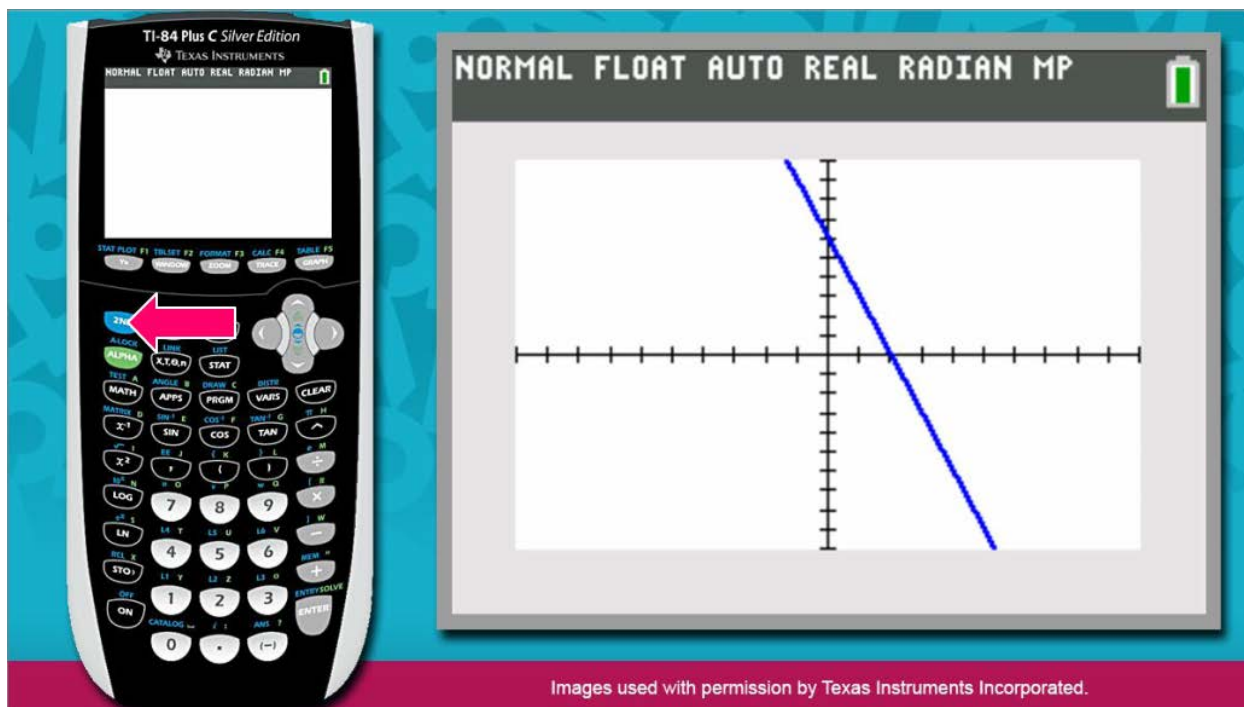
Enter the expression  $-3x + 6$  to the right of Y1.

Press the negative sign key, located beneath the 3 key. Then, press the 3 key and then the  $x$  key. Next, press the addition key and then the 6 key.

## Module 10: Linear and Quadratic Function Families

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#### Example Two (continued)



Now, press GRAPH.

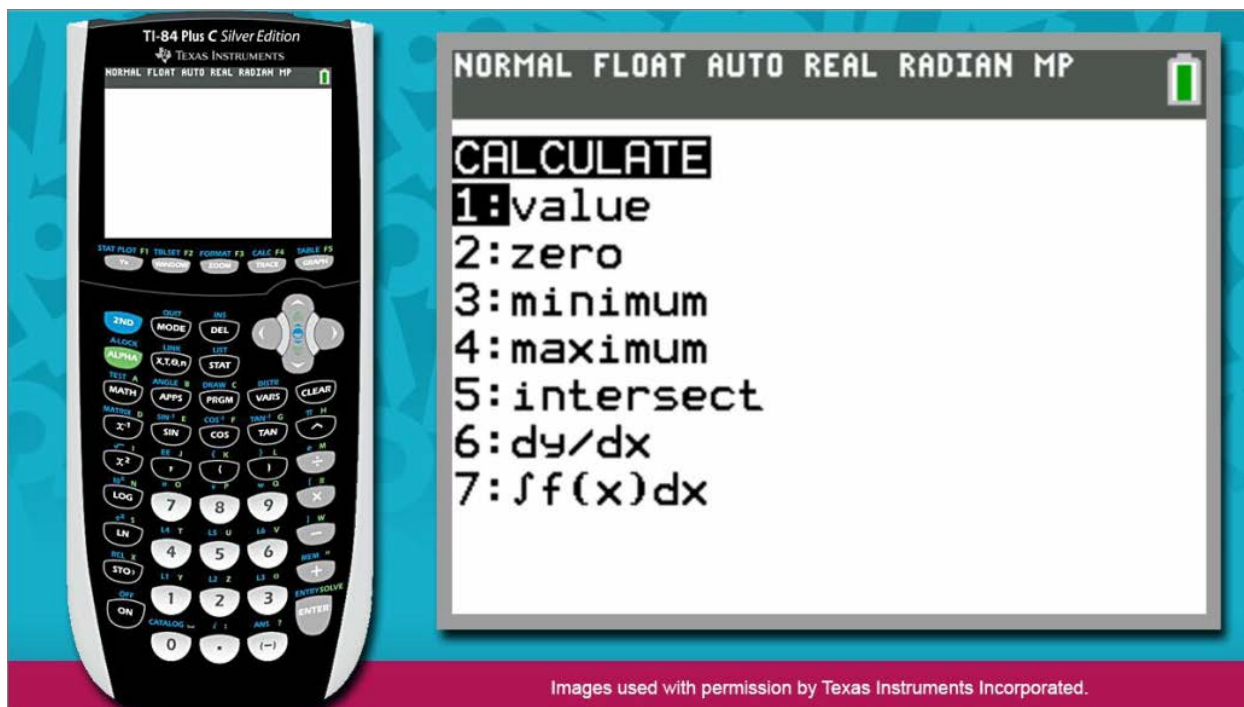
You can now move on to identify the  $x$ -intercept.

Press 2<sup>nd</sup>. This allows you to access a function stamped above a calculator key.

## Module 10: Linear and Quadratic Function Families

### Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

#### Example Two (continued)

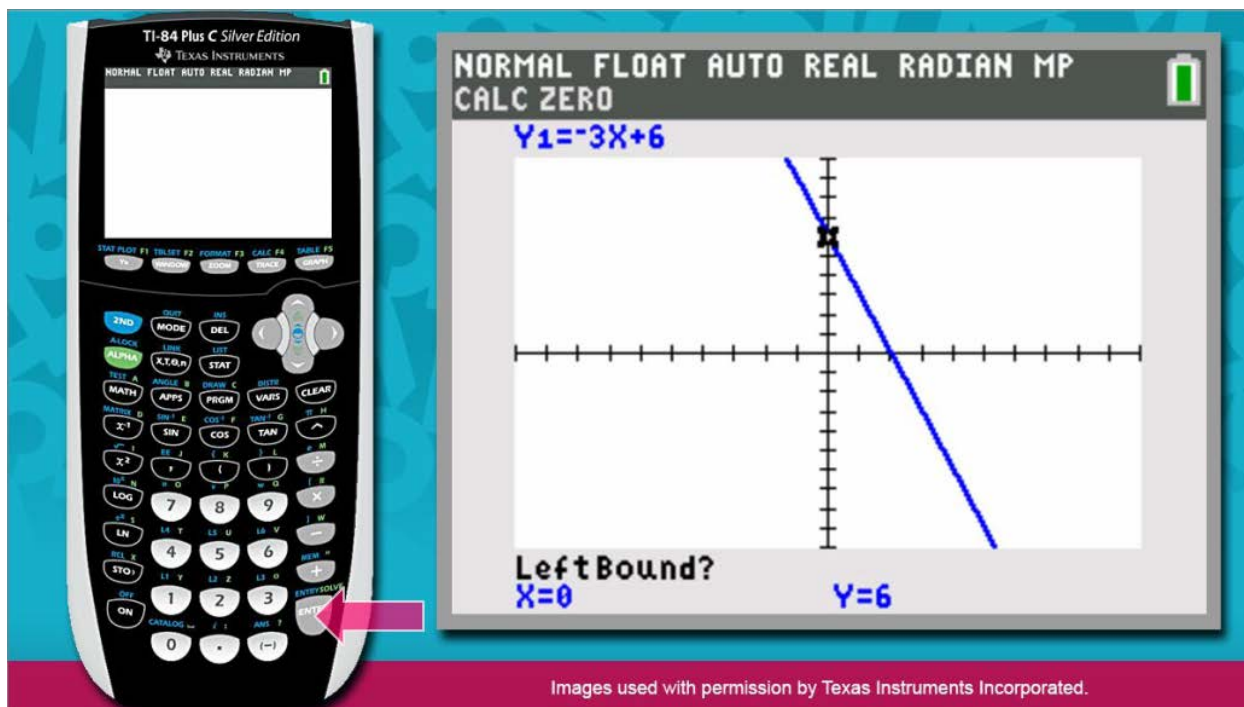


Now press the TRACE key, located in the very top row of keys. This allows you to access the CALCULATE menu. You'll notice a list of options appear on the screen.

## Module 10: Linear and Quadratic Function Families

### Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

#### Example Two (continued)



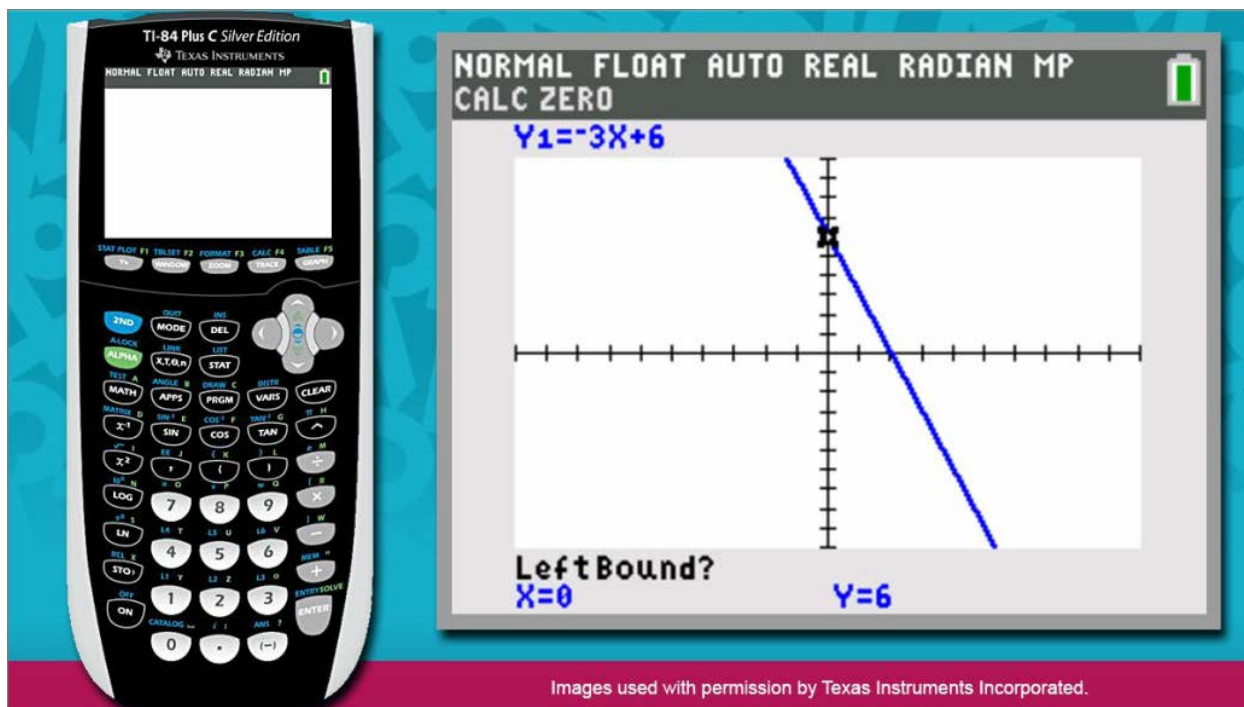
Press the down arrow so that the cursor moves to the second option in the list, the zero option. Remember that finding the zero of the function will inform you of the location of the  $x$ -intercept.

Now press ENTER.

## Module 10: Linear and Quadratic Function Families

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#### Example Two (continued)

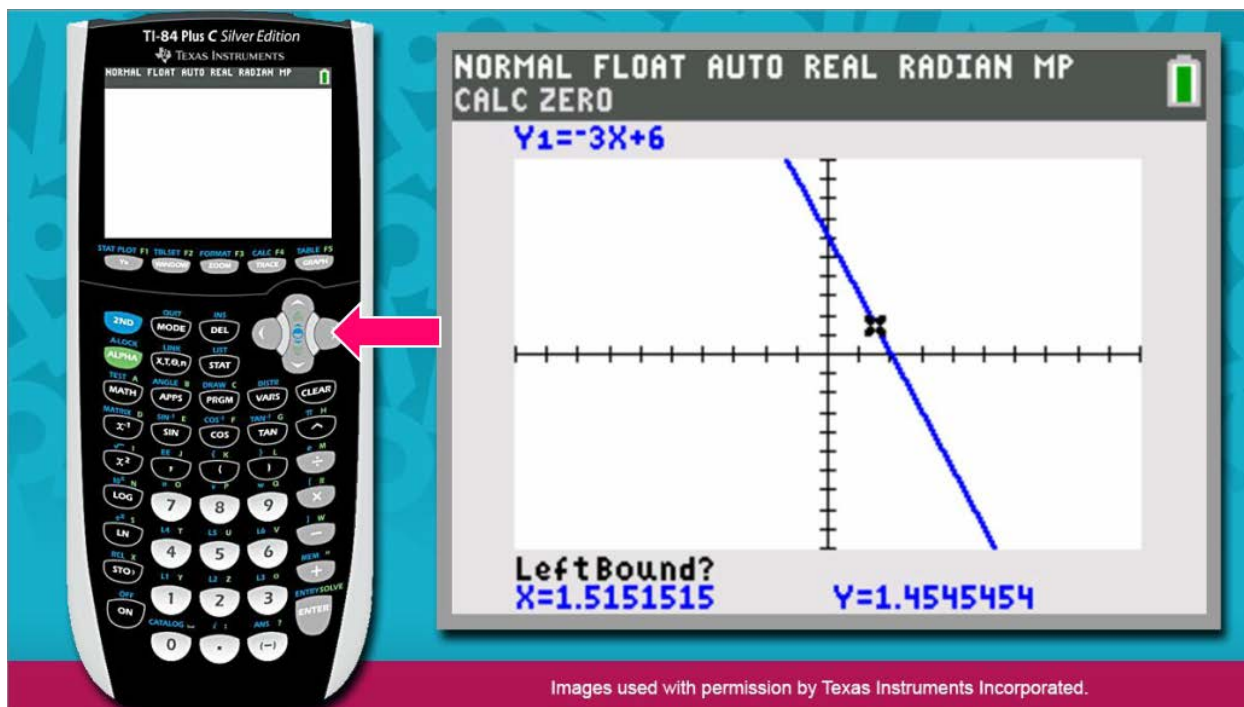


The calculator is now prepared to identify the  $x$ -intercept. You'll notice a question appear in the bottom left corner of the window. The calculator is prompting you to set a left boundary for the region in which you would like for it to search for the  $x$ -intercept.

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Example Two (continued)

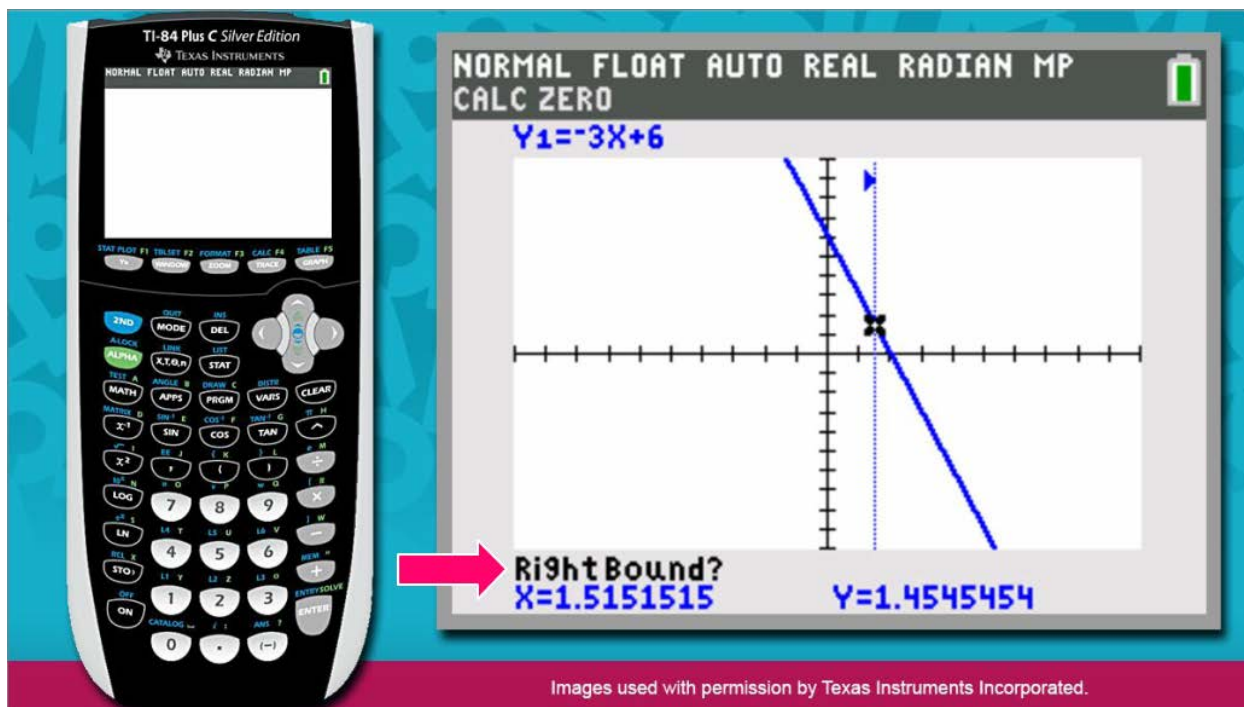


Press the right arrow key until the cursor is blinking just slightly to the left of the  $x$ -intercept.

## Module 10: Linear and Quadratic Function Families

### Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

#### Example Two (continued)



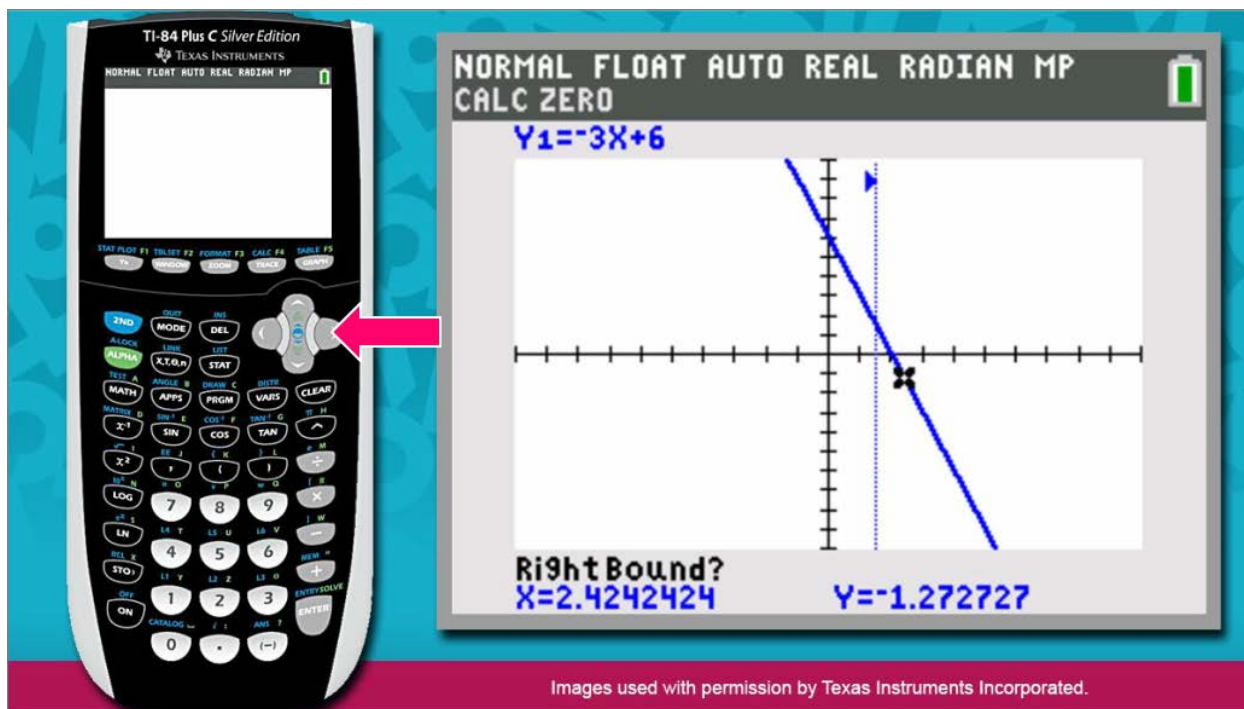
Then, press ENTER.

You'll notice that a vertical line now appears at the location of the left boundary. The calculator now prompts you to set the right boundary.

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Example Two (continued)



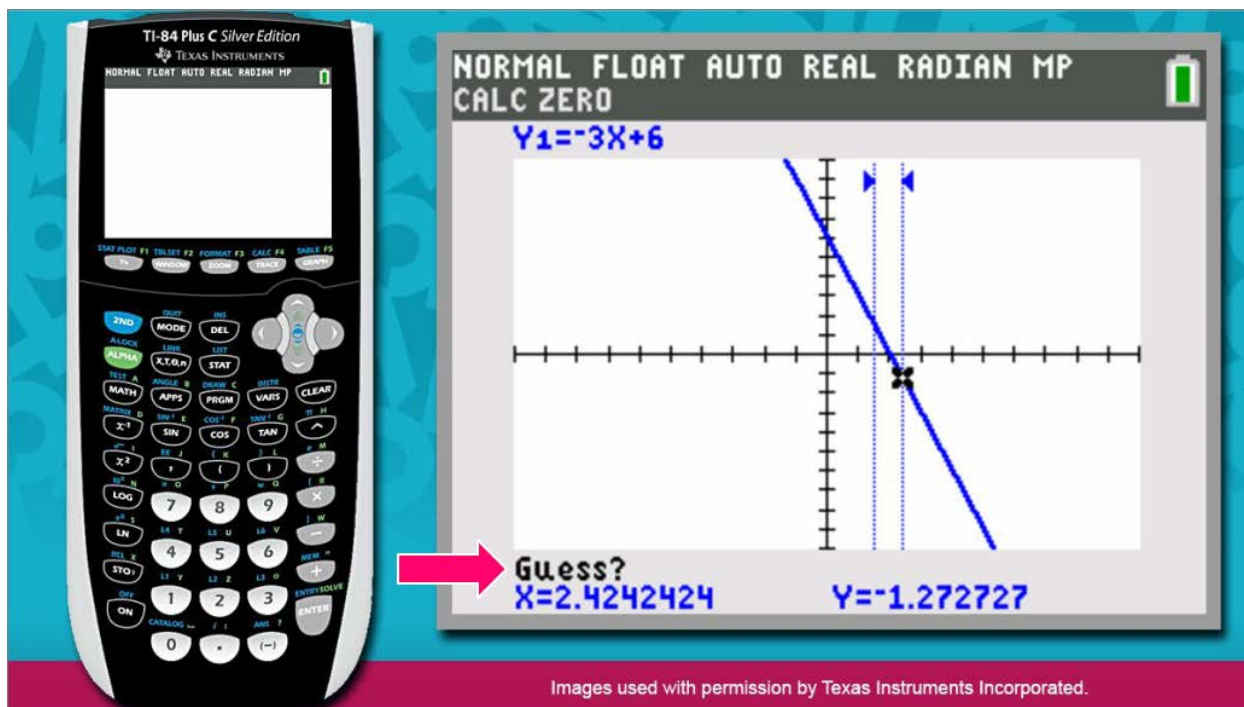
Press the right arrow key until the cursor is blinking just slightly to the right of the  $x$ -intercept.



# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Example Two (continued)



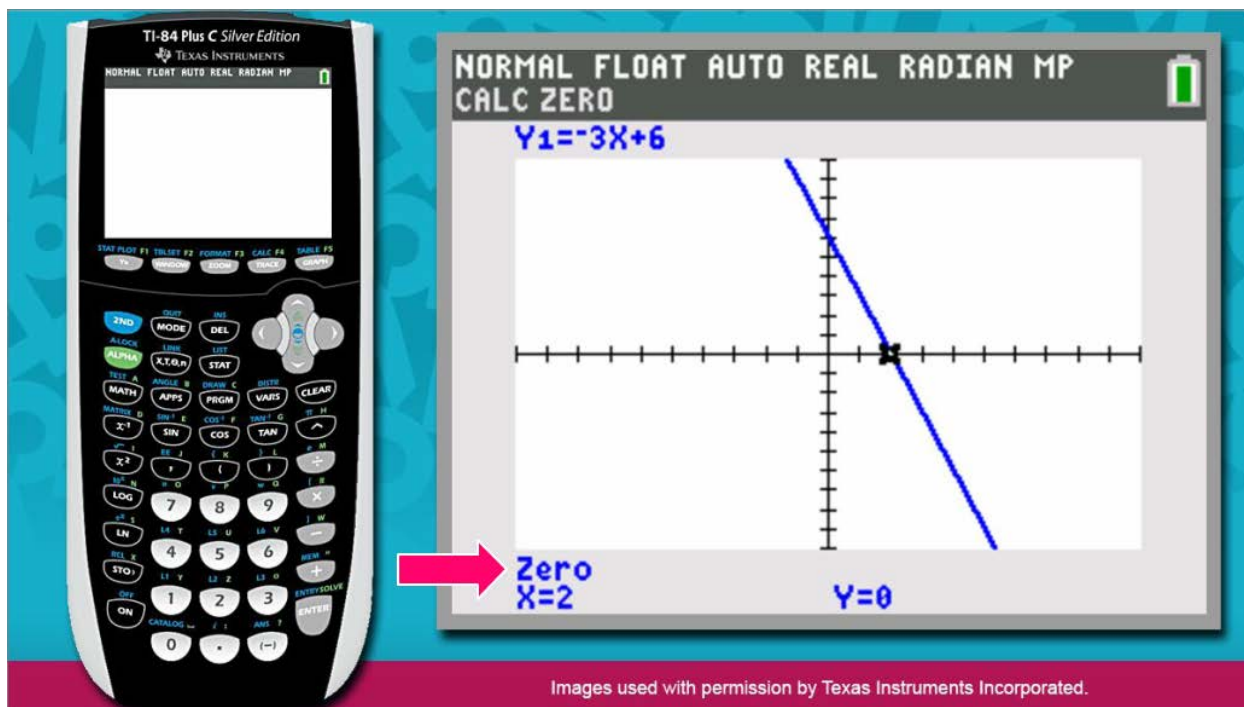
Now, press ENTER.

You'll notice that a vertical line now appears at the location of the right boundary. In the bottom left corner of the window, you'll notice that the calculator is prompting you to confirm that you are ready for it to determine the location of the  $x$ -intercept.

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#### Example Two (continued)



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Press ENTER.

The cursor is blinking at the location of the  $x$ -intercept (2, 0).

In the bottom left corner of the window, you'll notice that the calculator now informs you that the zero of the function is 2.

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**Example 3**

**EXAMPLE 3**

Find the y-intercept of  $f(x) = -3x + 6$ .

The y-intercept of a function is the output value that results from an input value of 0.

$$\begin{aligned}f(x) &= -3x + 6 \\ &= -3(0) + 6 \\ &= 0 + 6\end{aligned}$$

$$f(0) = 6$$

The y-intercept of  $f(x) = -3x + 6$  is 6.

**Find the y-intercept of  $f(x) = -3x + 6$ .**

$$f(x) = -3x + 6$$

$$f(0) = -3(0) + 6$$

The y-intercept of a function is the output value that results from an input value of 0. To determine the y-intercept of the given function, find  $f(0)$ . Begin by substituting 0 for  $x$ . Then, simplify the expression on the right side of the equation.

$$\begin{aligned}f(0) &= -3(0) + 6 \\ &= 0 + 6 \\ &= 6\end{aligned}$$

$$-3 \cdot 0 = 0.$$

Bring down the addition sign and 6.

$$0 + 6 = 6.$$

$$f(0) = 6$$

$$\text{So, } f(0) = 6.$$

The y-intercept of  $f(x) = -3x + 6$  is 6. Therefore, the y-intercept of the function is 6.

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**Example 4**

**EXAMPLE 4**

Verify graphically that the  $y$ -intercept of  $f(x) = -3x + 6$  is 6.

$$\begin{aligned}f(x) &= -3x + 6 \\f(0) &= -3(0) + 6 \\&= -3(0) + 6 \\&= 0 + 6 \\f(0) &= 6\end{aligned}$$

The  $y$ -intercept of the function is located at  $(0, 6)$ .

Verify graphically that the  $y$ -intercept of  $f(x) = -3x + 6$  is 6.

$$\begin{aligned}\text{Given: } f(x) &= -3x + 6 \\f(0) &= -3(0) + 6 \\&= -3(0) + 6 \\&= 0 + 6 \\f(0) &= 6\end{aligned}$$

The  $y$ -intercept of the function is located at  $(0, 6)$

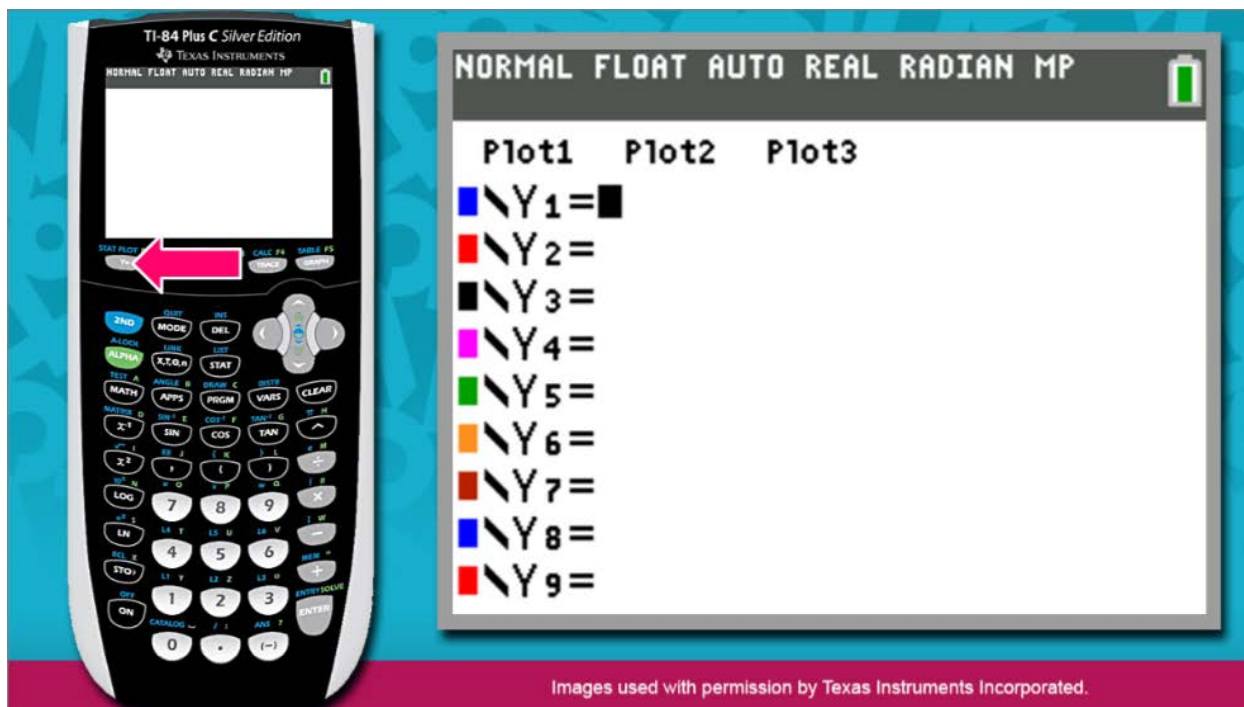
In Example 3, you determined algebraically that the  $y$ -intercept of the given function is 6, because  $f(0) = 6$ . Graphically, it is the point located at  $(0, 6)$ .

You can use the graphing calculator to verify this.

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

Example 4 (continued)

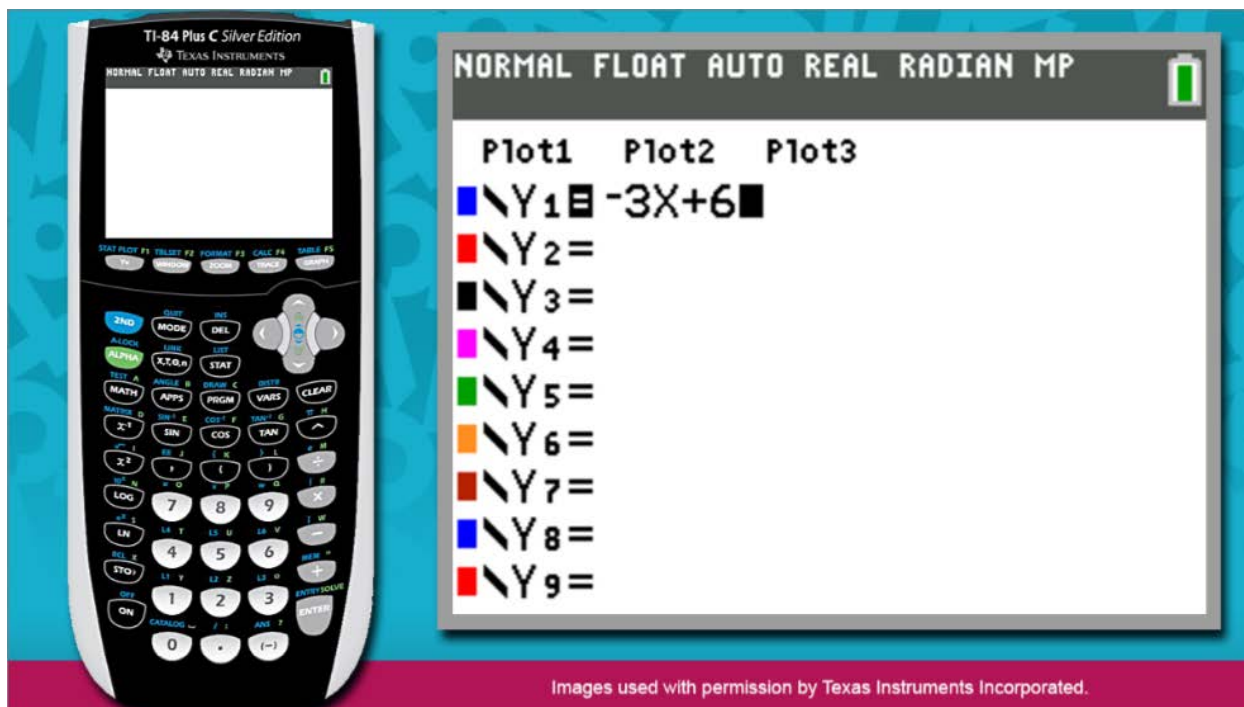


Press the Y= key.

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

Example 4 (continued)

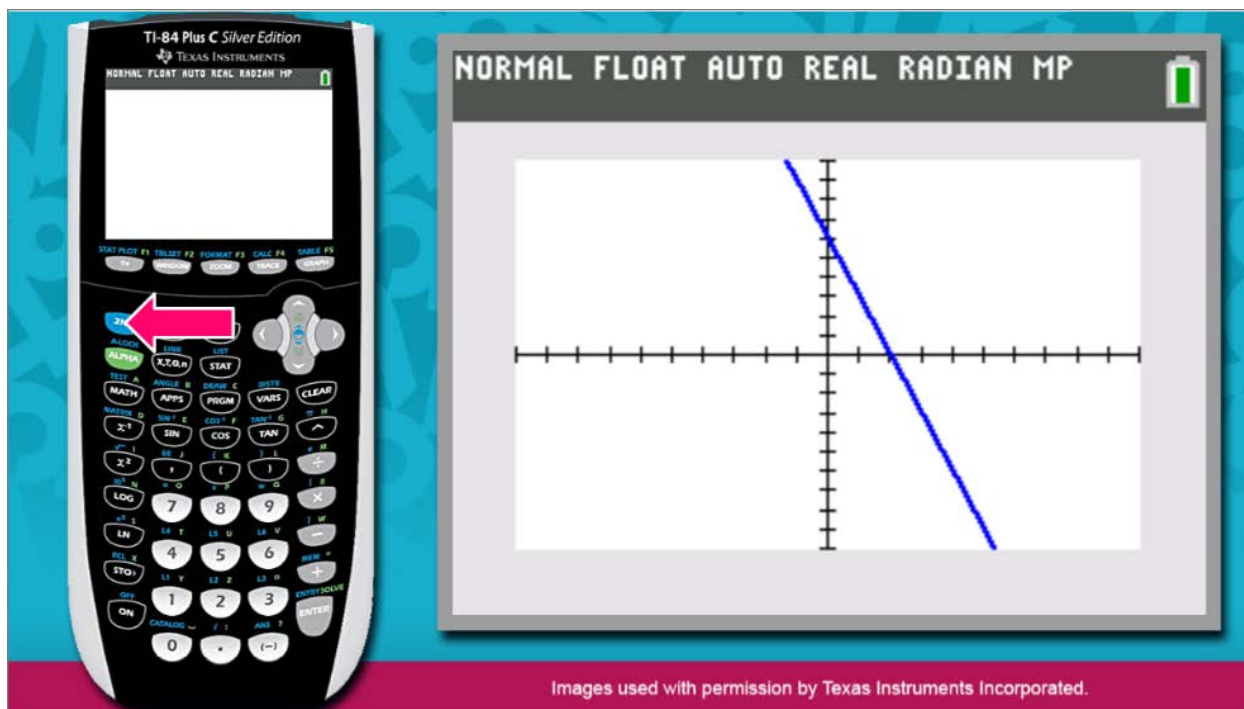


Enter the expression  $-3x + 6$  to the right of Y1.

## Module 10: Linear and Quadratic Function Families

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Example 4 (continued)



Now, press GRAPH.

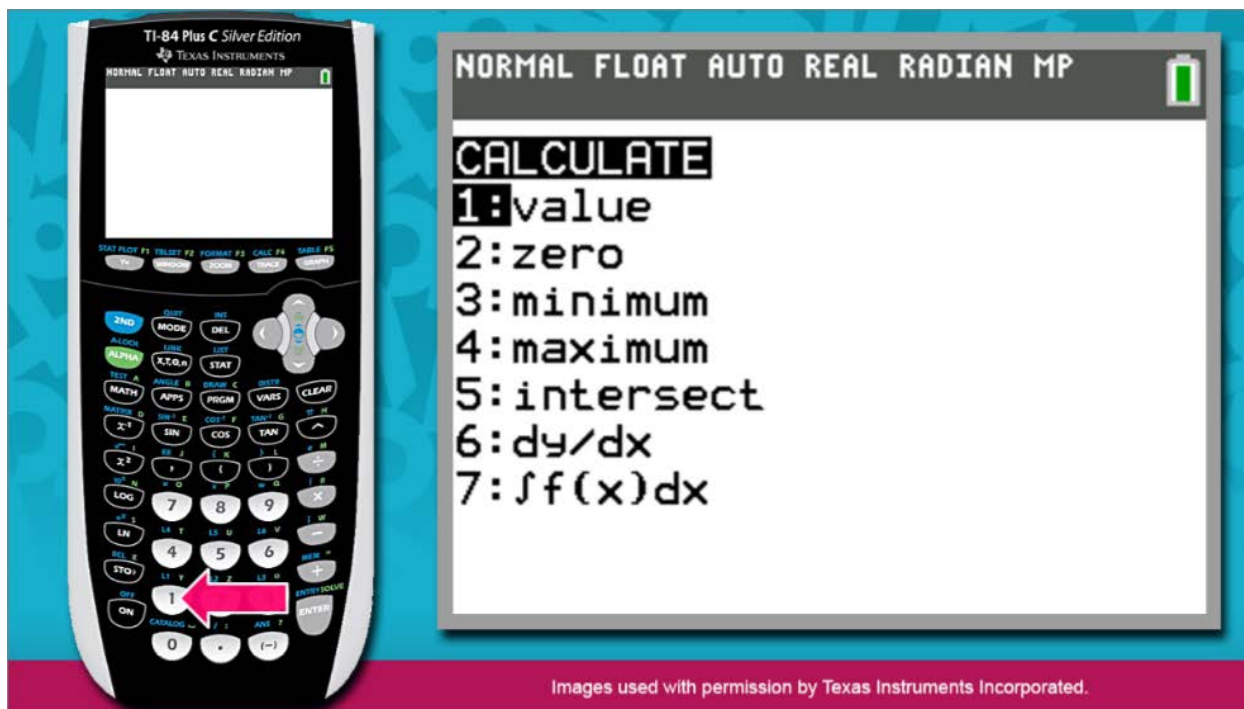
You can now move on to identify the  $y$ -intercept.

Press  $2^{nd}$ . This allows you to access a function stamped above a calculator key.

## Module 10: Linear and Quadratic Function Families

### Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

Example 4 (continued)



Now press the TRACE key to access the CALCULATE menu.

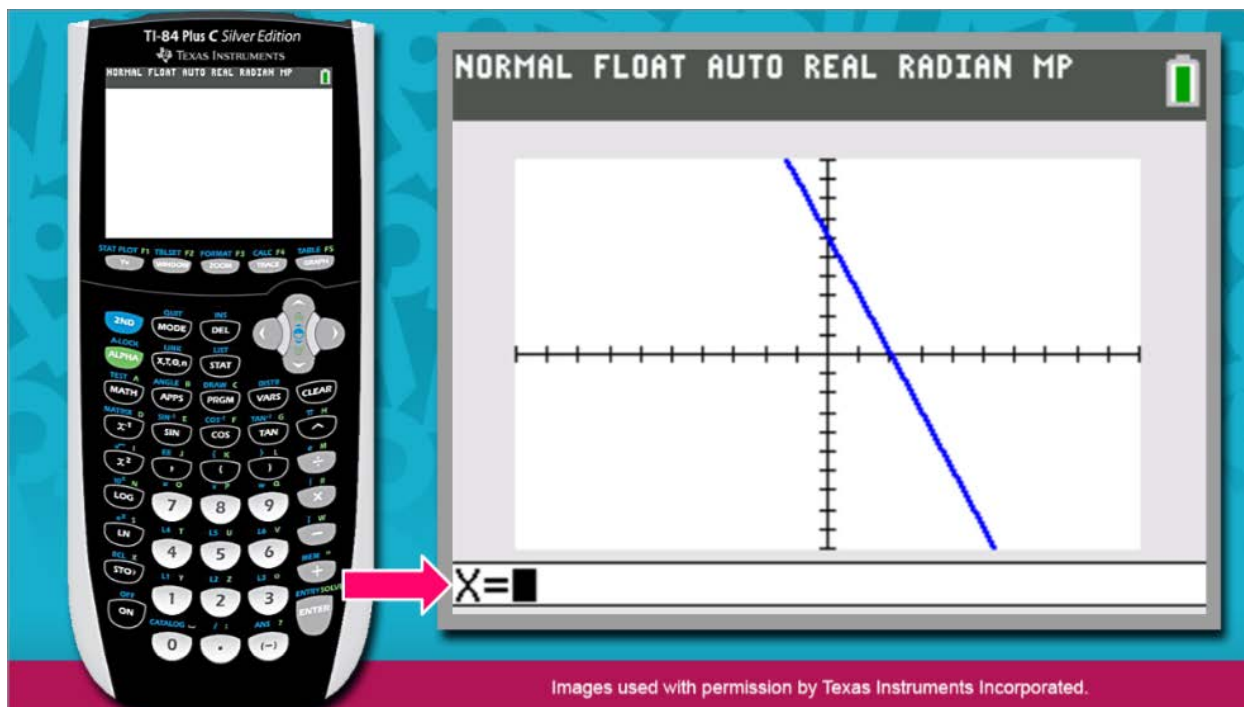
Press 1 to access the value option. This option will allow you to enter an input value.



## Module 10: Linear and Quadratic Function Families

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Example 4 (continued)

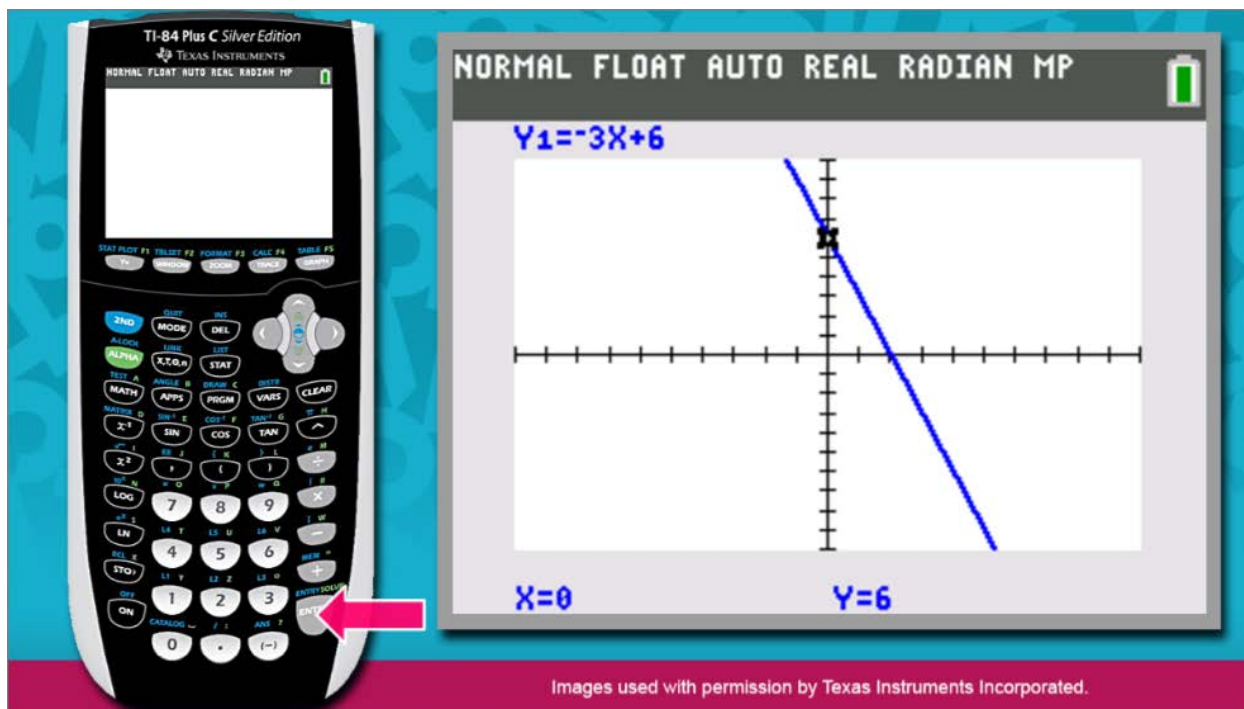


Notice in the bottom left corner of the window that the calculator is prompting you to enter a value of  $x$ .

## Module 10: Linear and Quadratic Function Families

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Example 4 (continued)



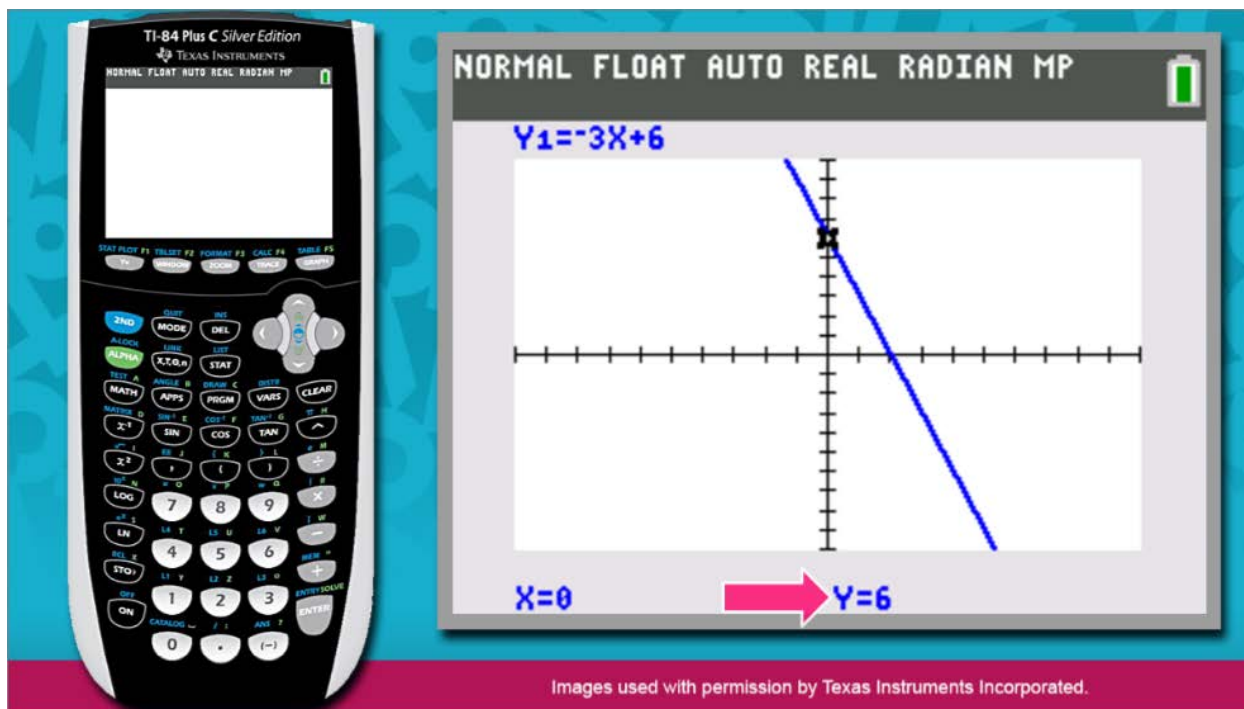
Recall that the  $y$ -intercept is the output value that results from an input value of 0.

Press 0. Then, press ENTER.

## Module 10: Linear and Quadratic Function Families

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#### Example 4 (continued)

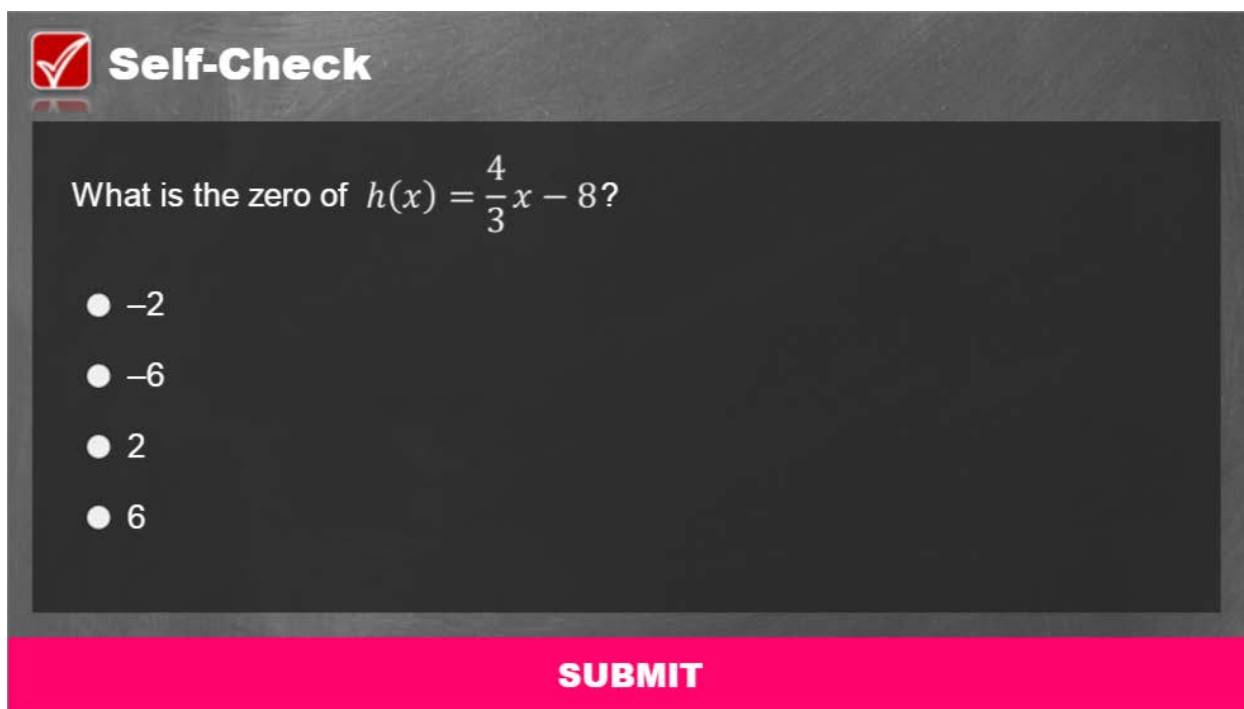


The cursor is blinking at the location of the y-intercept  $(0, 6)$ .

At the bottom of the window, you'll also notice that the calculator informs you that when  $x = 0$ ,  $y = 6$ .

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Self-Check 1



**Self-Check**

What is the zero of  $h(x) = \frac{4}{3}x - 8$ ?

- 2
- 6
- 2
- 6

**SUBMIT**

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

**Module 10: Linear and Quadratic Function Families**  
**Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes**

Self-Check 1: Answer

The screenshot shows a self-check interface with a grey background and a red checkmark icon in the top left corner. The word "Self Check" is partially visible. The main content is a white rounded rectangle with the following text and equations:

**Correct**

That's correct! Set  $h(x) = 0$ , and solve for  $x$  in the given equation. Start by adding 8 to each side of the equation.

$$h(x) = \frac{4}{3}x - 8$$
$$0 = \frac{4}{3}x - 8$$
$$\begin{array}{r} +8 \qquad +8 \\ \hline 8 = \frac{4}{3}x \end{array}$$

Next, multiply both sides by 3.

$$3 \cdot 8 = \frac{4}{3}x \cdot 3$$
$$24 = 4x$$

Lastly, divide each side by 4.

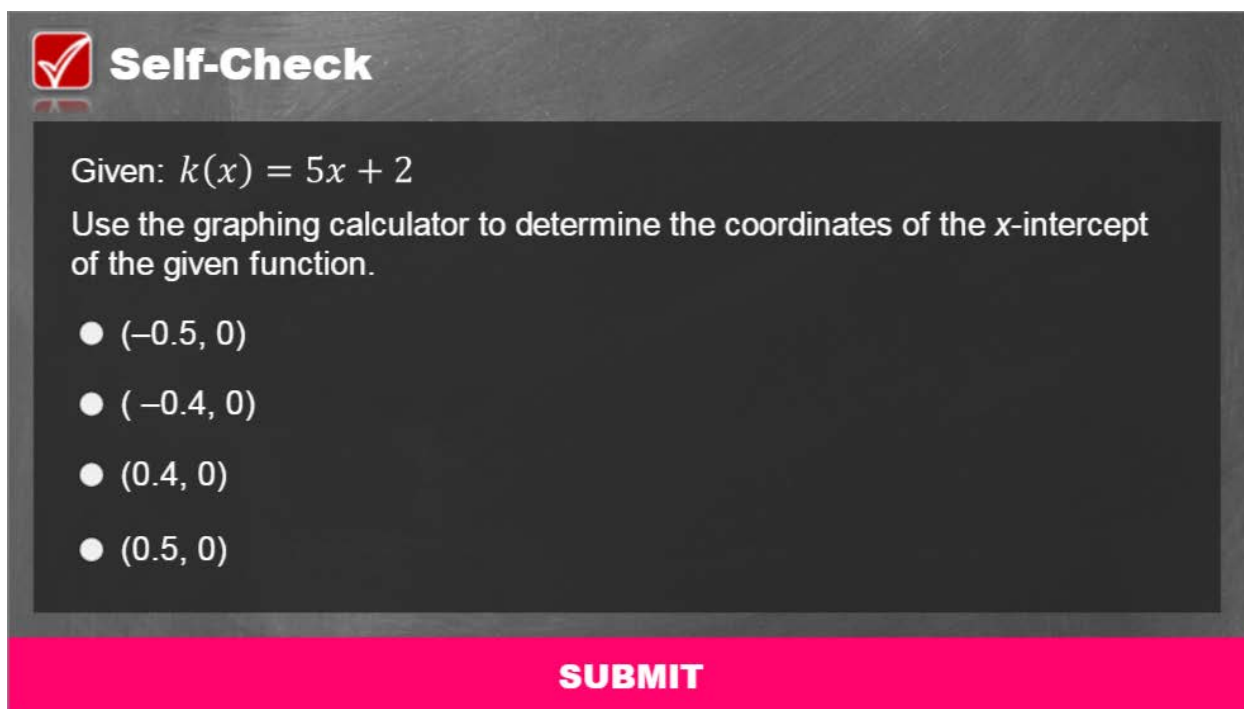
$$\frac{24}{4} = \frac{4x}{4}$$
$$6 = x$$

At the bottom of the white box is a "Continue" button. Below the white box is a red bar with the word "SUBMIT" in white capital letters.

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, the function  $k(x) = 5x + 2$  is given. The instruction asks to use a graphing calculator to find the x-intercept. Four multiple-choice options are listed: (-0.5, 0), (-0.4, 0), (0.4, 0), and (0.5, 0). A bright pink "SUBMIT" button is at the bottom.

**Self-Check**

Given:  $k(x) = 5x + 2$

Use the graphing calculator to determine the coordinates of the x-intercept of the given function.

- (-0.5, 0)
- (-0.4, 0)
- (0.4, 0)
- (0.5, 0)

**SUBMIT**

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

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Self-Check 2: Answer

**Self Check**

**Correct**

NORMAL FLOAT AUTO REAL RADIAN MP

**CALCULATE**

- 1:value
- 2:zero**
- 3:minimum
- 4:maximum
- 5:intersect
- 6:dy/dx
- 7:ff(x)dx

Press **TRACE**, and select the zero option on the **CALCULATE** menu. Then, press **ENTER**.

NORMAL FLOAT AUTO REAL RADIAN MP

**CALC ZERO**

$V_1=5X+2$

Guess?  
X= .1515152    Y=1.2424242

Use the left and right arrow keys to set the boundaries for the region in which you would like to search for the x-intercept.

Part One    **Part Two**    Part Three    Continue

**SUBMIT**

**Self Check**

**Correct**

NORMAL FLOAT AUTO REAL RADIAN MP

**CALCULATE**

- 1:value
- 2:zero**
- 3:minimum
- 4:maximum
- 5:intersect
- 6:dy/dx
- 7:ff(x)dx

Press **TRACE**, and select the zero option on the **CALCULATE** menu. Then, press **ENTER**.

NORMAL FLOAT AUTO REAL RADIAN MP

**CALC ZERO**

$V_1=5X+2$

Guess?  
X= .1515152    Y=1.2424242

Use the left and right arrow keys to set the boundaries for the region in which you would like to search for the x-intercept.

Part One    **Part Two**    Part Three    Continue

**SUBMIT**

For your reference, the images above show the correct solution to the self-check problem.

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Self-Check 2: Answer (continued)

**Correct**

Press **ENTER** when the calculator prompts you to confirm that you are ready for it to determine the location of the x-intercept.

The zero of the function is  $-0.4$ .  
Therefore, the coordinates of the x-intercept are  $(-0.4, 0)$ .

**Calculator Window:**  
NORMAL FLOAT AUTO REAL RADIAN MP  
CALC ZERO  
 $Y_1=5X+2$   
Zero  
 $X=-.4$        $Y=0$

Part One    Part Two    **Part Three**    Continue

**SUBMIT**

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



**Module 10: Linear and Quadratic Function Families**  
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Self-Check 3



**Self-Check**

Given:  $m(x) = 4x - 12$ . Which of the following shows the work needed to find the y-intercept of the function?

$m(x) = 4x - 12$   
 $0 = 4x - 12$   
 $\quad +12 \quad +12$   

---

 $12 = 4x$   
 $\quad \underline{4} \quad \underline{4}$   
 $3 = x$

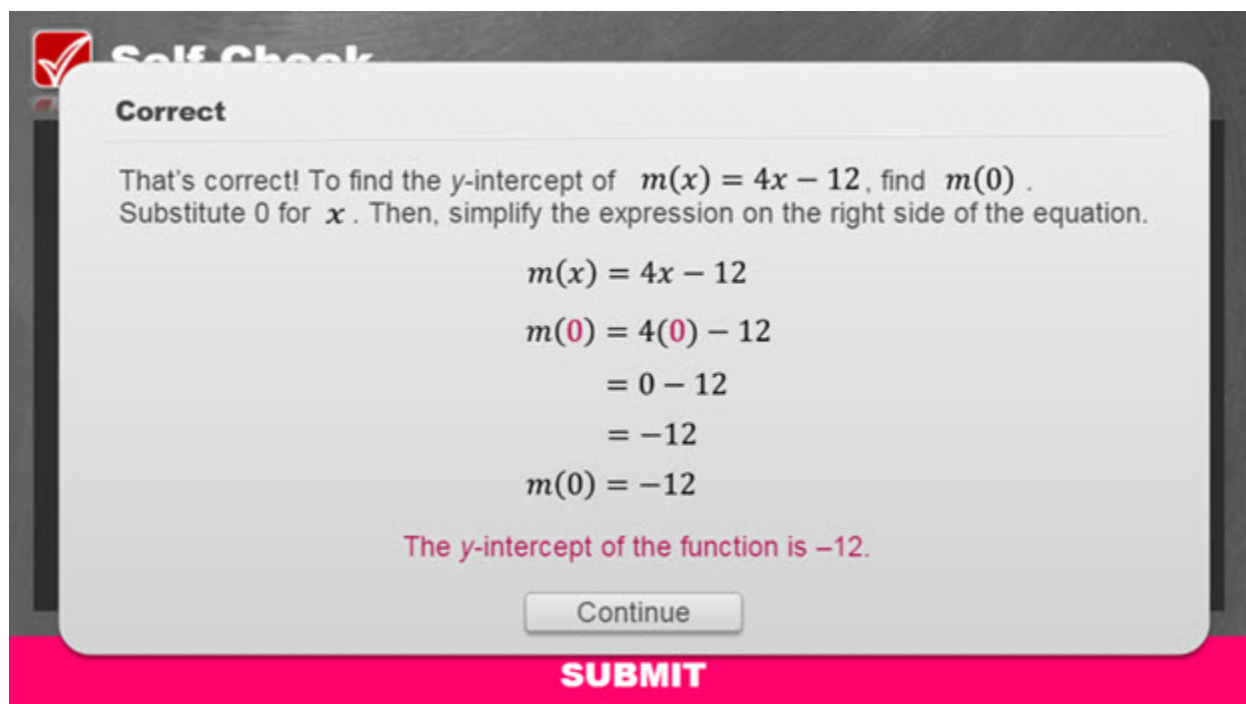
$m(x) = 4x - 12$   
 $m(0) = 4(0) - 12$   
 $\quad = 0 - 12$   
 $\quad = -12$   
 $m(0) = -12$

**SUBMIT**

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

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Self-Check 3: Answer



**Correct**

That's correct! To find the y-intercept of  $m(x) = 4x - 12$ , find  $m(0)$ . Substitute 0 for  $x$ . Then, simplify the expression on the right side of the equation.

$$\begin{aligned}m(x) &= 4x - 12 \\m(0) &= 4(0) - 12 \\&= 0 - 12 \\&= -12 \\m(0) &= -12\end{aligned}$$

The y-intercept of the function is  $-12$ .

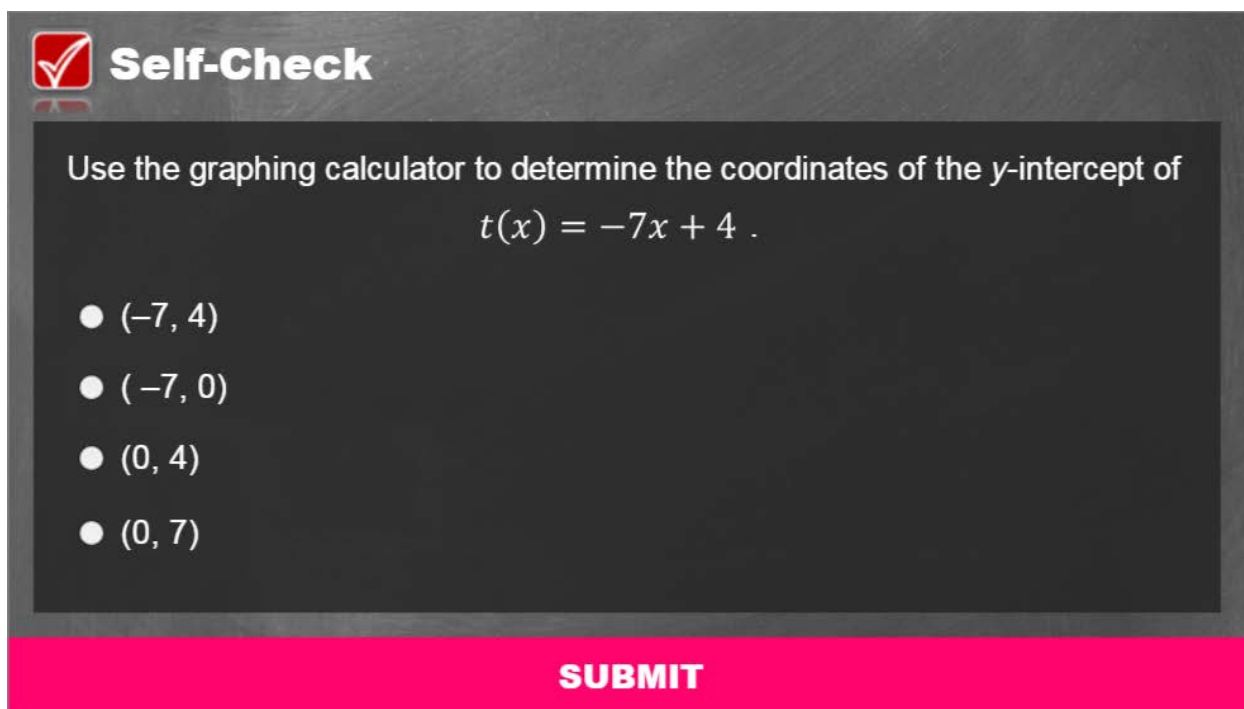
Continue

**SUBMIT**

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

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Self-Check 4

A self-check interface with a dark grey background. At the top left is a red checkmark icon in a square, followed by the text "Self-Check" in white. Below this is a dark grey rectangular area containing the text "Use the graphing calculator to determine the coordinates of the y-intercept of" followed by the equation  $t(x) = -7x + 4$ . Below the equation are four radio button options:  $(-7, 4)$ ,  $(-7, 0)$ ,  $(0, 4)$ , and  $(0, 7)$ . At the bottom of the interface is a bright pink rectangular button with the word "SUBMIT" in white capital letters.

**Self-Check**

Use the graphing calculator to determine the coordinates of the  $y$ -intercept of

$$t(x) = -7x + 4 .$$

- $(-7, 4)$
- $(-7, 0)$
- $(0, 4)$
- $(0, 7)$

**SUBMIT**

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

# Module 10: Linear and Quadratic Function Families

## Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

### Self-Check 4: Answer

**Correct**

That's correct!

Plot1 Plot2 Plot3  
Y1 = -7X + 4  
Y2 =  
Y3 =  
Y4 =  
Y5 =  
Y6 =  
Y7 =  
Y8 =  
Y9 =

Press the **Y=** key. Enter the expression  $-7x + 4$  to the right of **Y1**.

Press **GRAPH**. Then, press **2nd** to begin identifying the y-intercept.

Part One    Part Two    Part Three    Continue

**SUBMIT**

**Correct**

**TRACE**  
1:value  
2:zero  
3:minimum  
4:maximum  
5:intersect  
6:dy/dx  
7:∫f(x)dx

Press the **TRACE** key, and then press **1** to access the value option.

Press **0**. Then press **ENTER**.

Part One    Part Two    Part Three    Continue

**SUBMIT**

For your reference, the images above show the correct solution to the self-check problem.

**Module 10: Linear and Quadratic Function Families**  
**Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes**

Self-Check 4: Answer (continued)

**Correct**

Notice the cursor is blinking at the location of the y-intercept (0, 4).

At the bottom of the window, you'll also notice that the calculator informs you that when  $x = 0$ ,  $y = 4$ .

The coordinates of the y-intercept are (0, 4).

**Y1=-7X+4**

**X=0**      **Y=4**

Part One    Part Two    **Part Three**    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 2 Content: Finding Zeros and Intercepts of Linear Functions Notes**

**Conclusion**



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checklist with two items, each preceded by a checkmark: "Determined the zero of a linear function" and "Determined the intercepts of a linear function". Below the checklist are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of this box is a cartoon illustration of a woman with dark skin, curly hair, and a pink long-sleeved shirt, set against a blue background with a pattern of mathematical symbols like pi, infinity, and numbers.

You have reached the conclusion of this lesson where you learned how to determine the zero and the intercepts of a linear function.