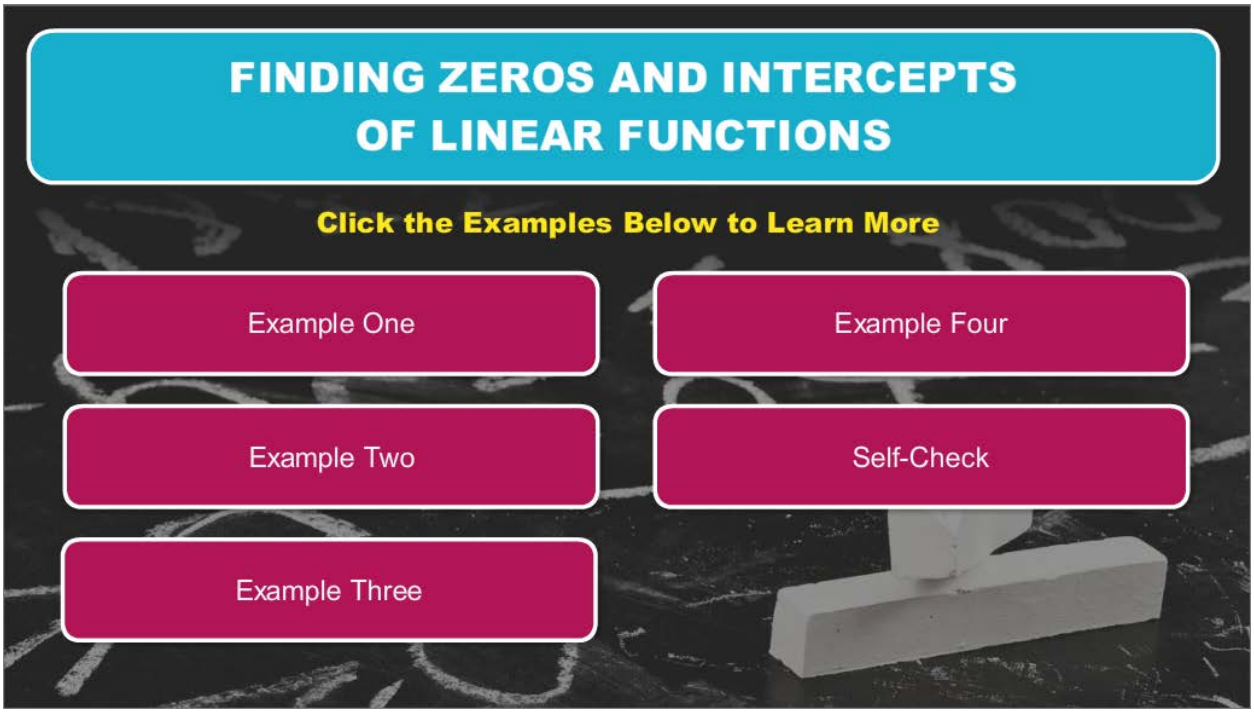
Module 10: Linear and Quadratic Function Families
Topic 2 Content: Finding Zeros and Intercepts of Linear Functions Notes

Introduction

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.

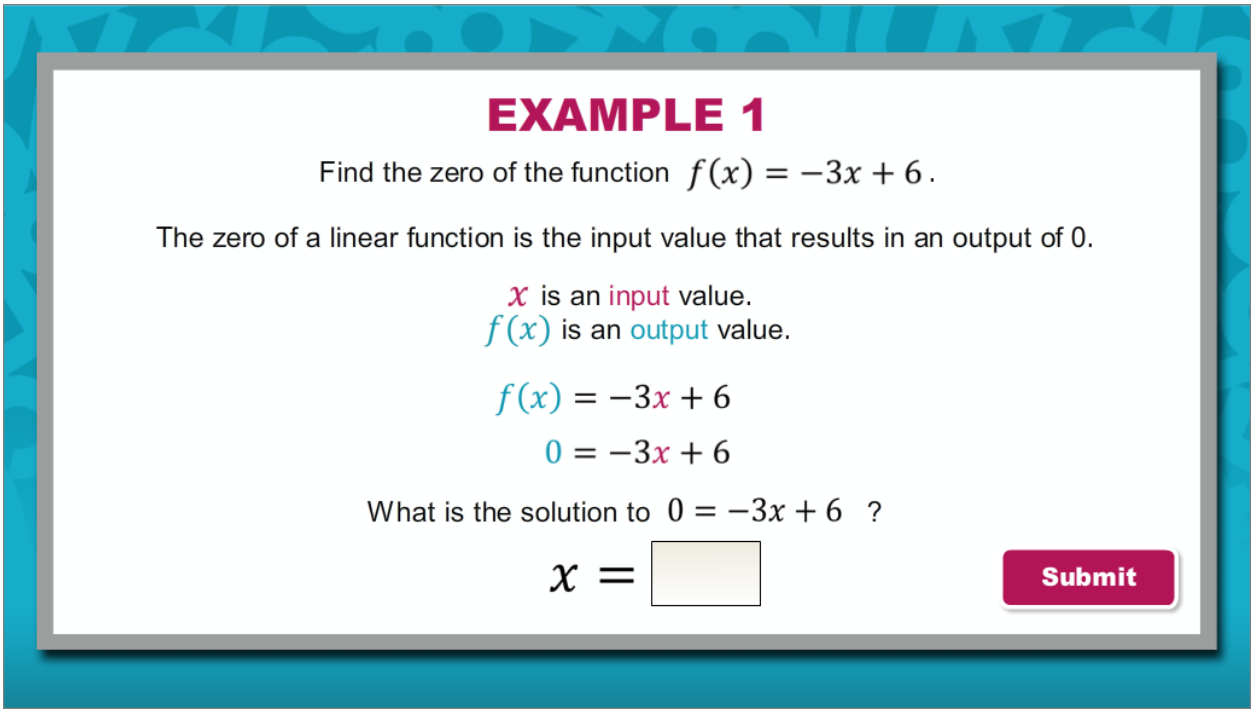
Finding Zeros and Intercepts of Quadratic Functions



Click the examples below to learn more.

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

Example One



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.

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

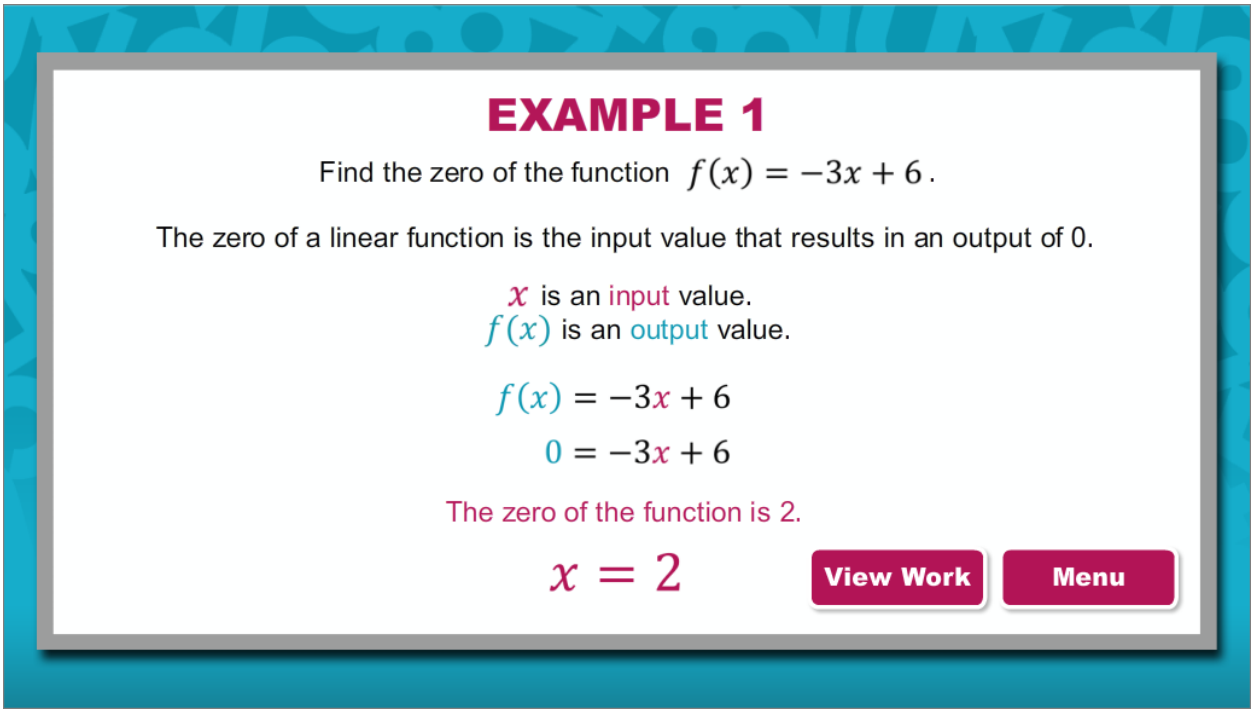
$0 = -3x + 6$

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

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

$x = ?$

Example One (continued)

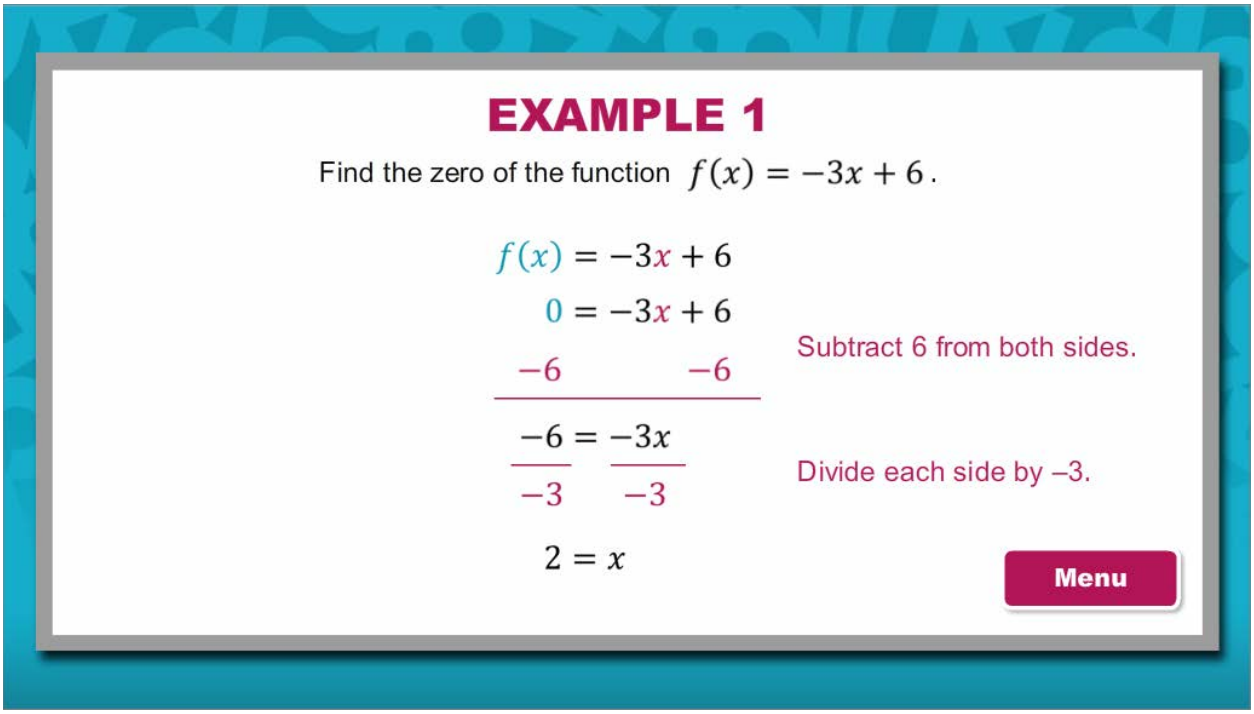


Find the zero of the function $f(x) = -3x + 6$.

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

$$x = 2$$

Example One (continued)



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

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

$0 = -3x + 6$

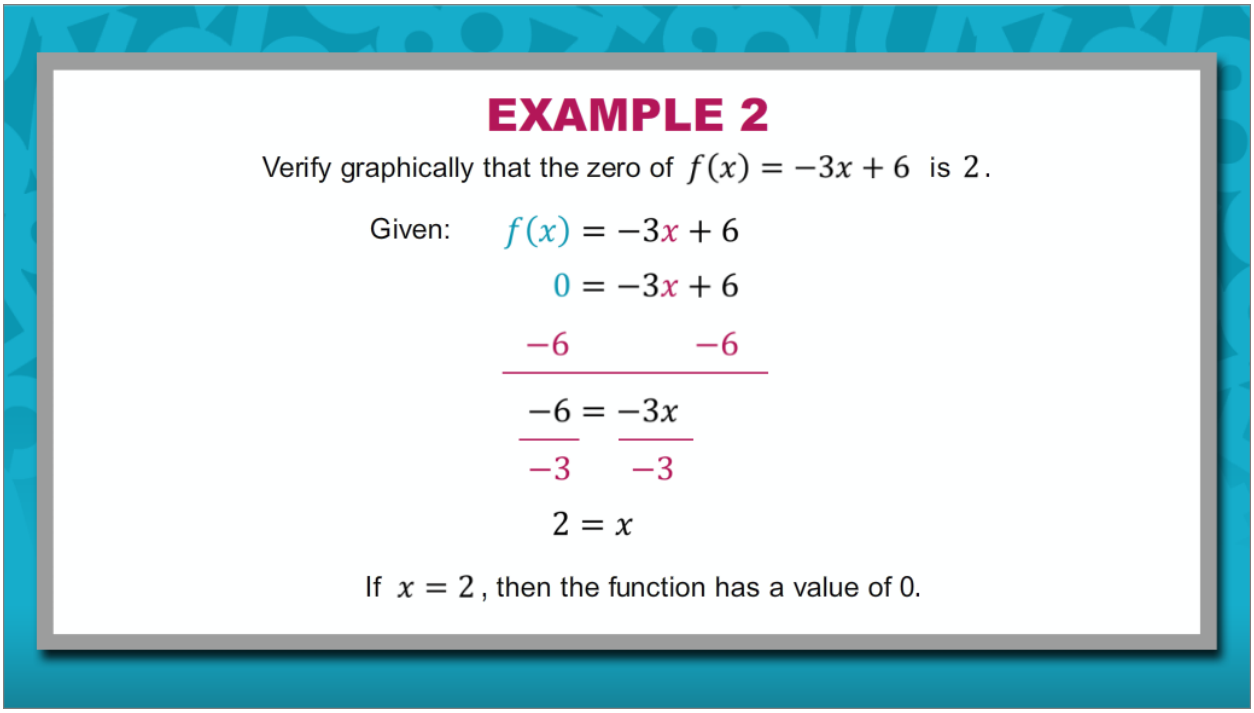
$-6 \quad -6$ Subtract 6 from both sides.

$-6 = -3x$

$\frac{-6}{-3} = \frac{-3x}{-3}$ Divide by 3.

$2 = x$

Example Two



EXAMPLE 2

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

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

$0 = -3x + 6$

$-6 \qquad -6$

$-6 = -3x$

$\frac{-6}{-3} = \frac{-3x}{-3}$

$2 = x$

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

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

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

$0 = -3x + 6$

$-6 \qquad -6$

$-6 = -3x$

$\frac{-6}{-3} = \frac{-3x}{-3}$

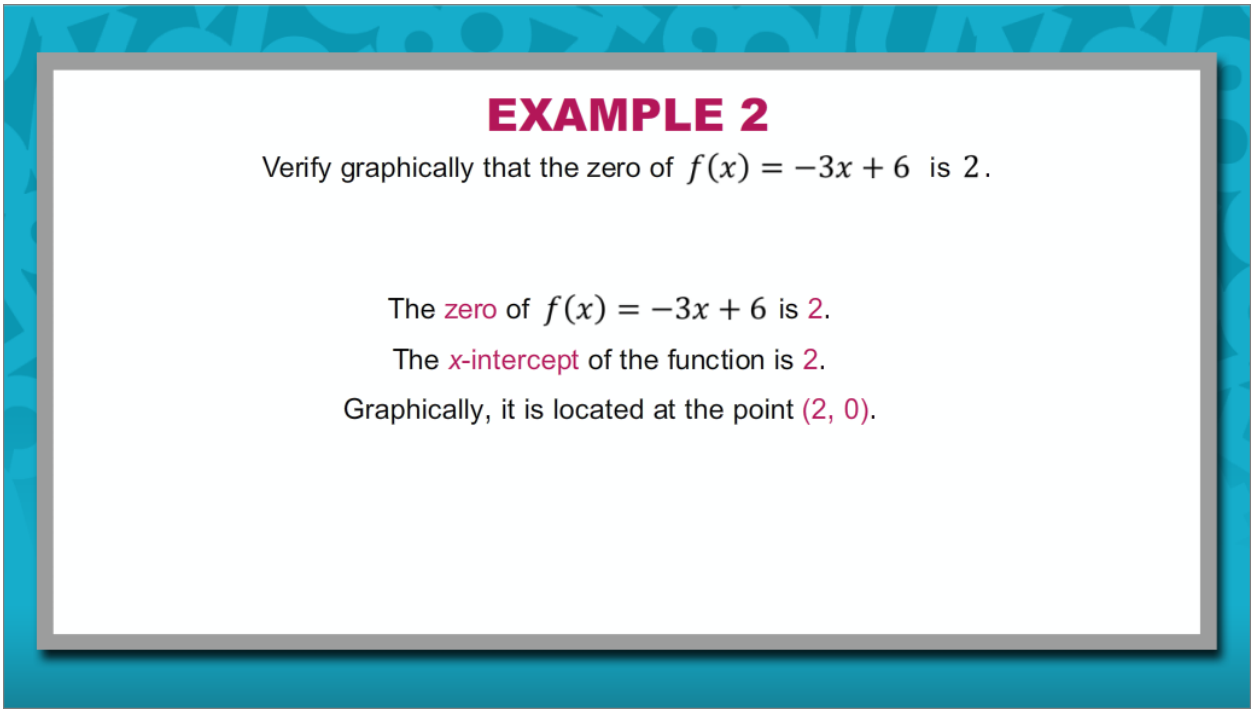
$2 = x$

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.

Example Two (continued)



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

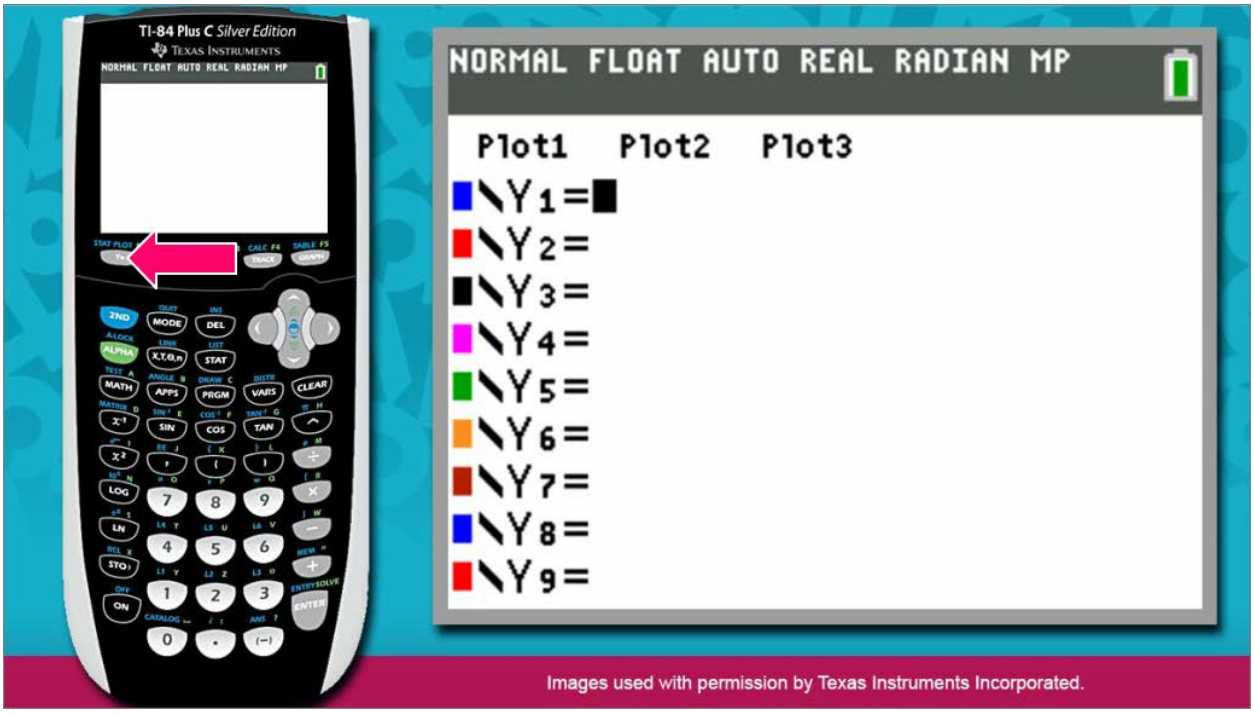
The zero of $f(x) = -3x + 6$ is 2.

The x-intercept of the function is 2.

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

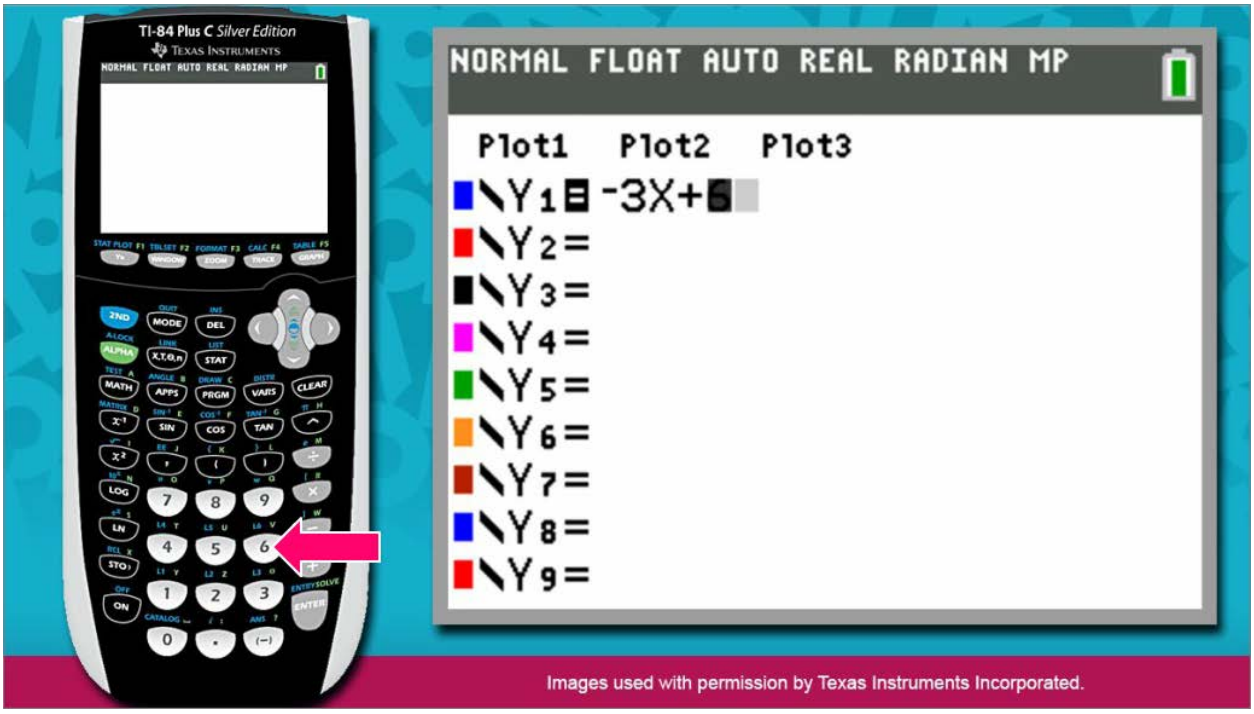
Because the zero of the function is 2, you can conclude that the x-intercept of the function is also 2. Graphically, it is the point located at $(2, 0)$. You can use the graphing calculator to verify this.

Example Two (continued)



Press the Y= key.

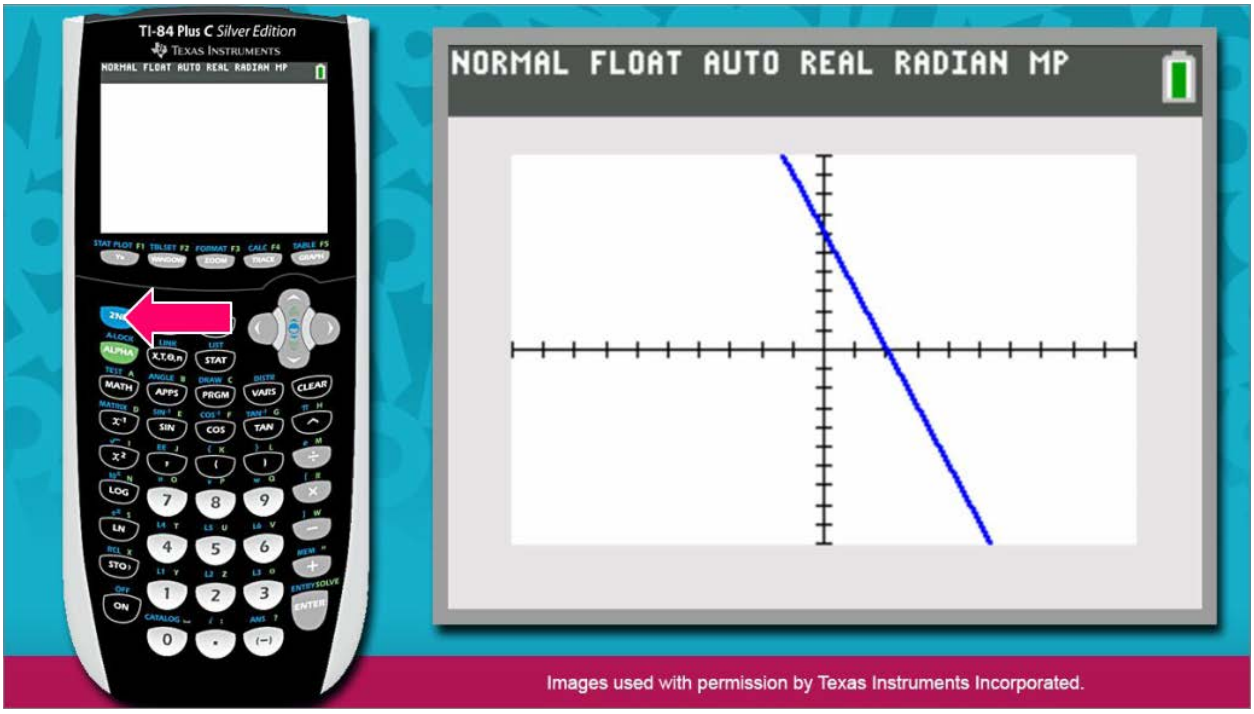
Example Two (continued)



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.

Example Two (continued)

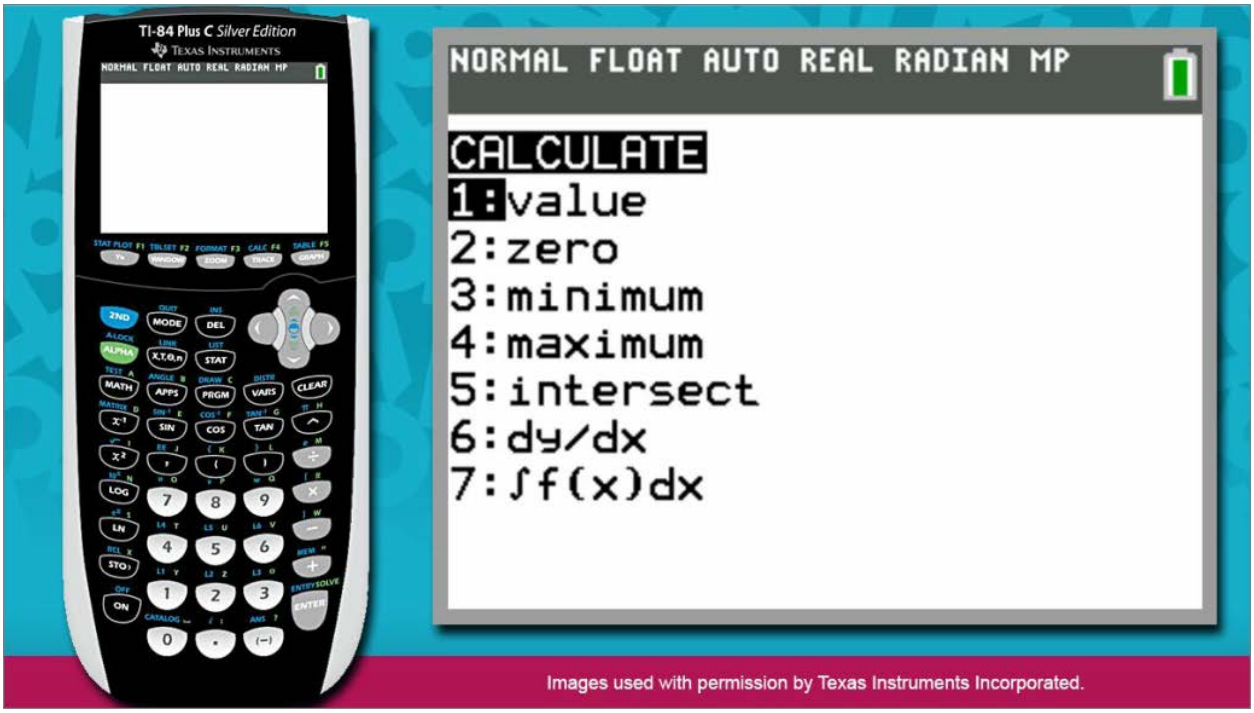


Now, press GRAPH.

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

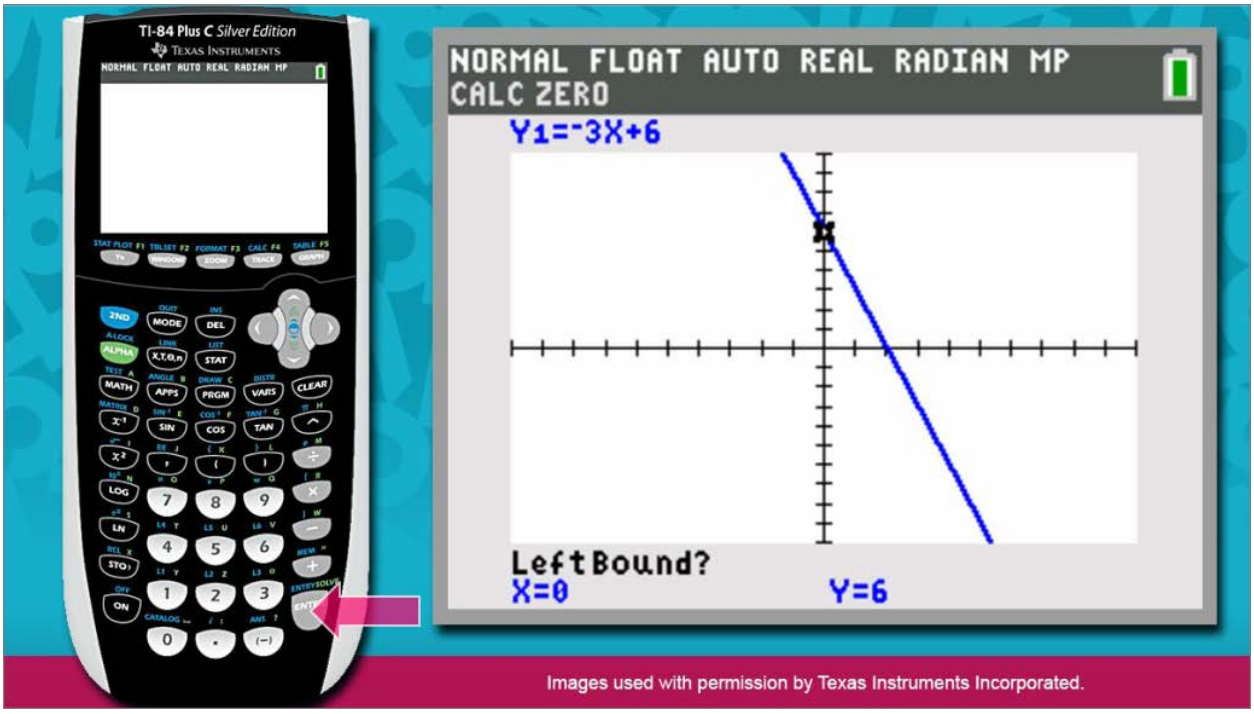
Press 2nd. This allows you to access a function stamped above a calculator key.

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.

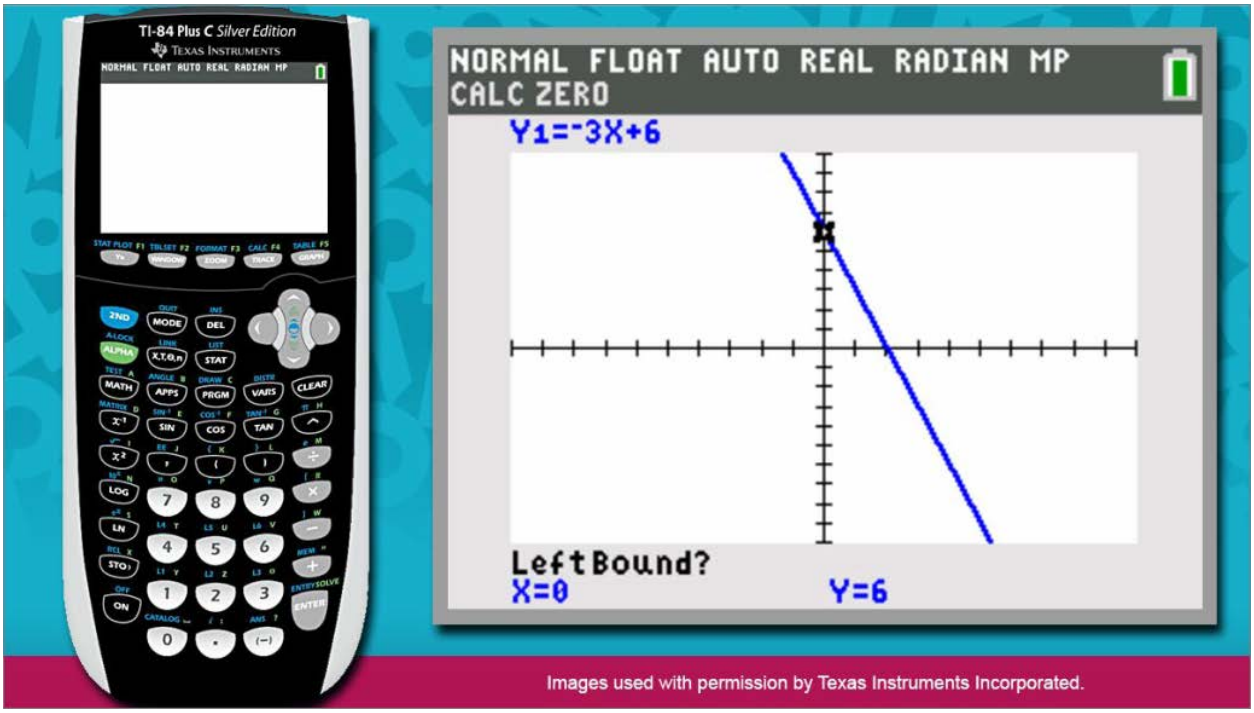
Example Two (continued)



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.

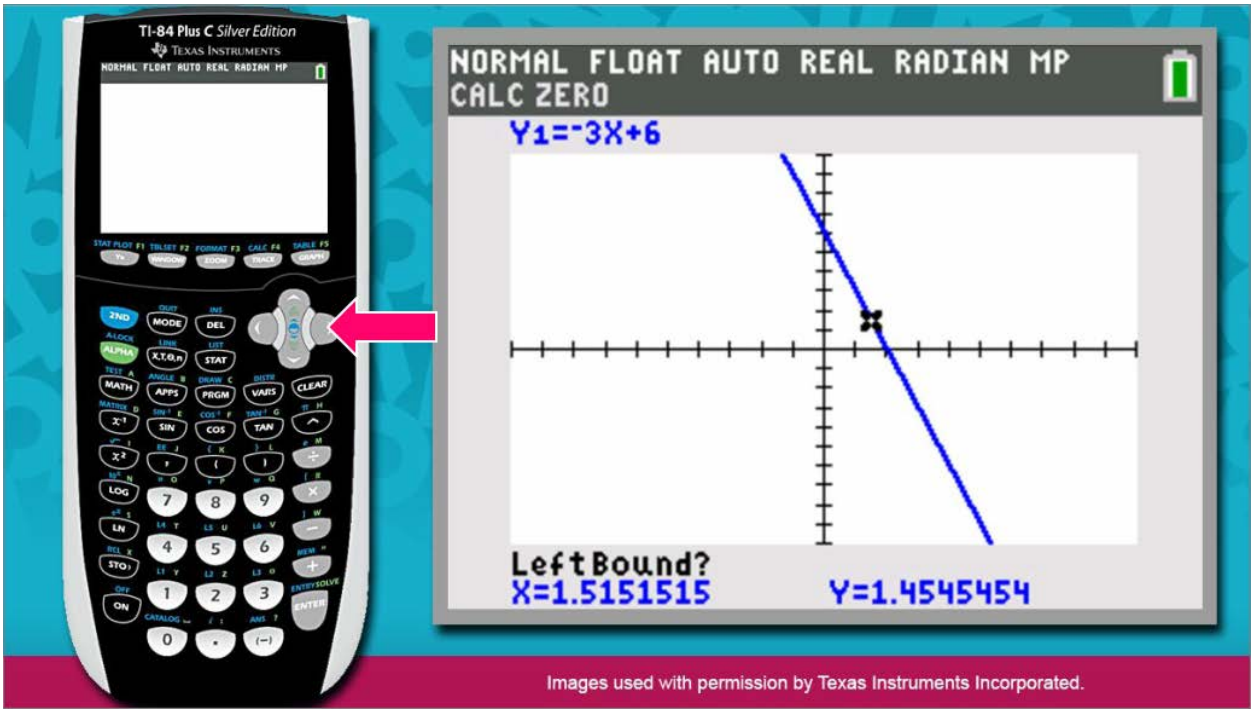
Now press ENTER.

Example Two (continued)



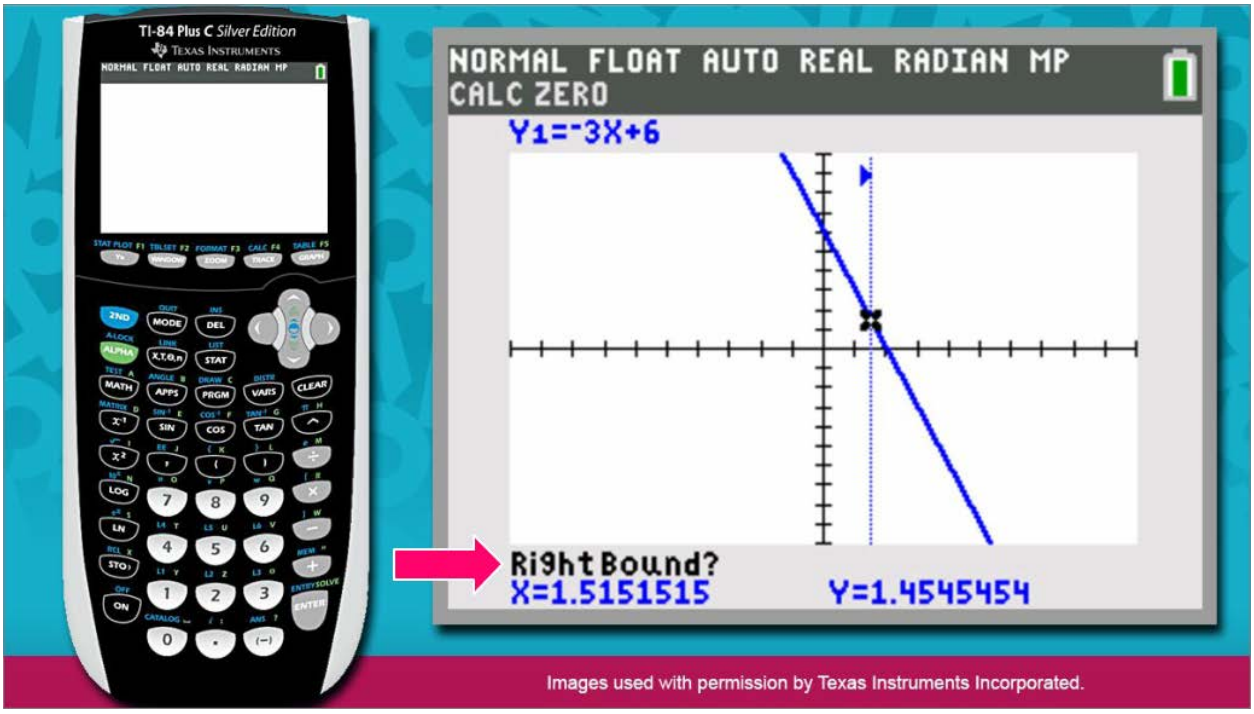
The calculator is now prepared to identify the x-intercept. You'll notice a question appear in the bottom left corner of the window. The calculator is prompting you to set a left boundary for the region in which you would like for it to search for the x-intercept.

Example Two (continued)



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

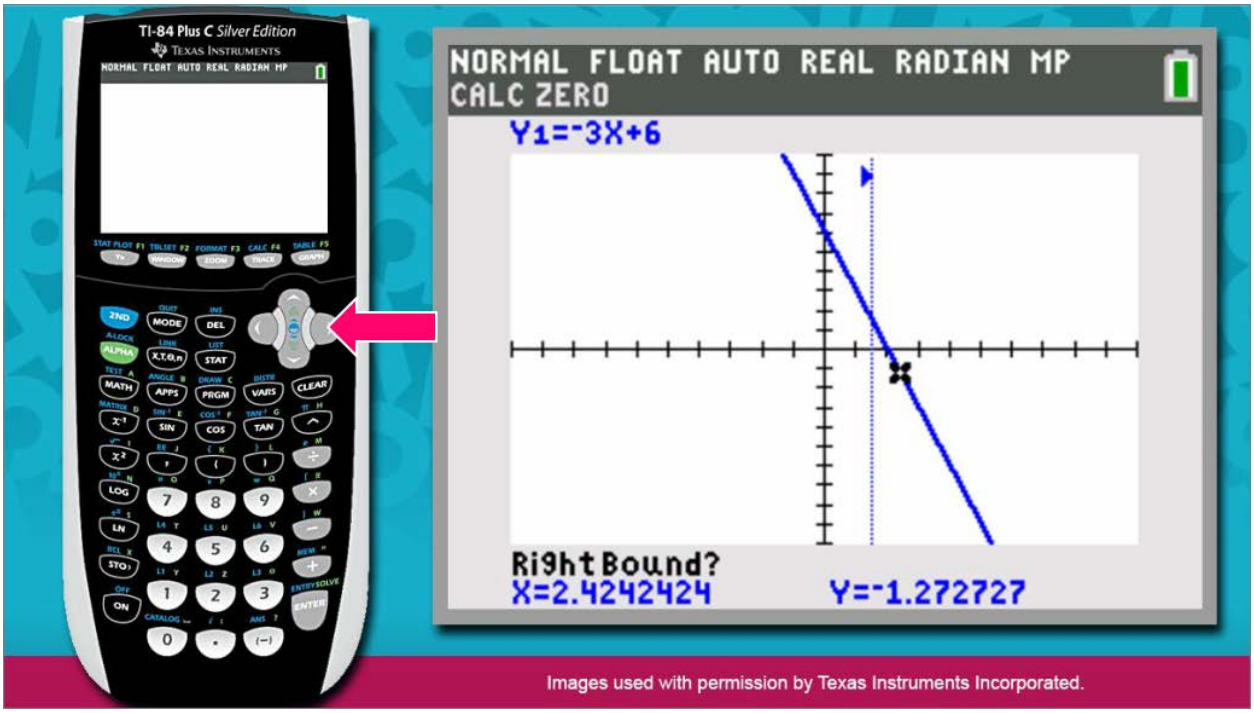
Example Two (continued)



Then, press ENTER.

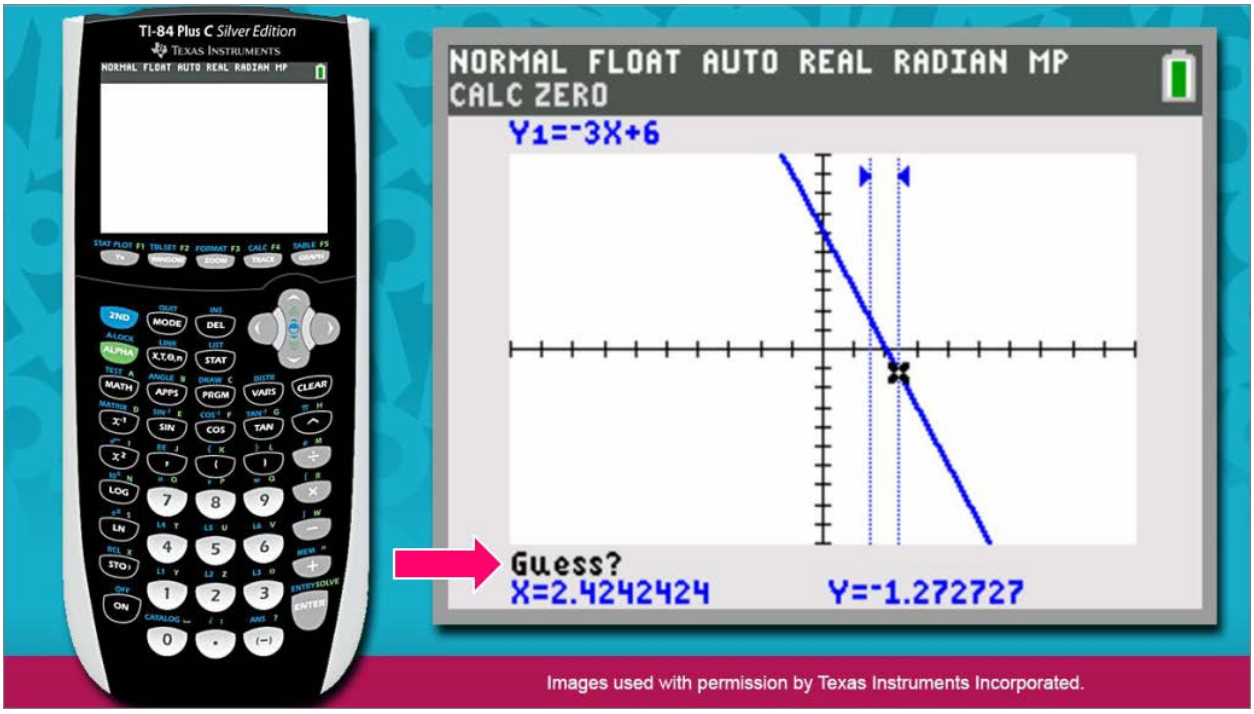
You'll notice that a vertical line now appears at the location of the left boundary. The calculator now prompts you to set the right boundary.

Example Two (continued)



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

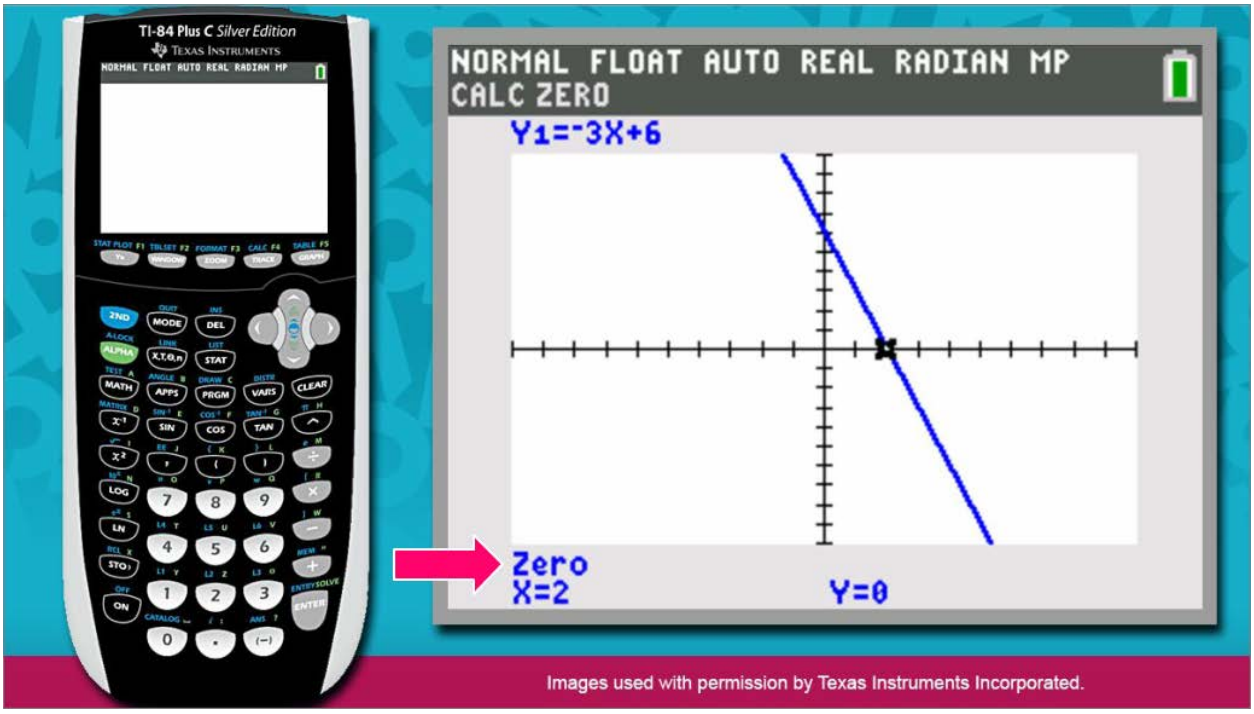
Example Two (continued)



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.

Example Two (continued)

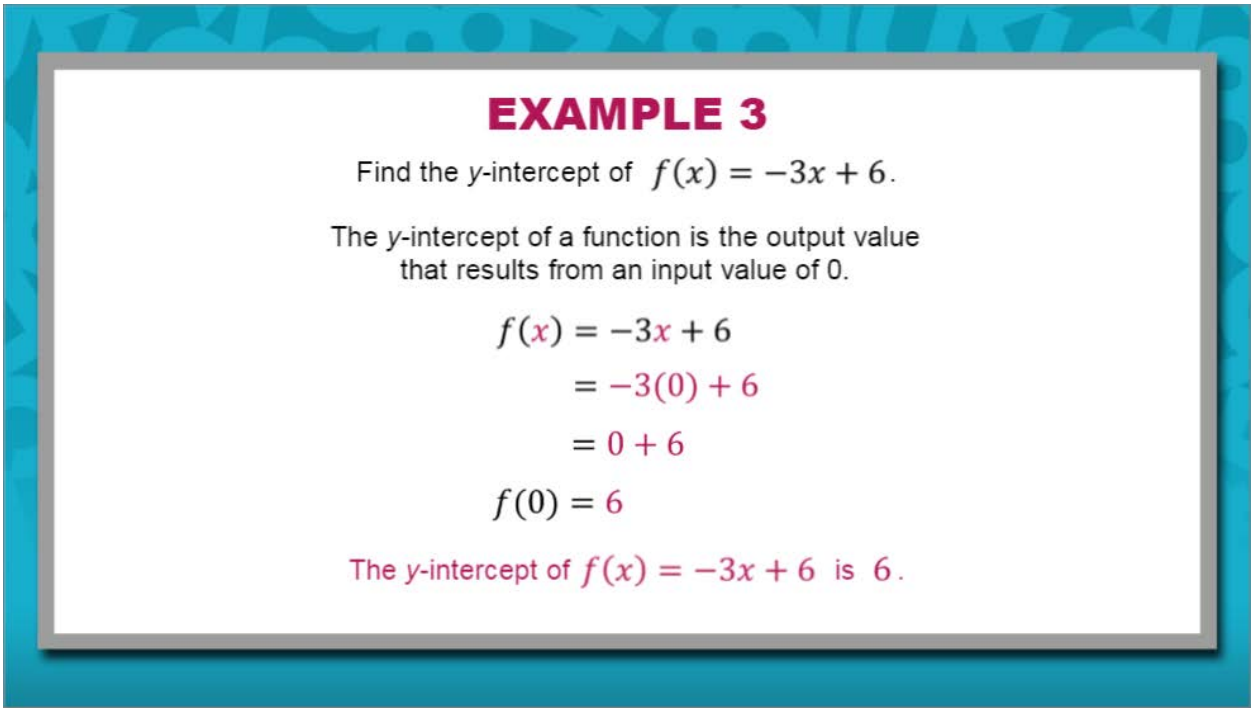


Press ENTER.

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.

Example 3



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

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

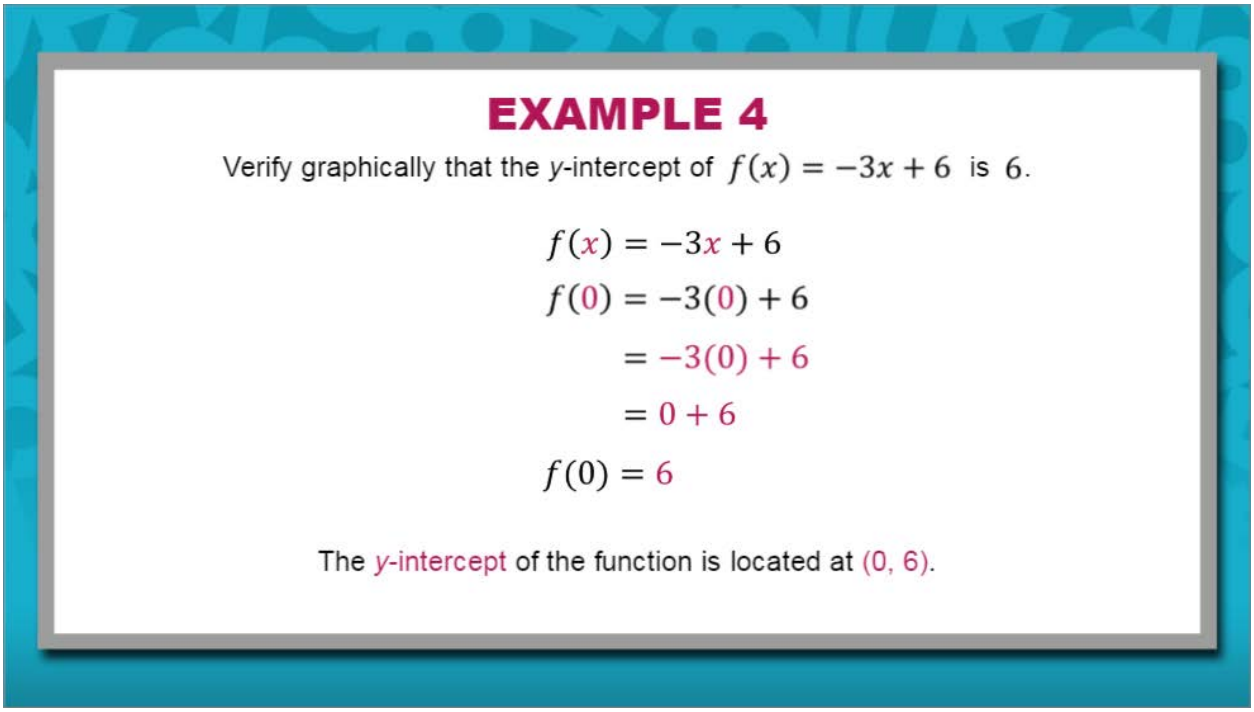
$$f(0) = -3(0) + 6$$

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.

$f(0) = -3(0) + 6$	$-3 \cdot 0 = 0$.
$= 0 + 6$	Bring down the addition sign and 6.
$= 6$	$0 + 6 = 6$.

$f(0) = 6$	So, $f(0) = 6$.
The y-intercept of $f(x) = -3x + 6$ is 6.	Therefore, the y-intercept of the function is 6.

Example 4



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

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

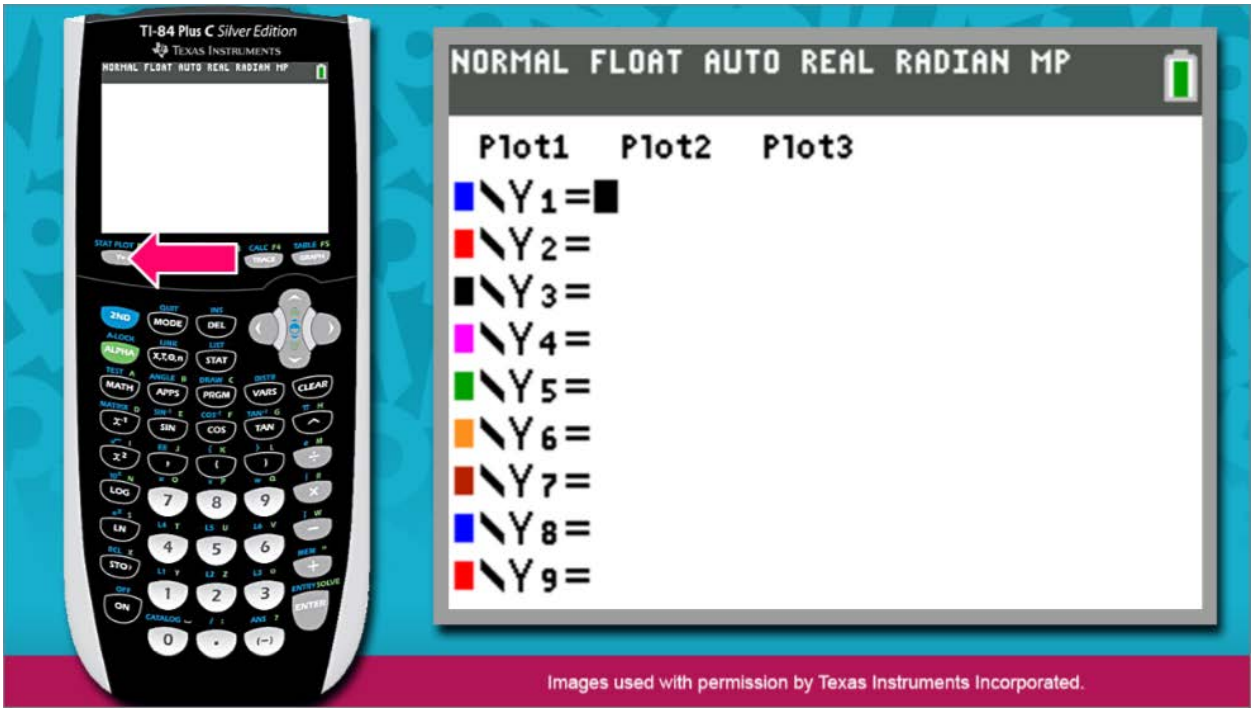
$$f(0) = -3(0) + 6$$
$$= -3(0) + 6$$
$$= 0 + 6$$
$$f(0) = 6$$

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 $(0, 6)$.

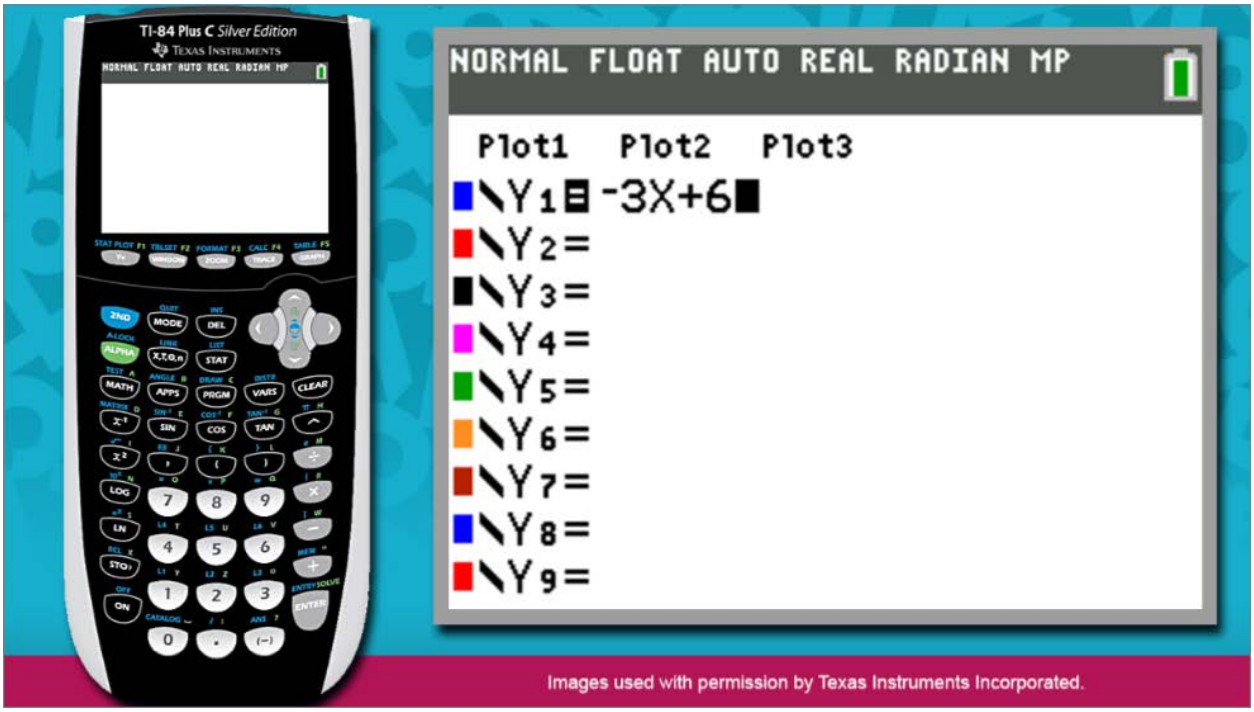
You can use the graphing calculator to verify this.

Example 4 (continued)



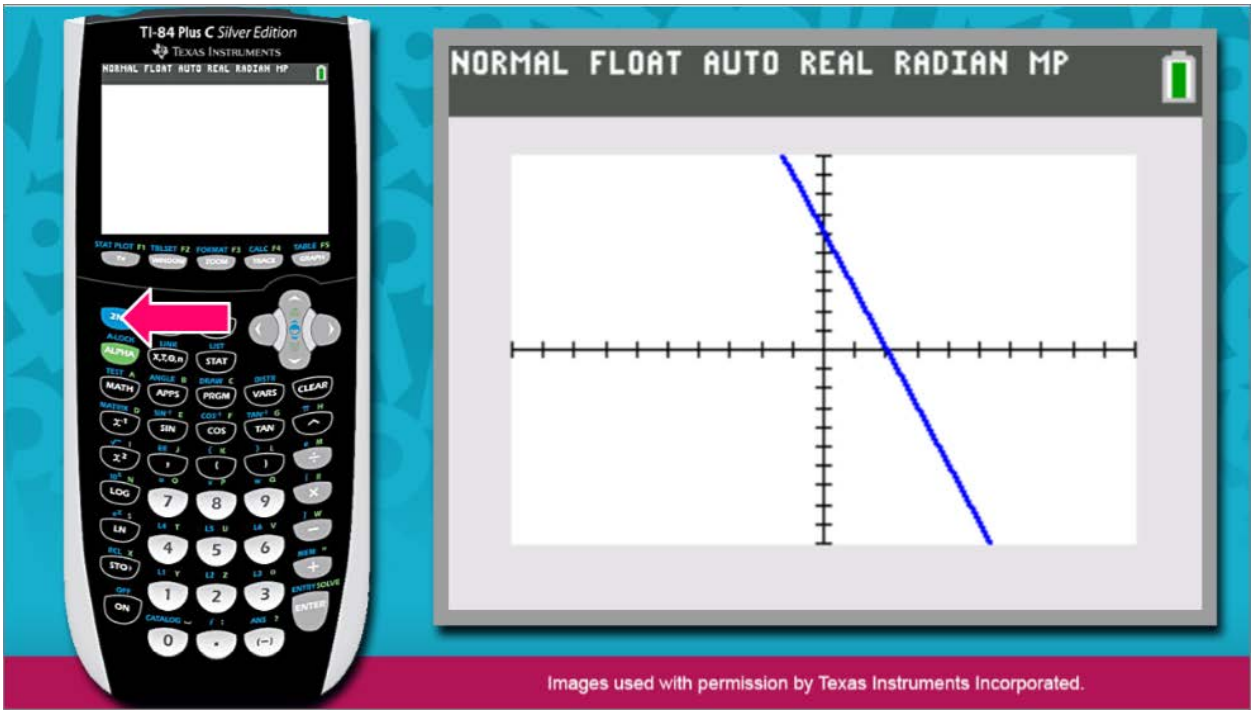
Press the Y= key.

Example 4 (continued)



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

Example 4 (continued)

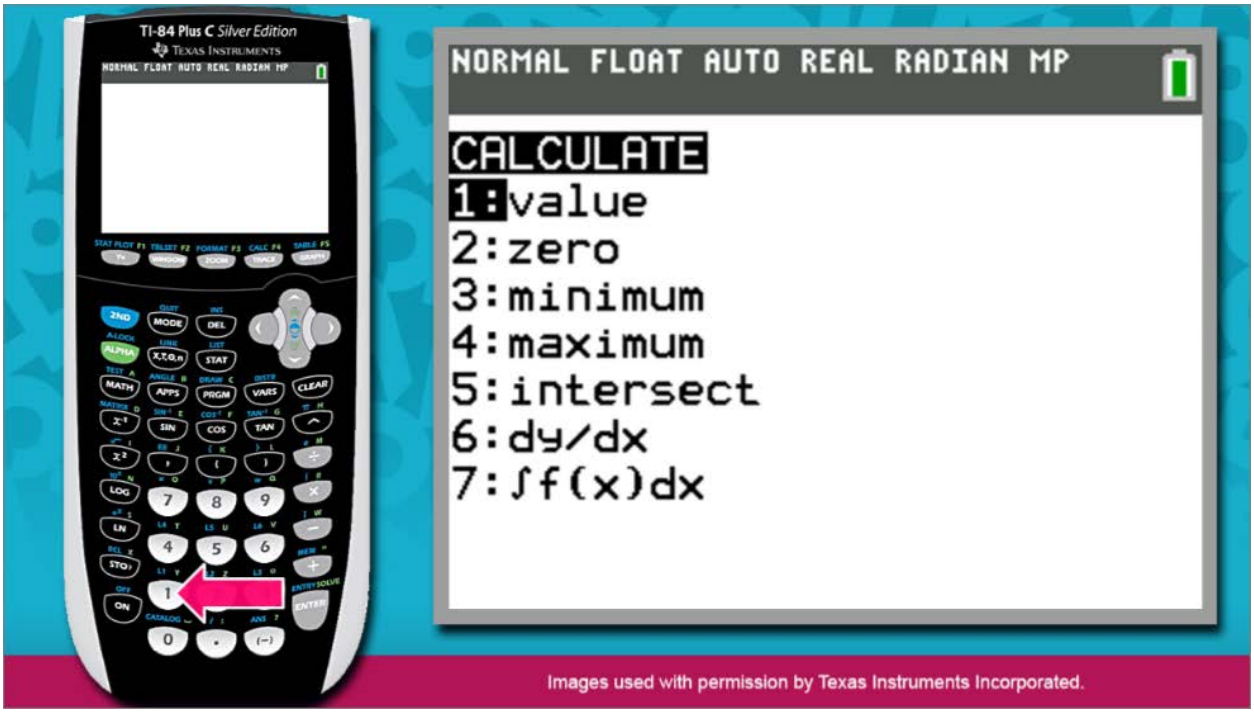


Now, press GRAPH.

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

Press 2nd. This allows you to access a function stamped above a calculator key.

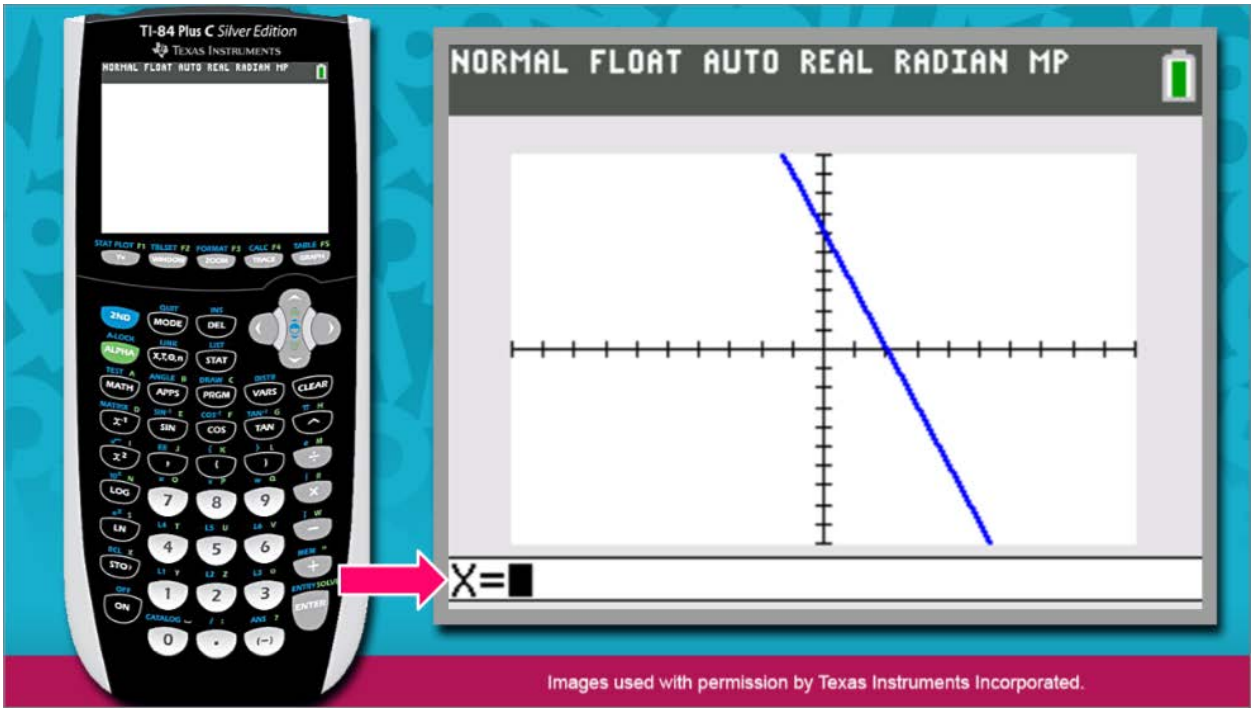
Example 4 (continued)



Now press the TRACE key to access the CALCULATE menu.

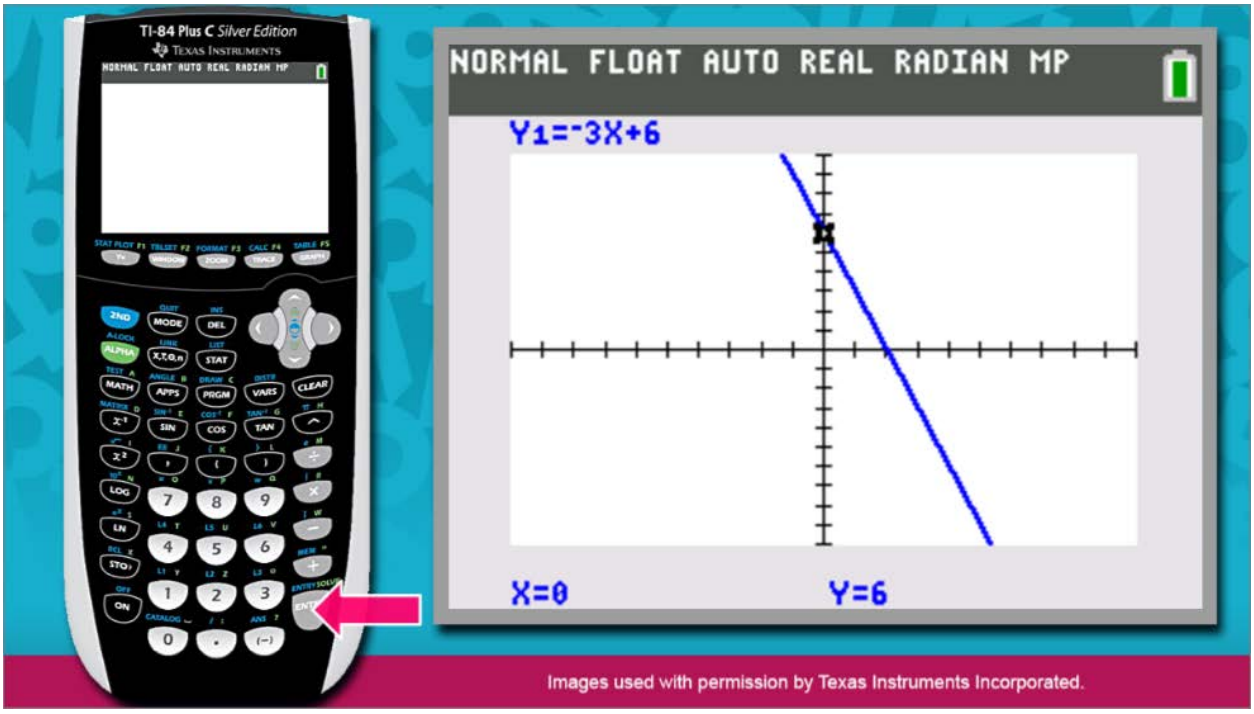
Press 1 to access the value option. This option will allow you to enter an input value.

Example 4 (continued)



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

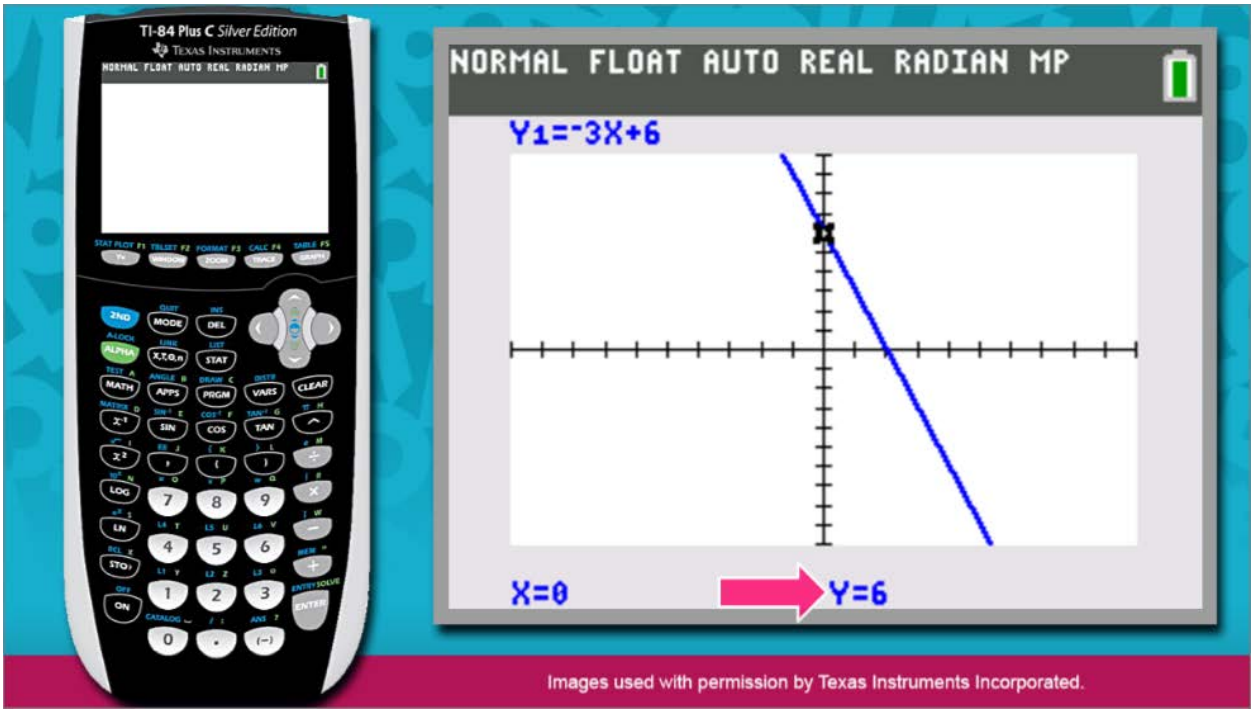
Example 4 (continued)



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

Press 0. Then, press ENTER.

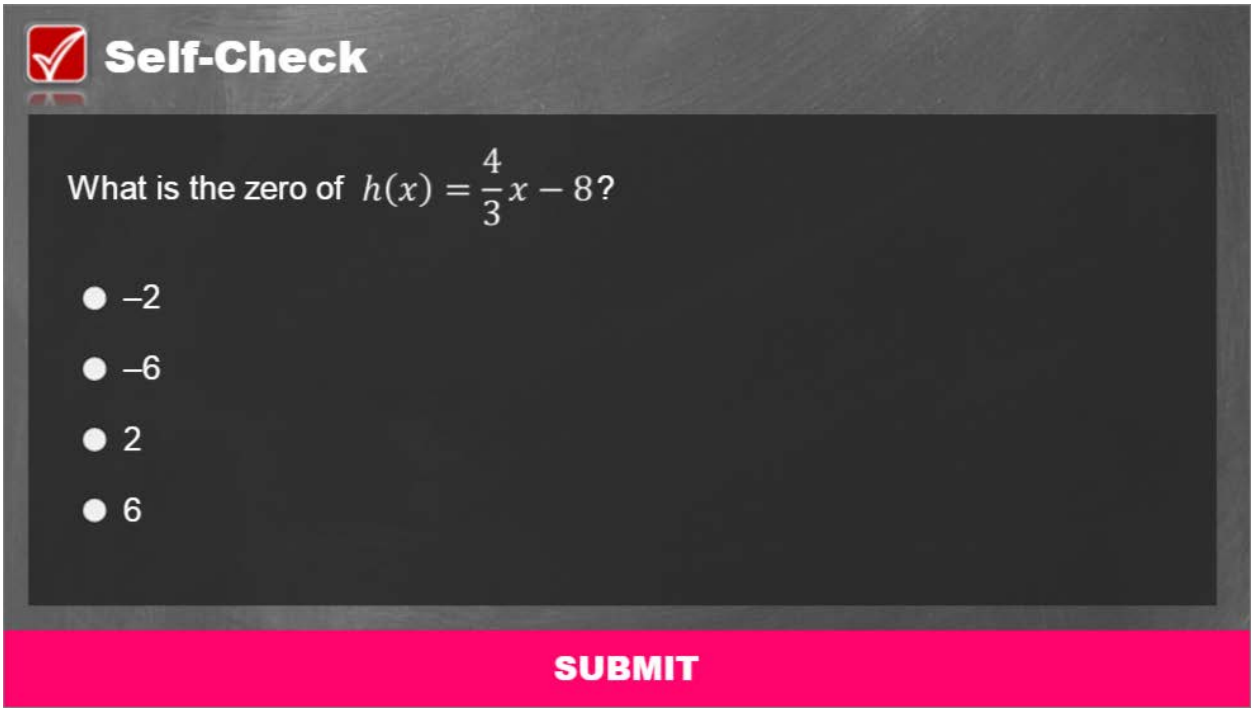
Example 4 (continued)



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

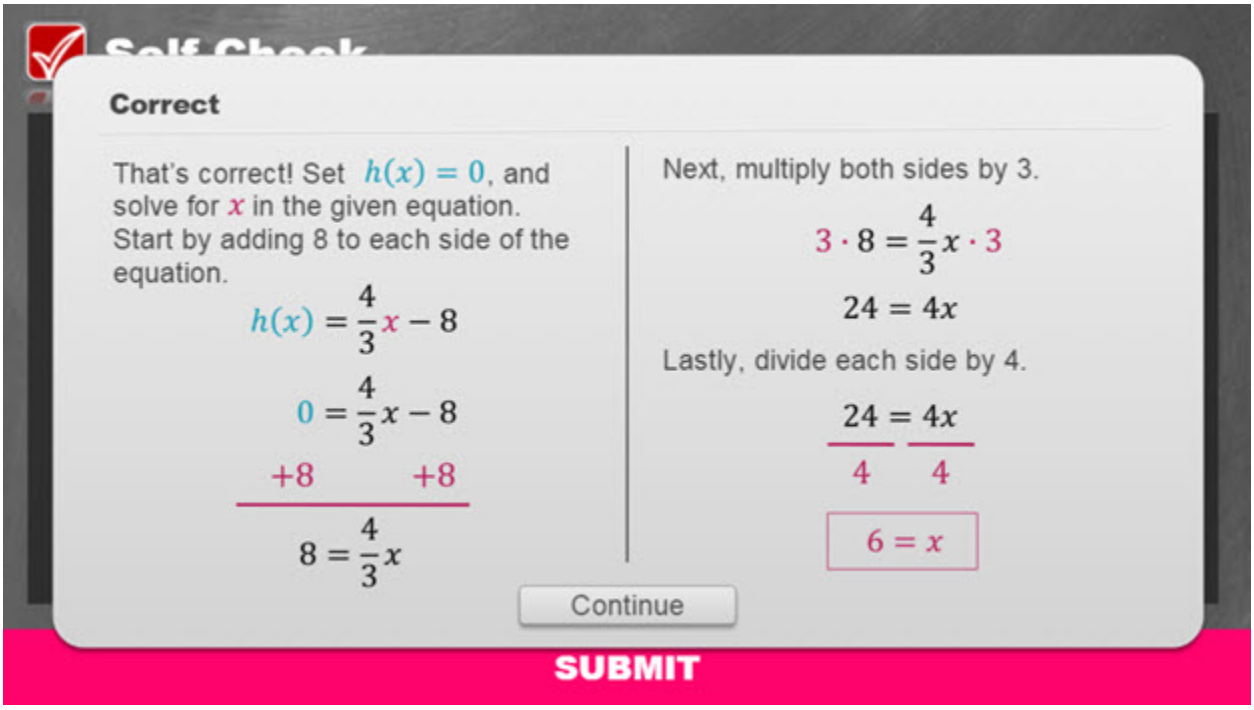
At the bottom of the window, you'll also notice that the calculator informs you that when $x = 0$, $y = 6$.

Self-Check 1



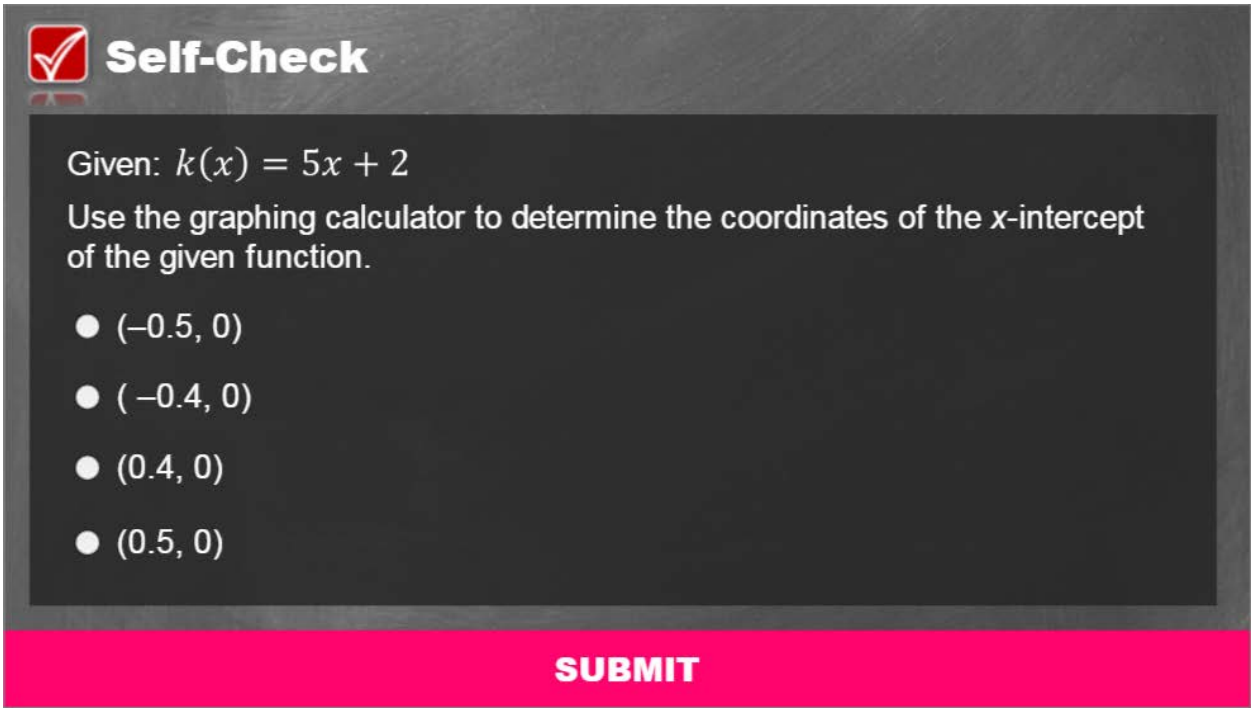
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



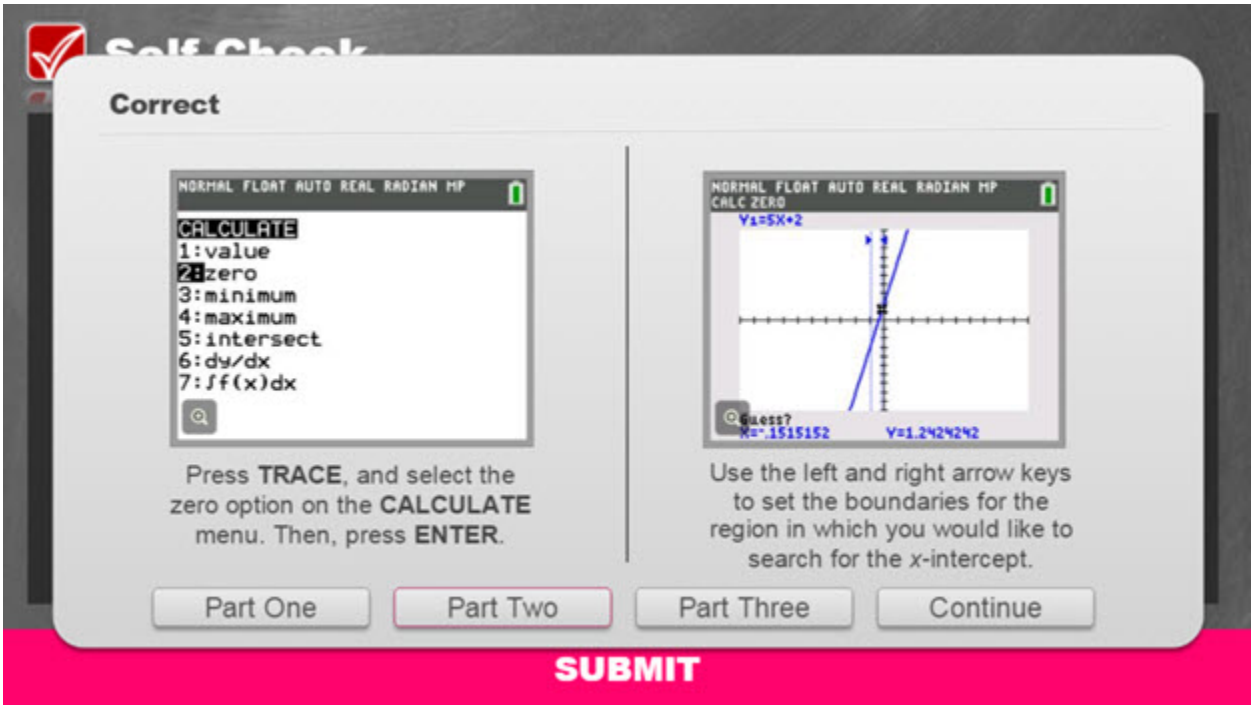
For your reference, the image above shows the correct solution to the self-check problem.

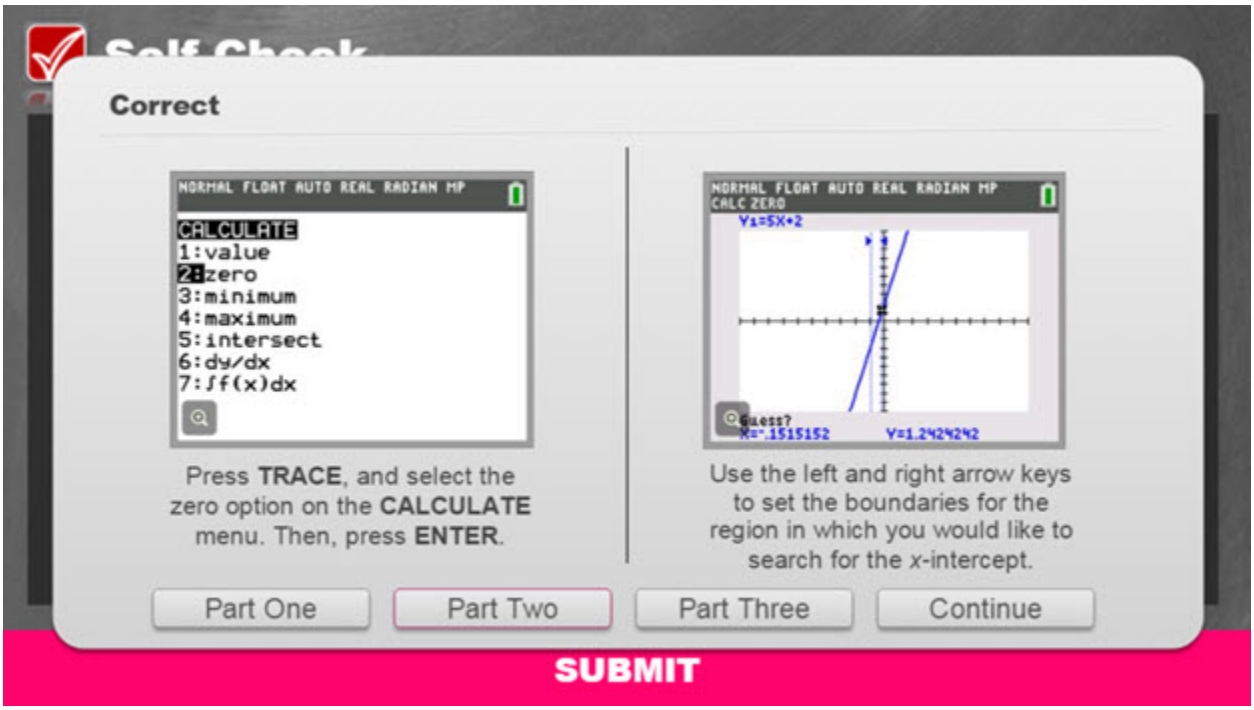
Self-Check 2



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

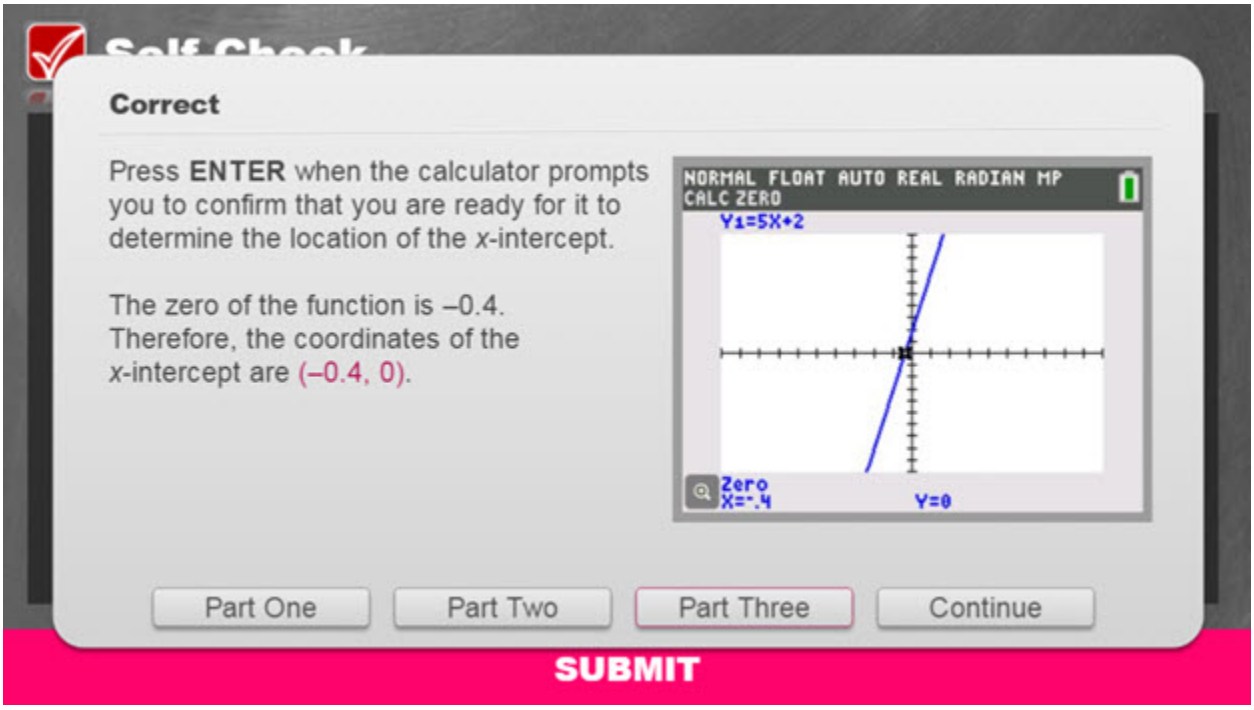
Self-Check 2: Answer





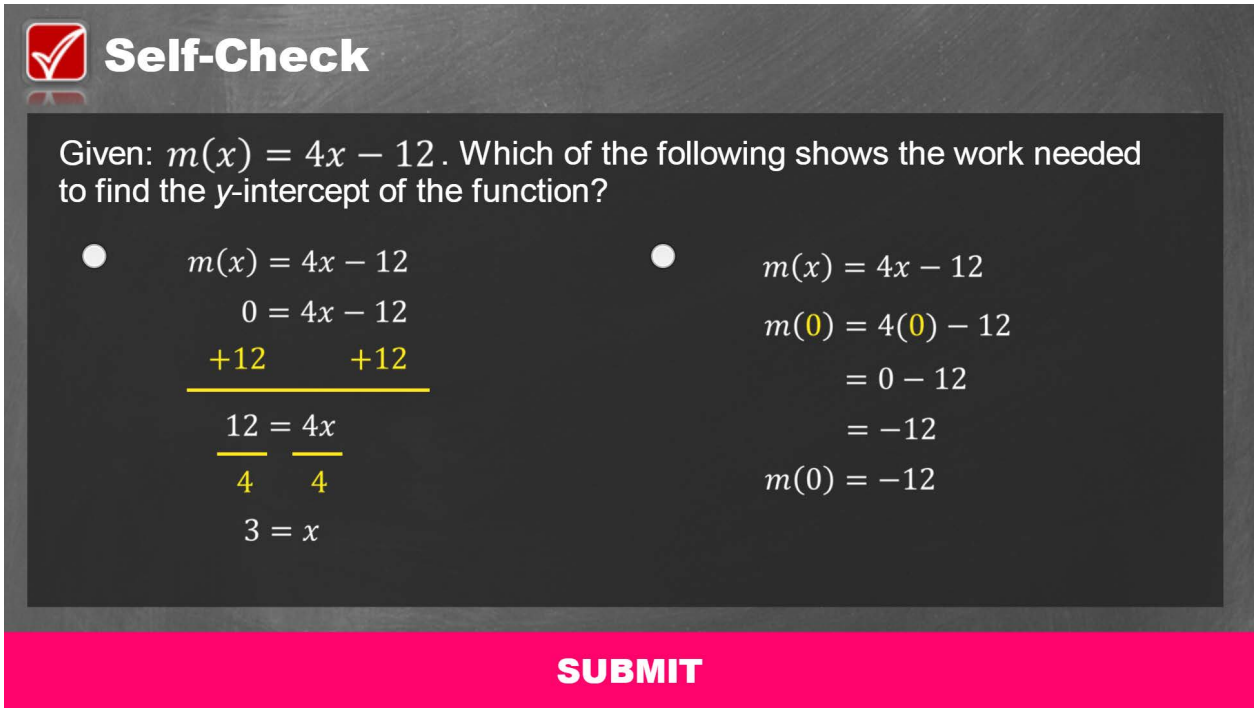
For your reference, the images above show the correct solution to the self-check problem.

Self-Check 2: Answer (continued)



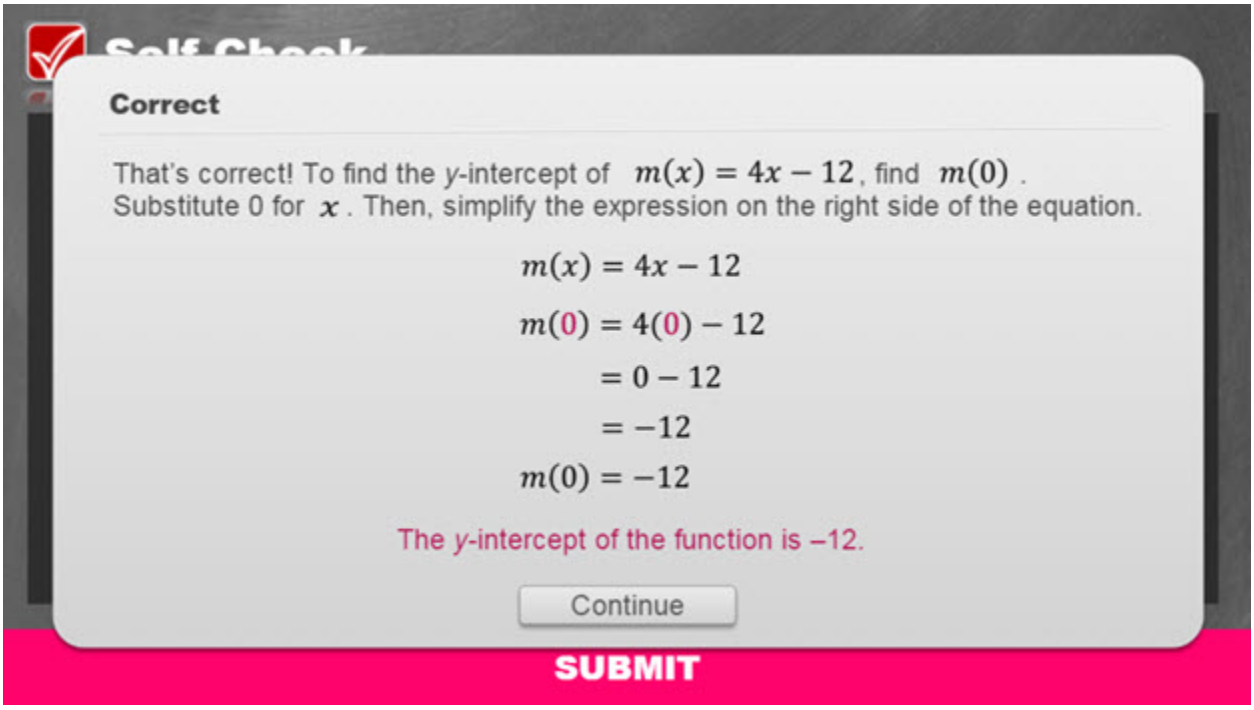
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 3



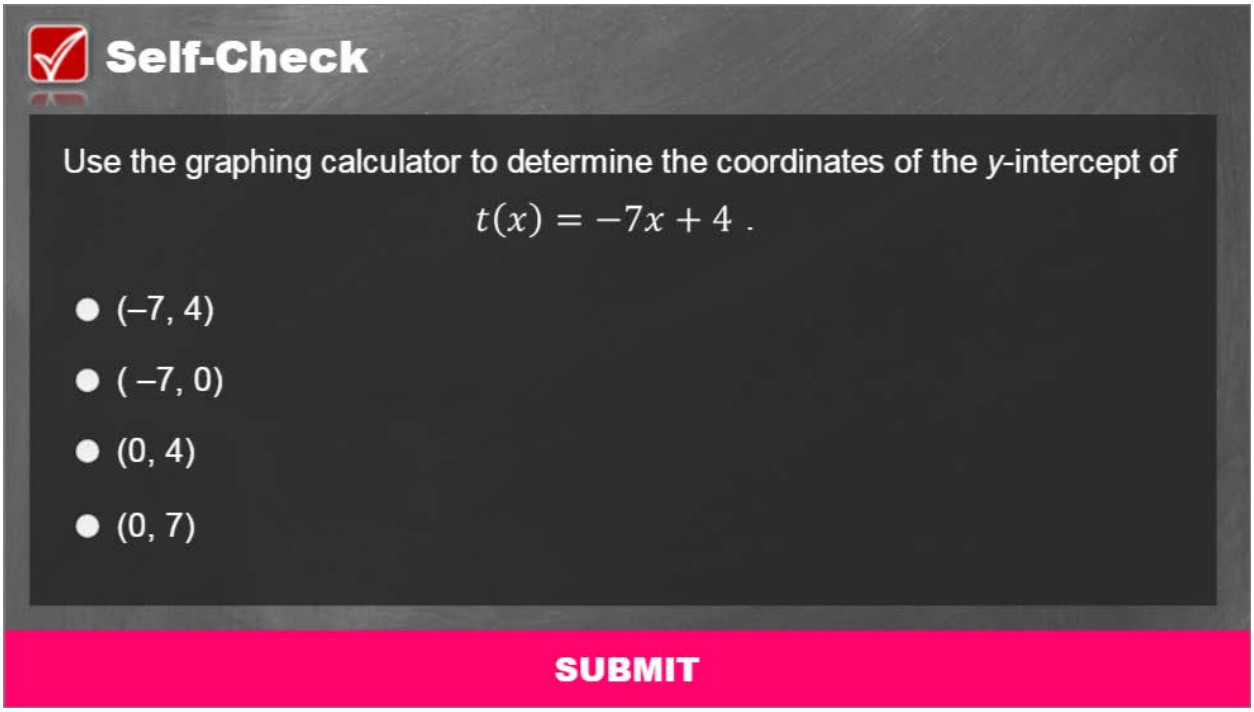
Solve the problem in the image above to check your understanding of the content.

Self-Check 3: Answer



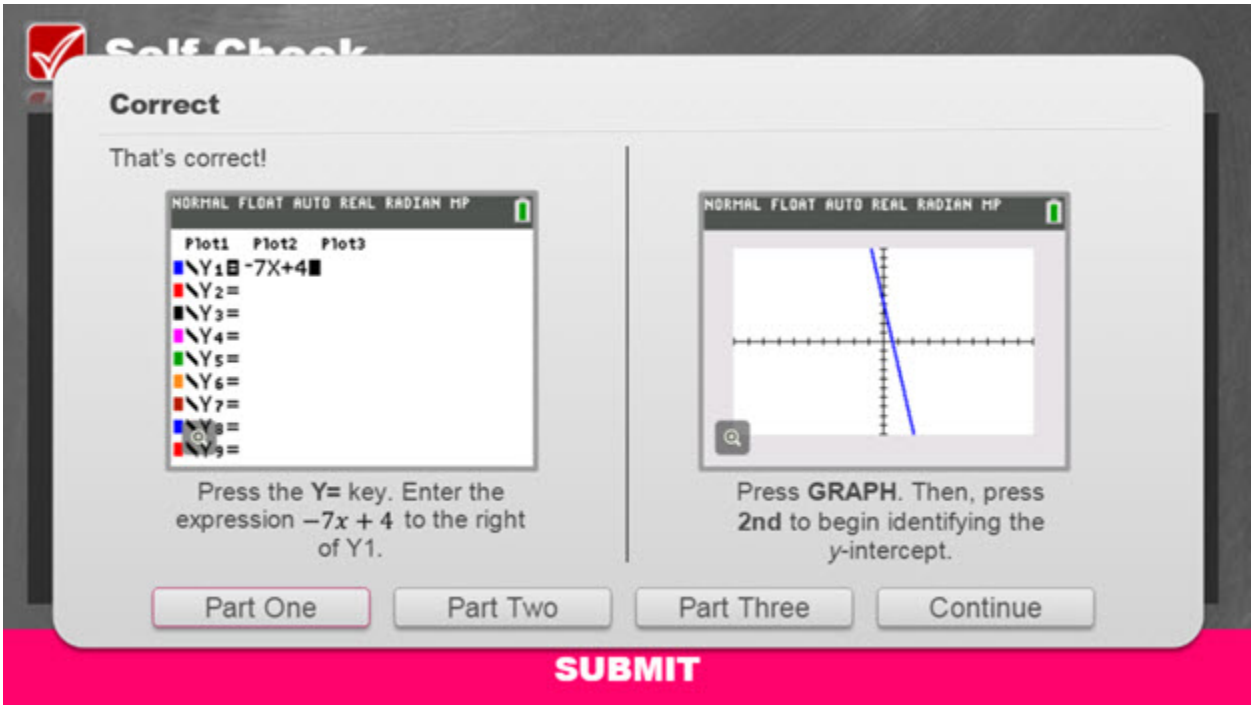
For your reference, the image above shows the correct solution to the self-check problem.

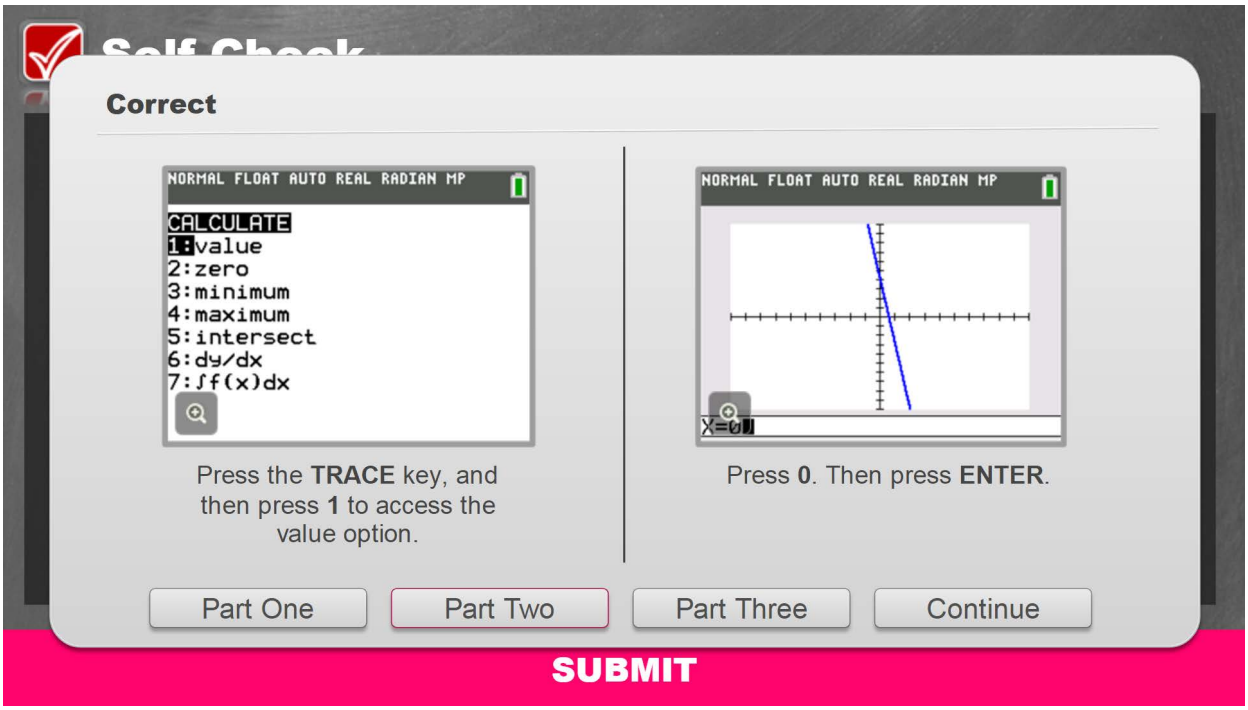
Self-Check 4



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

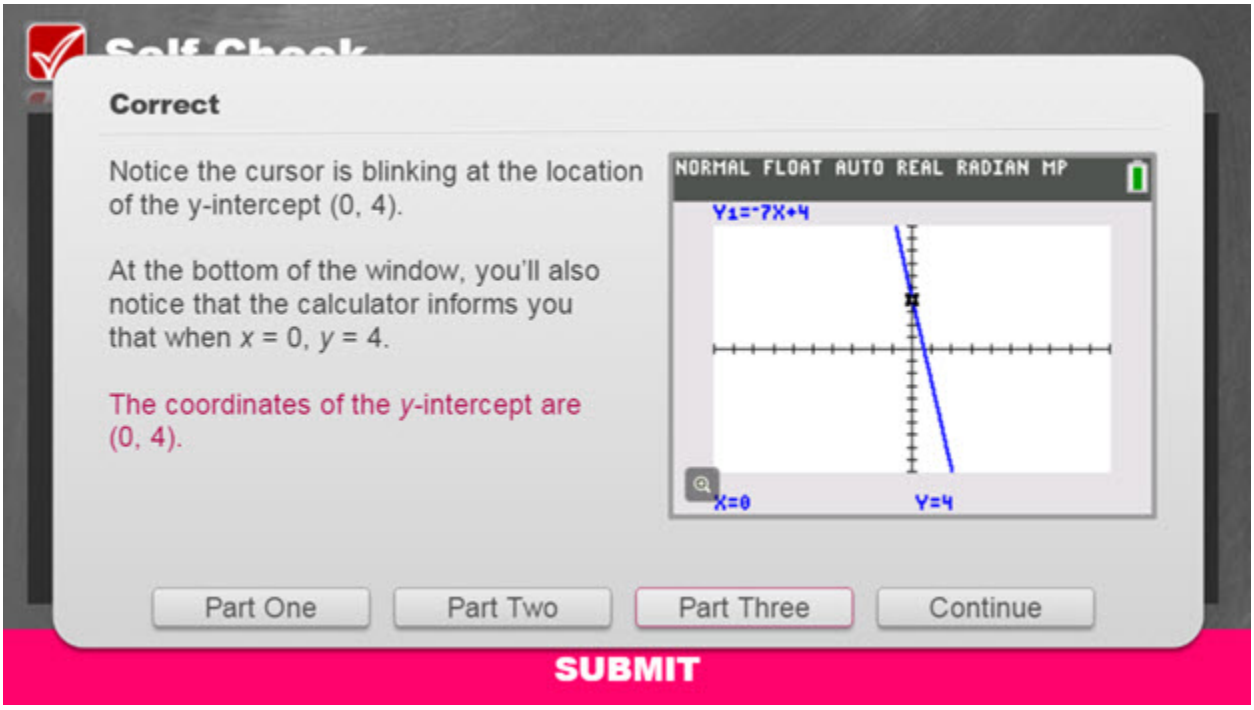
Self-Check 4: Answer





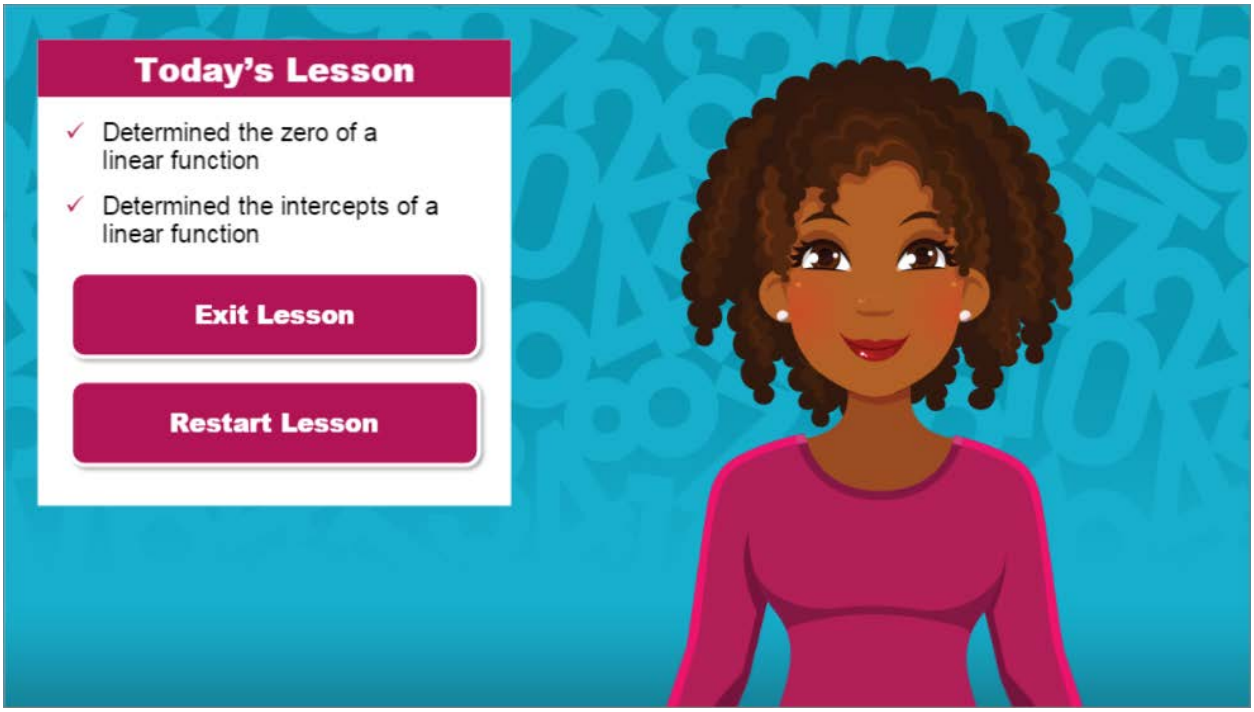
For your reference, the images above show the correct solution to the self-check problem.

Self-Check 4: Answer (continued)



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

Conclusion



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