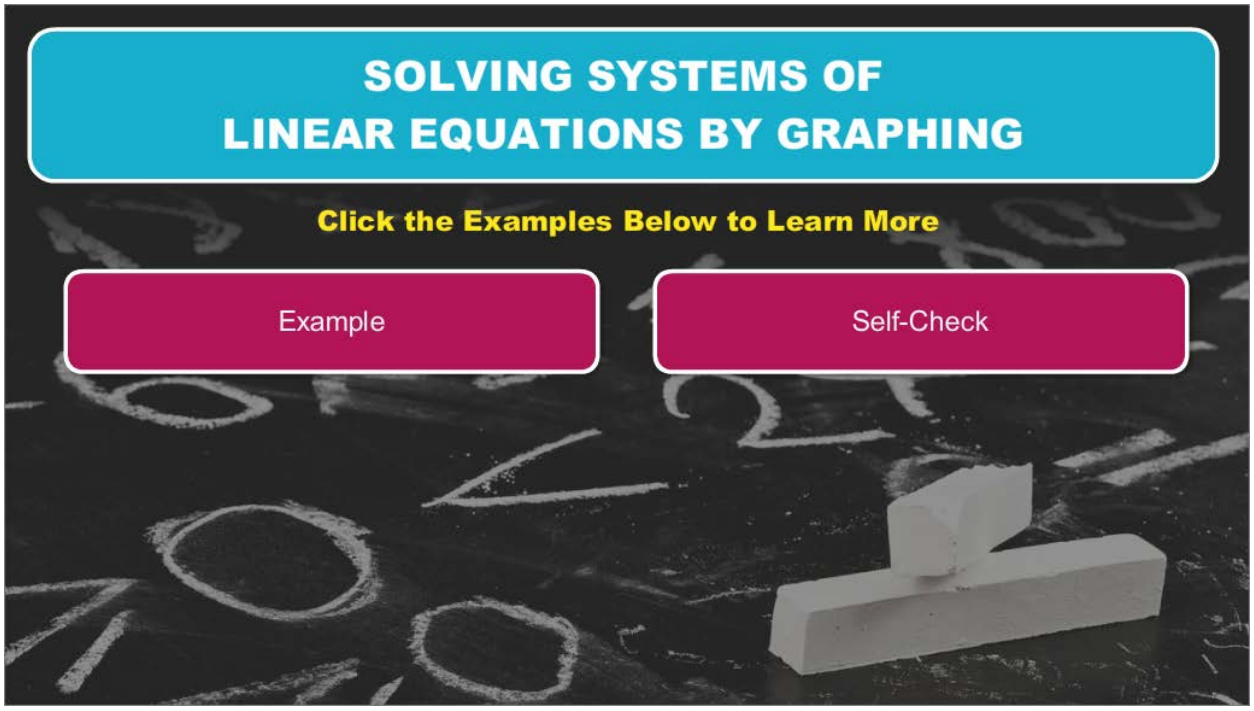
Module 5: Solving Linear Equations

Topic 3 Content: Solving Systems of Linear Equations by Graphing

Introduction

Hello and welcome! I'm so glad you could join me for this lesson in Algebra I, where you will learn how to use the graphing calculator to determine the solution to a system of linear equations.

Solving Systems of Linear Equations by Graphing



Click the examples below to learn more.

- Example
- Self-Check

Example

Solve the system by graphing.

$$\begin{cases} -4x + 3y = 18 \\ y = -2x - 5 \end{cases}$$

$$\begin{array}{rcl} -4x + 3y & = & 18 \\ \hline +4x & & +4x \end{array}$$

$$\begin{array}{rcl} 3y & = & 4x + 18 \\ \hline 3 & & 3 \quad 3 \end{array}$$

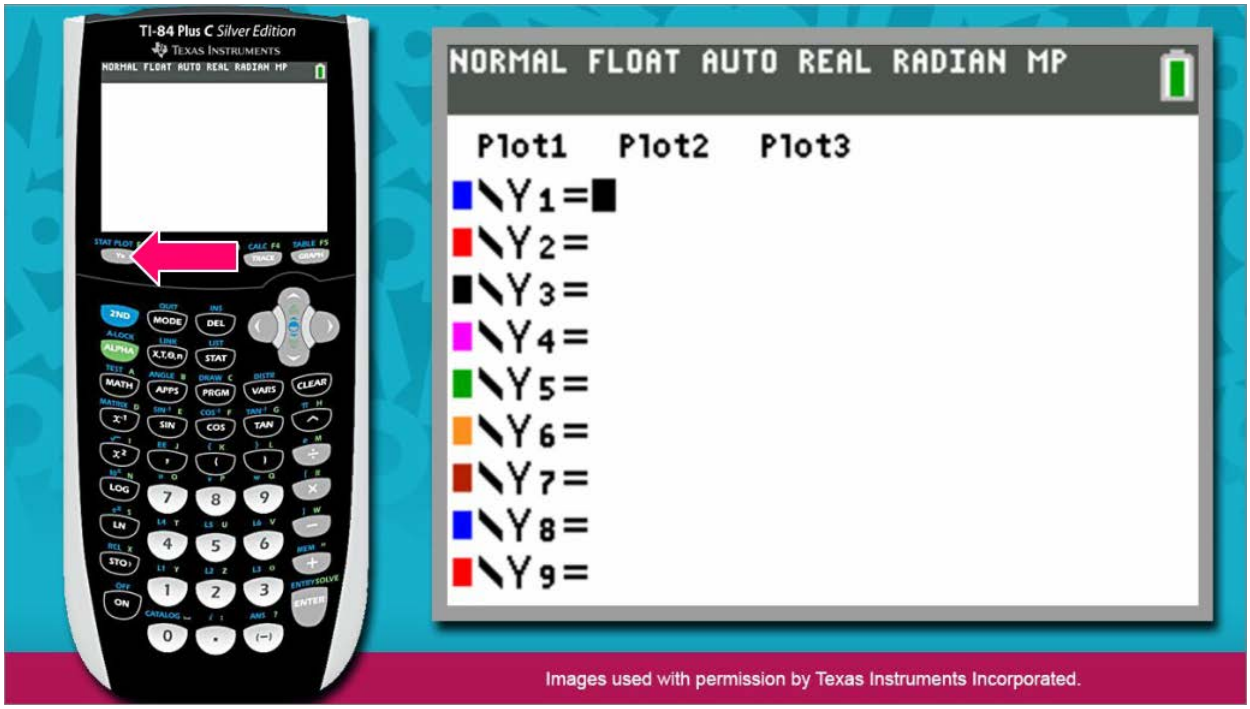
$$y = \frac{4}{3}x + 6$$

When using the graphing calculator to solve a system of equations, you must first ensure that each equation is solved for y. For this system, begin by solving the first equation for y.

Add $4x$ to each side of the equation.

The result is $3y = 4x + 18$. Now divide each term by 3. You find that $y = \frac{4}{3}x + 6$.

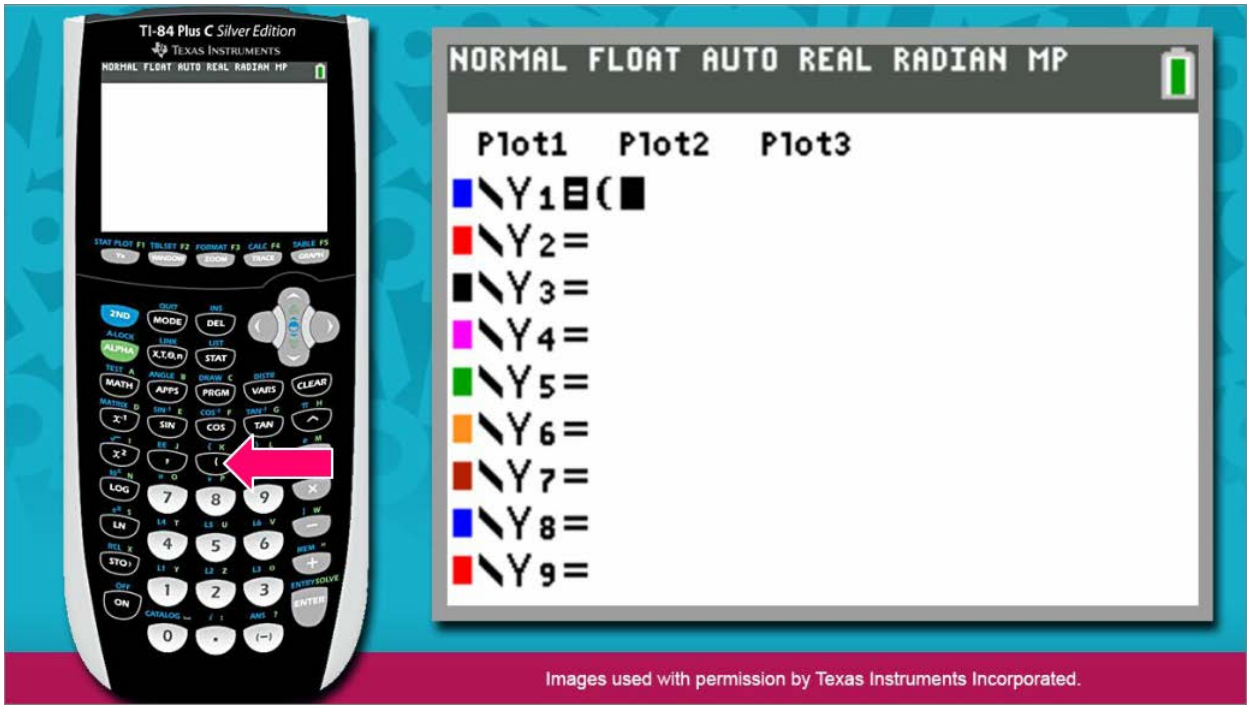
Example (continued)



Now that both equations are solved for y, you are ready to use the graphing calculator to solve the system. Begin by clearing the calculator's memory.

Press the Y= key, located in the top left corner of the keys.

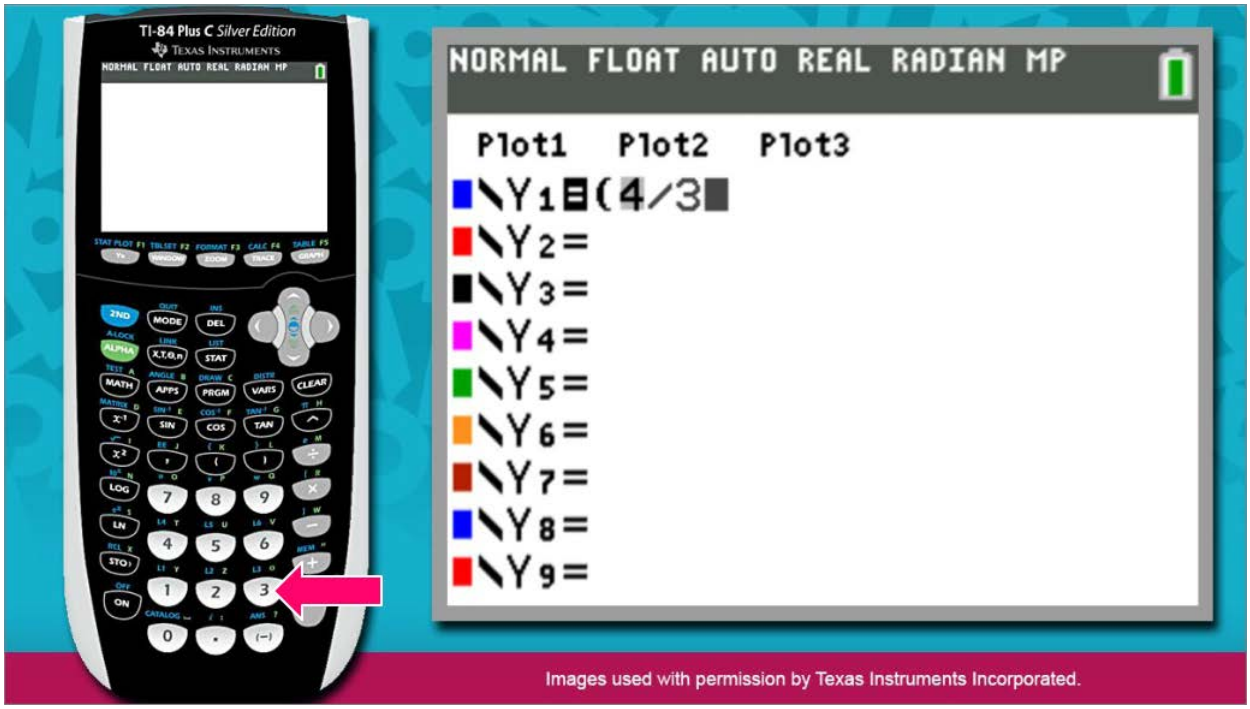
Example (continued)



Next, enter the right side of the first equation to the right of Y1. Remember when entering a fraction, you should use parentheses.

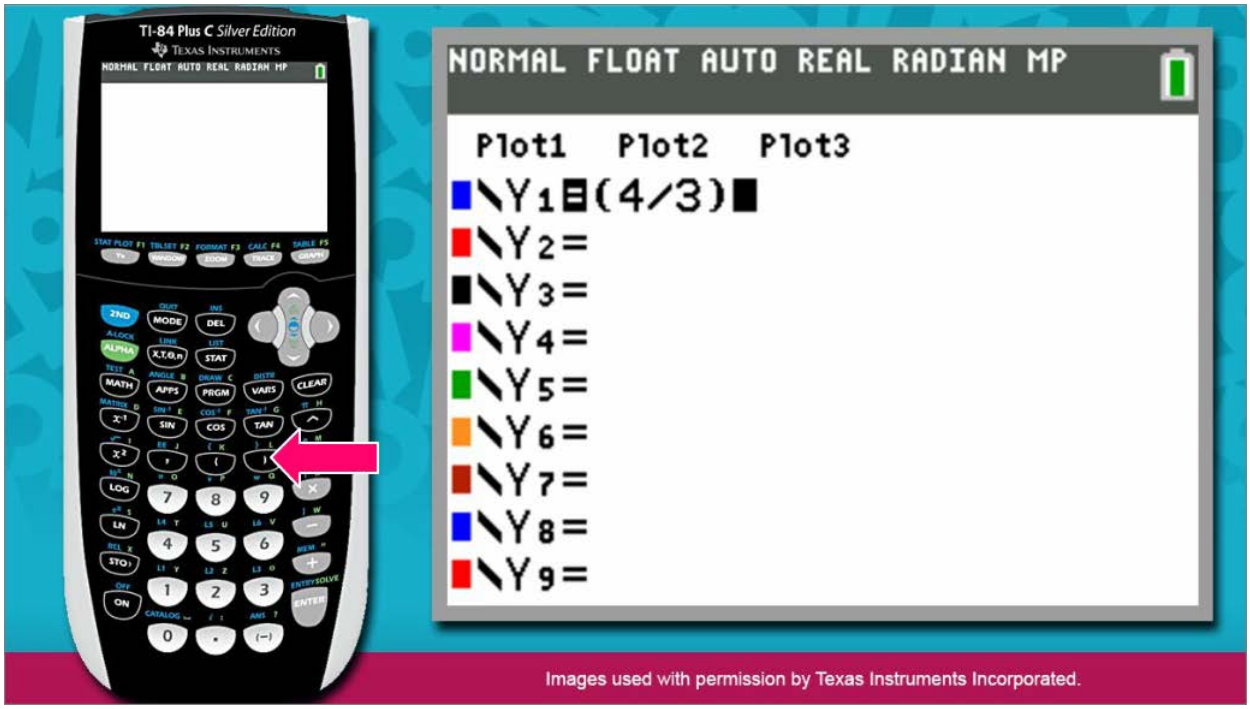
Press the left parentheses key, located above the 8 key.

Example (continued)



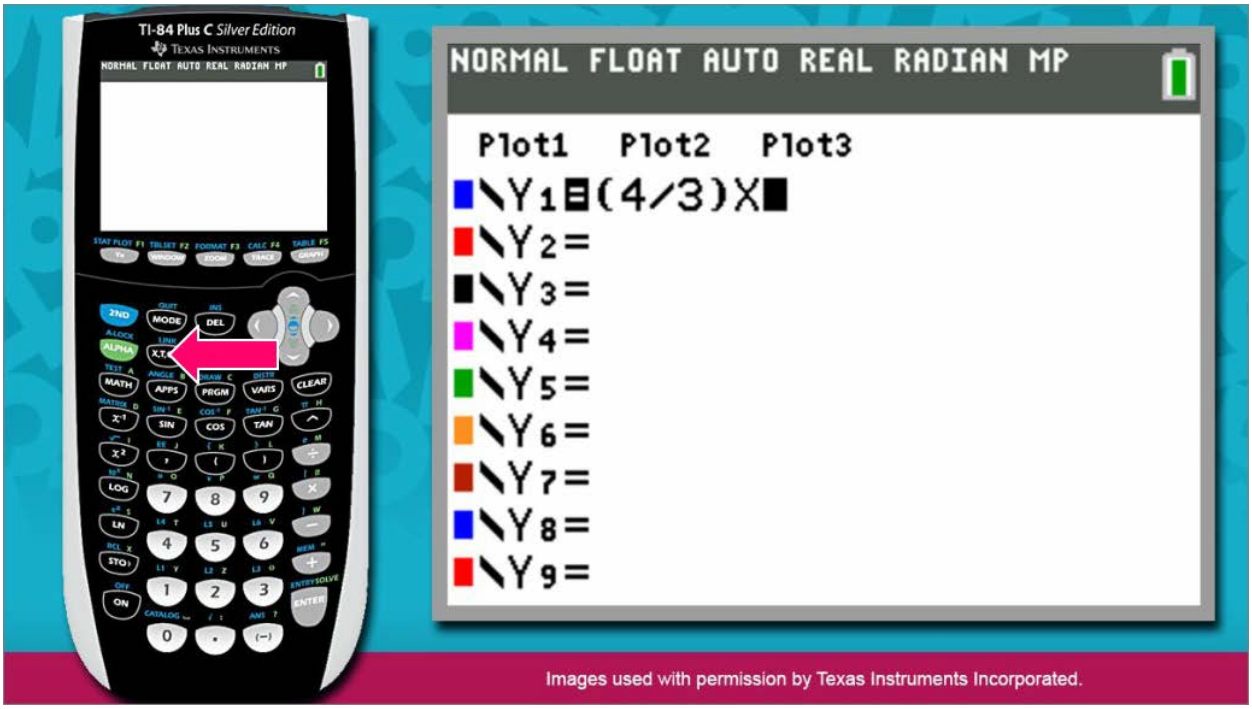
Now press the 4 key, then the division key, and then the 3 key.

Example (continued)



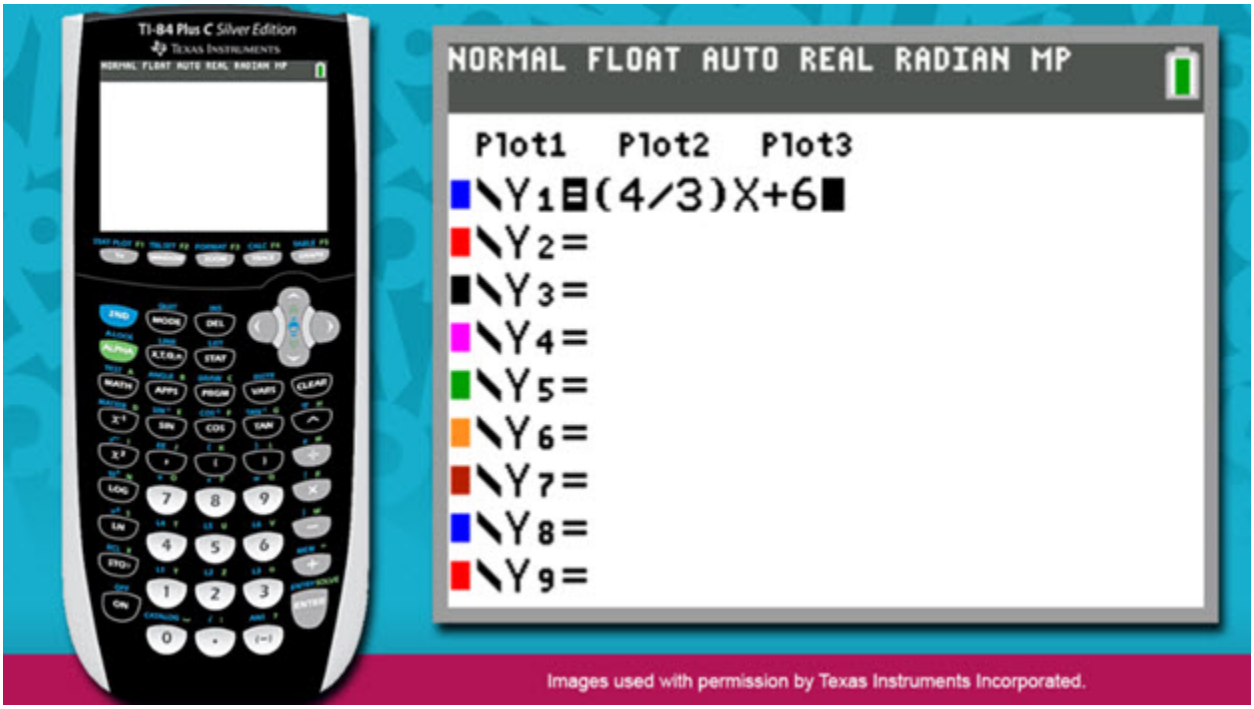
Next press the right parentheses key, located above the 9 key.

Example (continued)



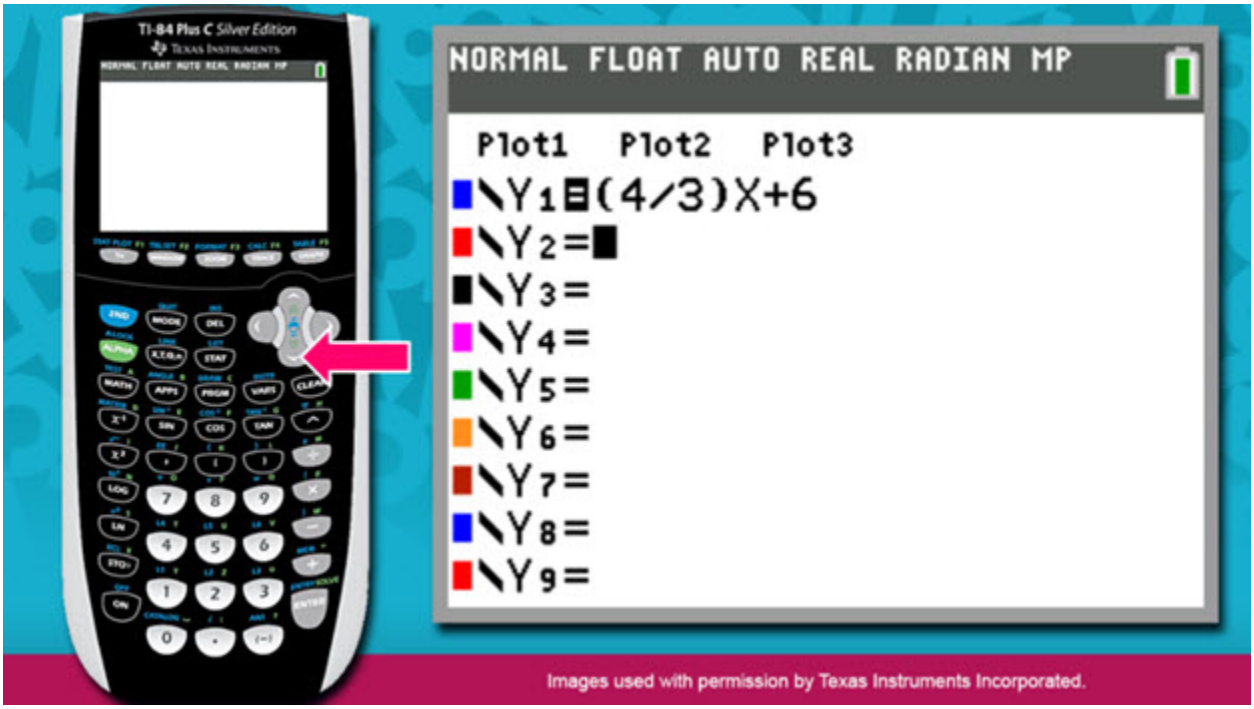
Then press the x key, located to the right of the green ALPHA key.

Example (continued)



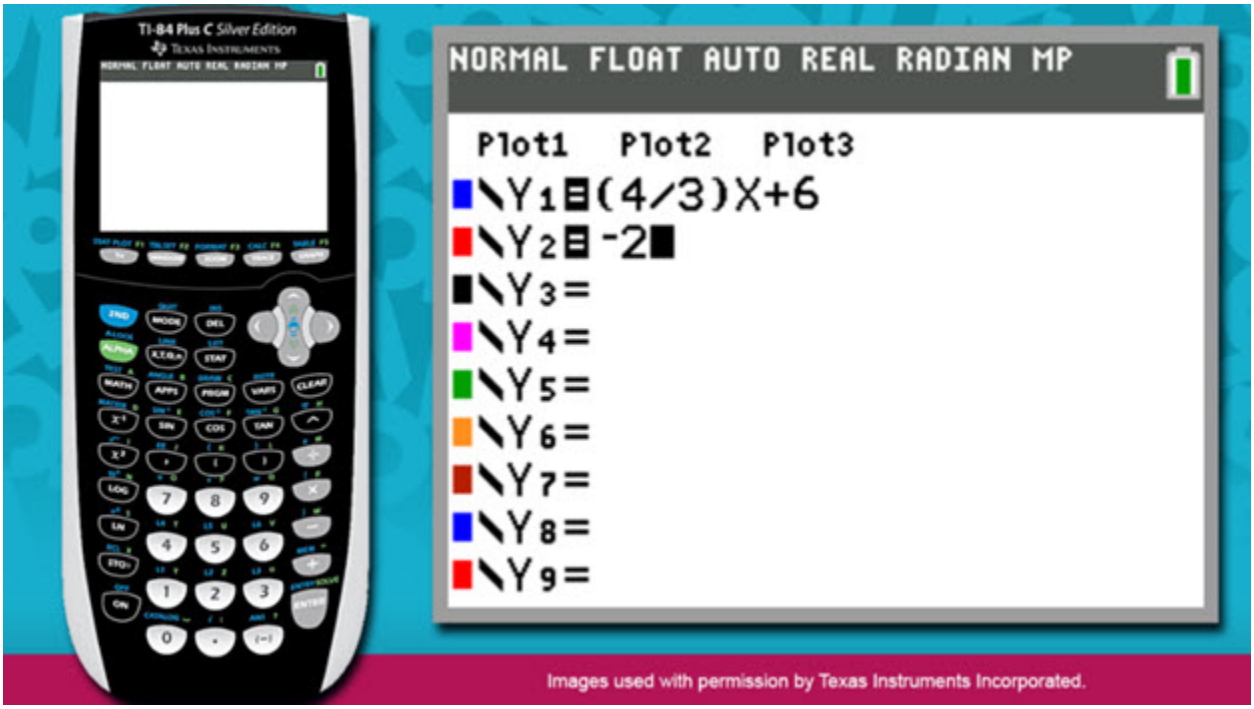
Then press the addition key and then the 6 key.

Example (continued)



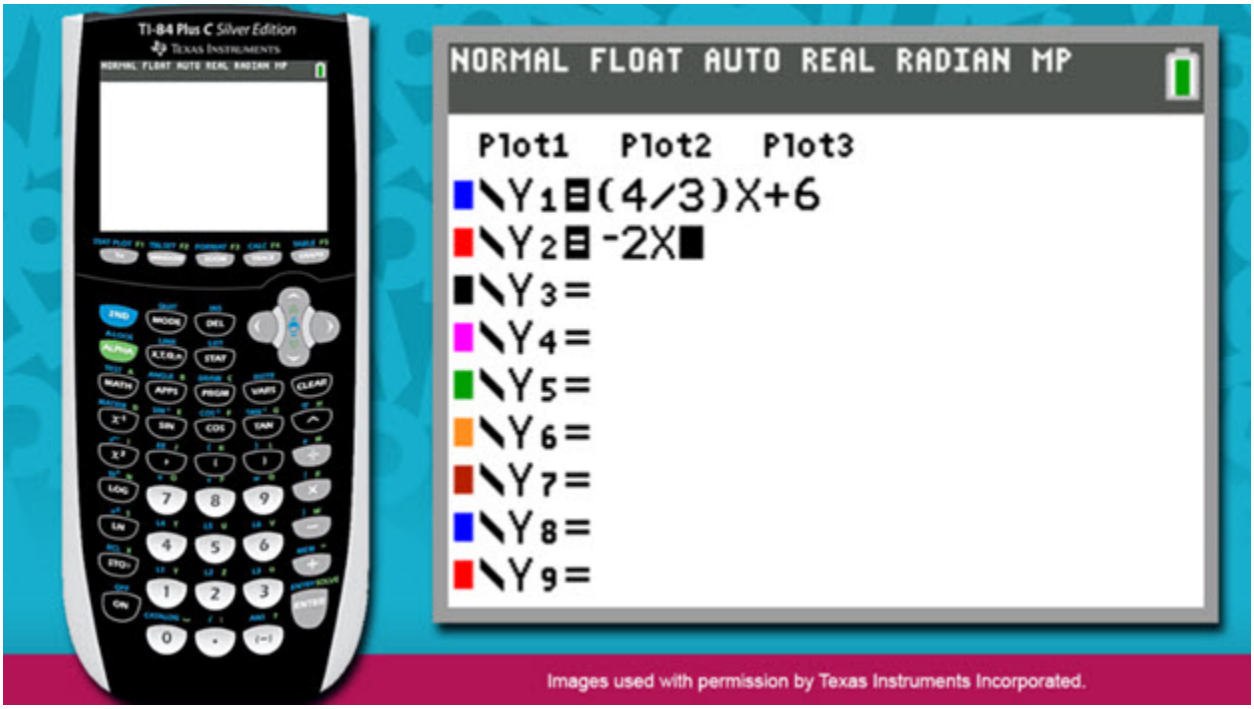
Now press the down arrow and enter the right side of the second equation to the right of Y2.

Example (continued)



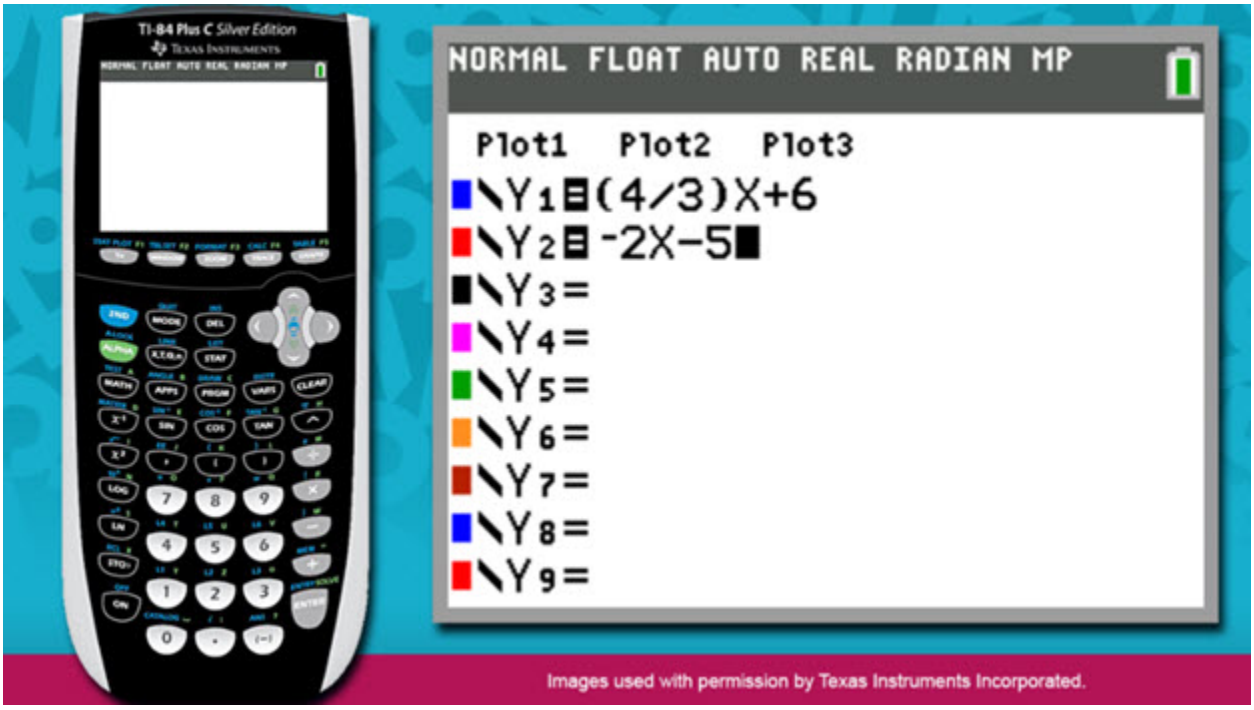
Press the negative key, located beneath the 3 key. Then press the 2 key.

Example (continued)



Next press the x key.

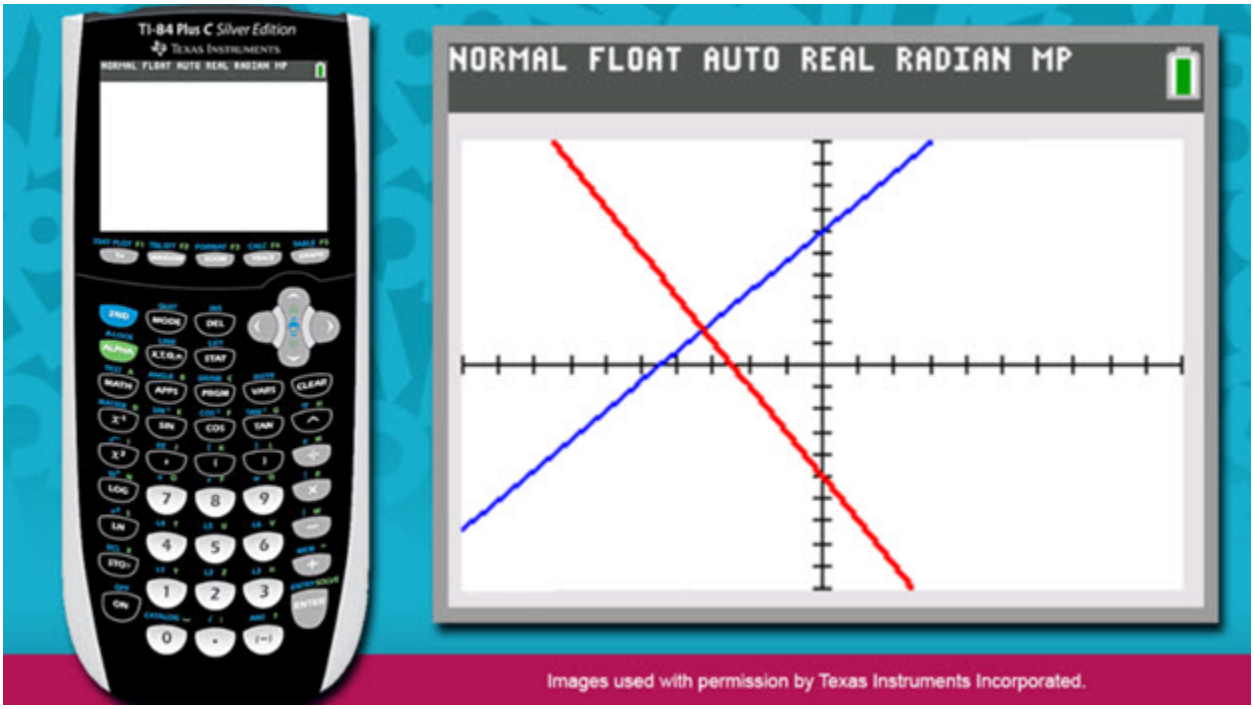
Example (continued)



Now press the subtraction key, located beneath the multiplication key. Then press the 5 key.

Now you are ready to graph the system of linear equations. Notice the colors located to the left of Y1 and Y2. The first linear equation will be represented by a blue line and the second equation will be represented by a red line.

Example (continued)

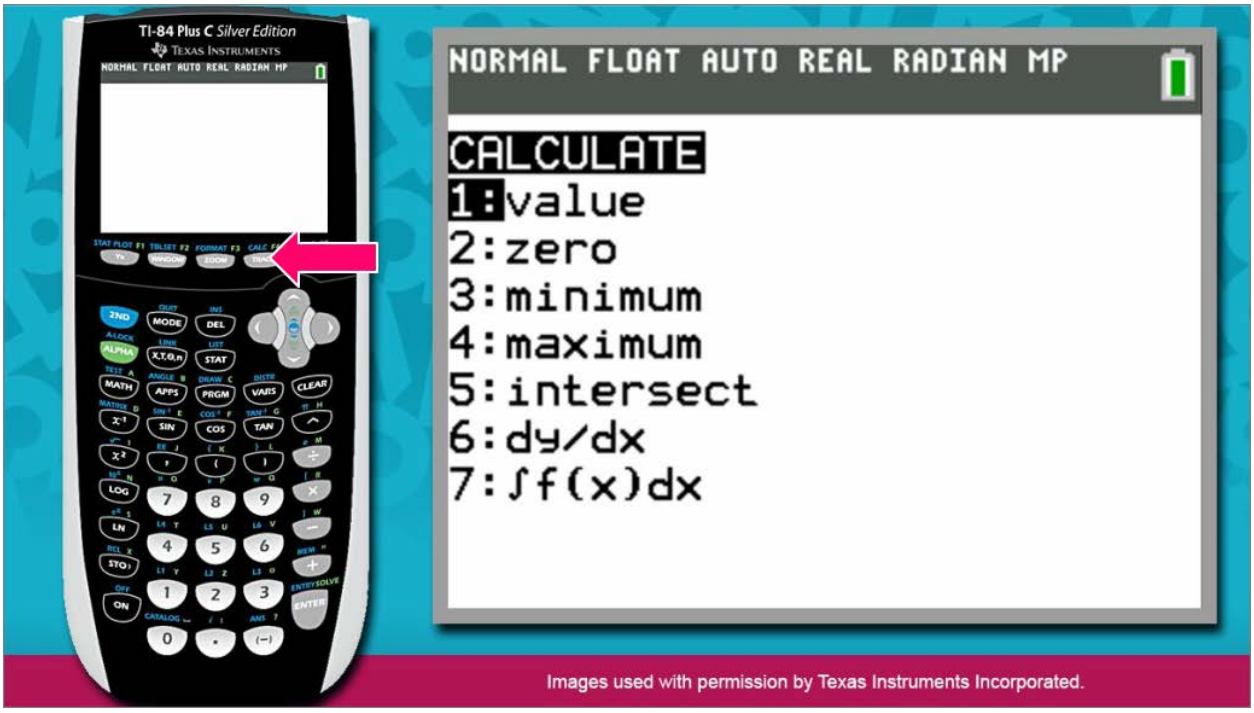


Press the GRAPH key, located in the top right corner of the keys.

Notice that the lines intersect at one point. This means that the system of linear equations has one solution. To determine the solution you must identify the coordinates of the point of intersection.

The calculator has a function that will determine the coordinates of this point.

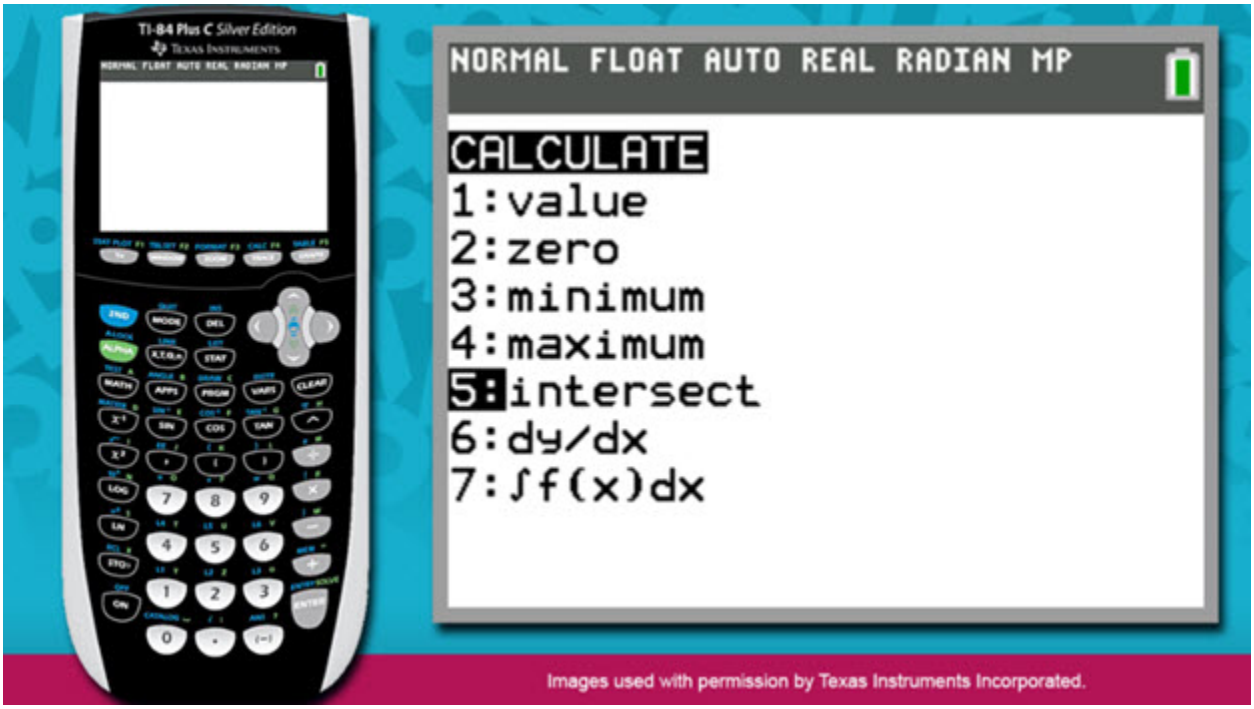
Example (continued)



Press the 2nd key, the blue button located near the top left corner of the keys. Pressing the 2nd key informs the calculator that you want to perform one of the functions stamped above a calculator key.

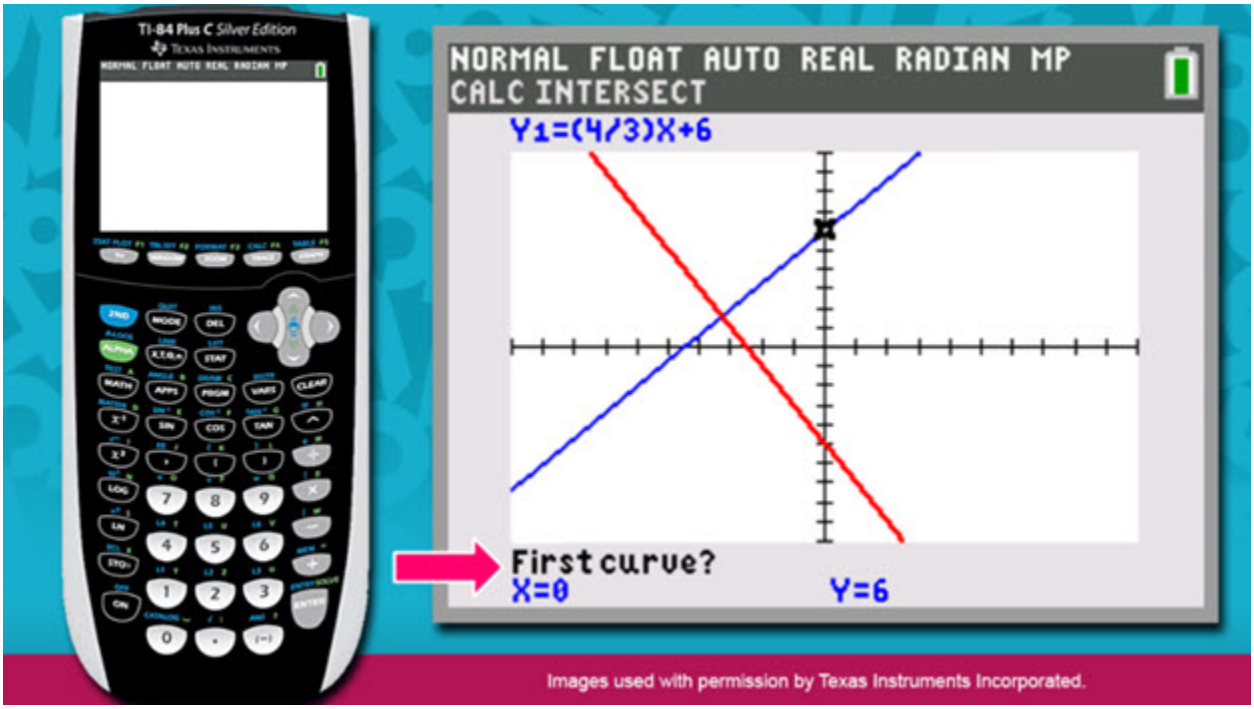
Then press the TRACE key, located to the left of the GRAPH key. You'll notice a menu of functions appear. These are some of the various functions that the calculator is able to perform.

Example (continued)



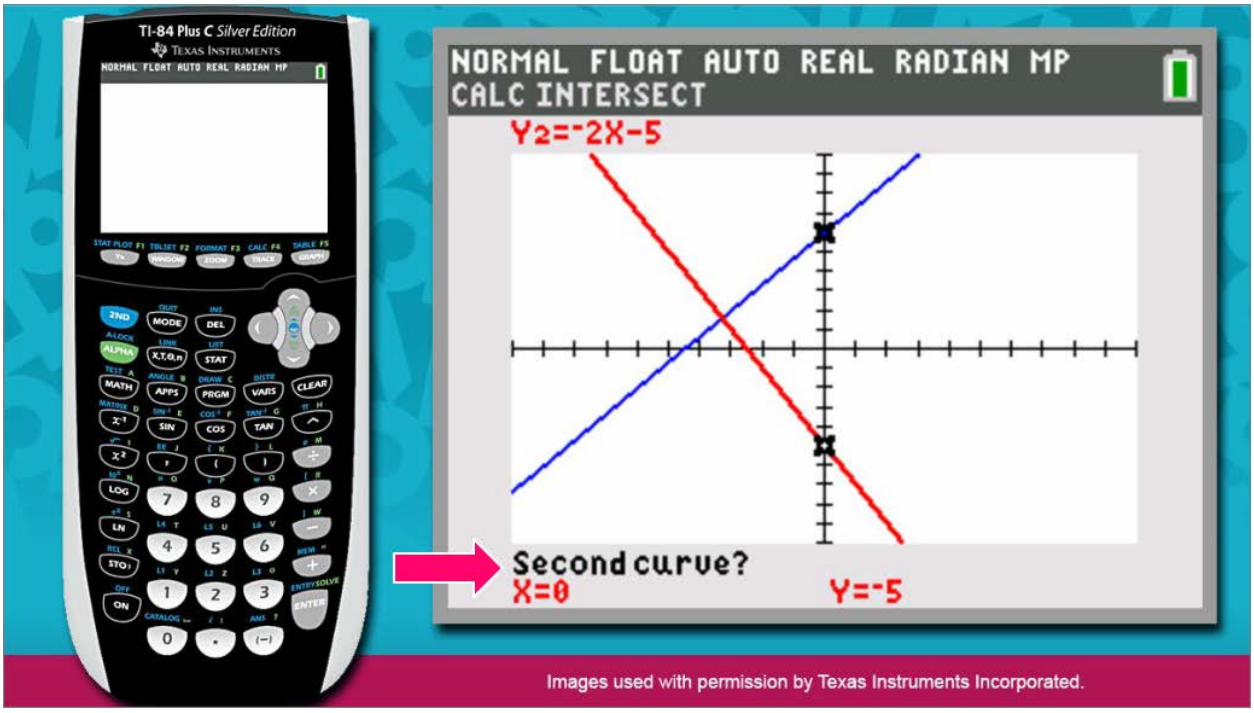
Since you would like the calculator to determine the coordinates of the point of intersection, you will need to select the fifth option in the list. Press the 5 key to select the intersect function.

Example (continued)



Notice that the calculator has returned to the graph of the system. The cursor is blinking on the blue line that represents the first linear equation, and a question appears in the bottom left corner of the window. The calculator is prompting you to confirm that the cursor is blinking on the first line included in the system. Although the question refers to a curve, you can interpret it as referring to a line, since you are analyzing the graph of a system of linear equations.

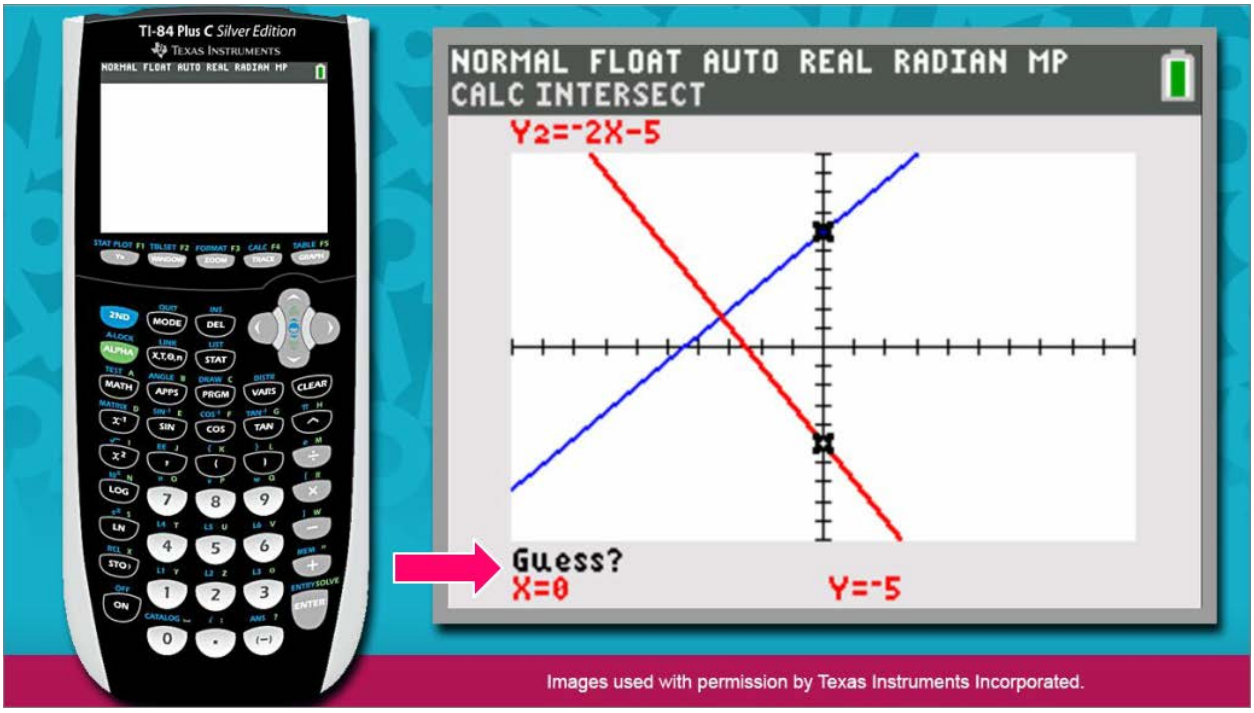
Example (continued)



If needed, you could press the up and down arrow keys to move the cursor to the appropriate line. Because the blinking cursor is indeed on the line that represents the first equation of the system, simply press ENTER to confirm.

Notice that one cursor remains on the blue line, a second cursor is now blinking on the red line, and question appears in the bottom left corner of the window. The calculator is prompting you to confirm that the cursor is blinking on the second line included in the system. Although the question again refers to a curve, you can interpret it as referring to a line, since you are analyzing the graph of a system of linear equations.

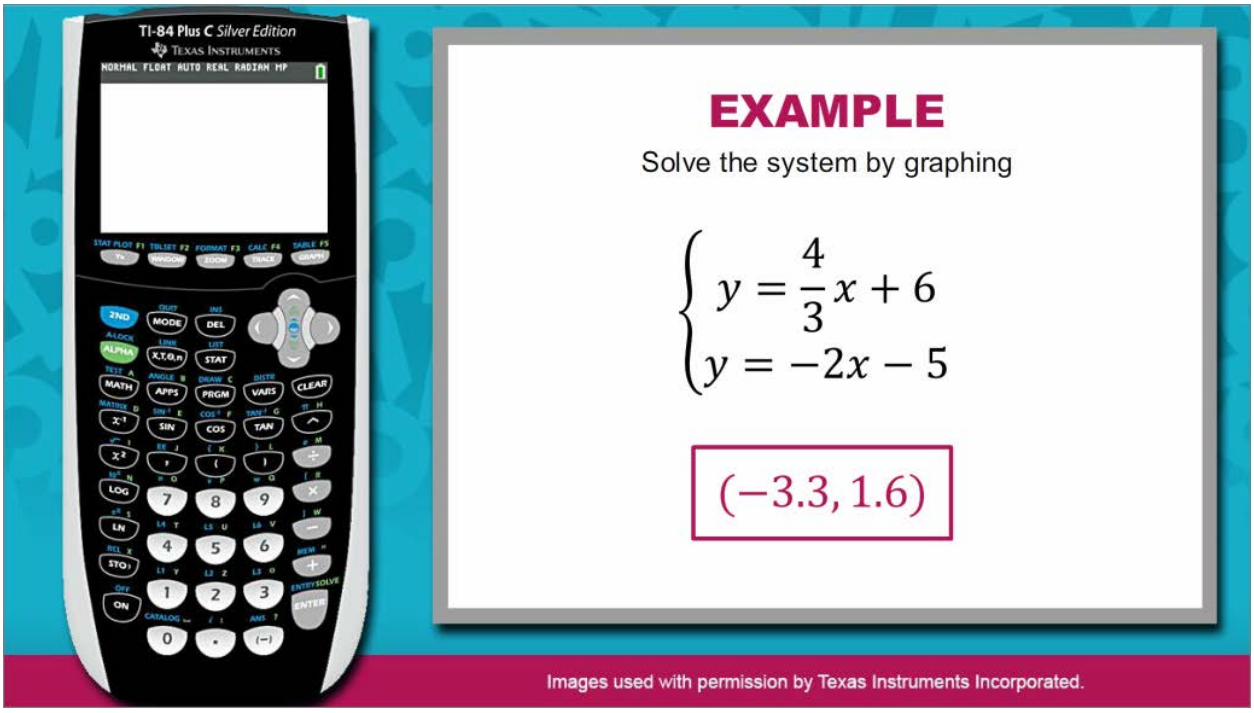
Example (continued)



Press ENTER to confirm.

Notice that the cursor continues to blink on the second line and a new question appears in the bottom left corner of the window. The calculator is prompting you to confirm that you are ready for it to identify the coordinates of the point of intersection.

Example (continued)

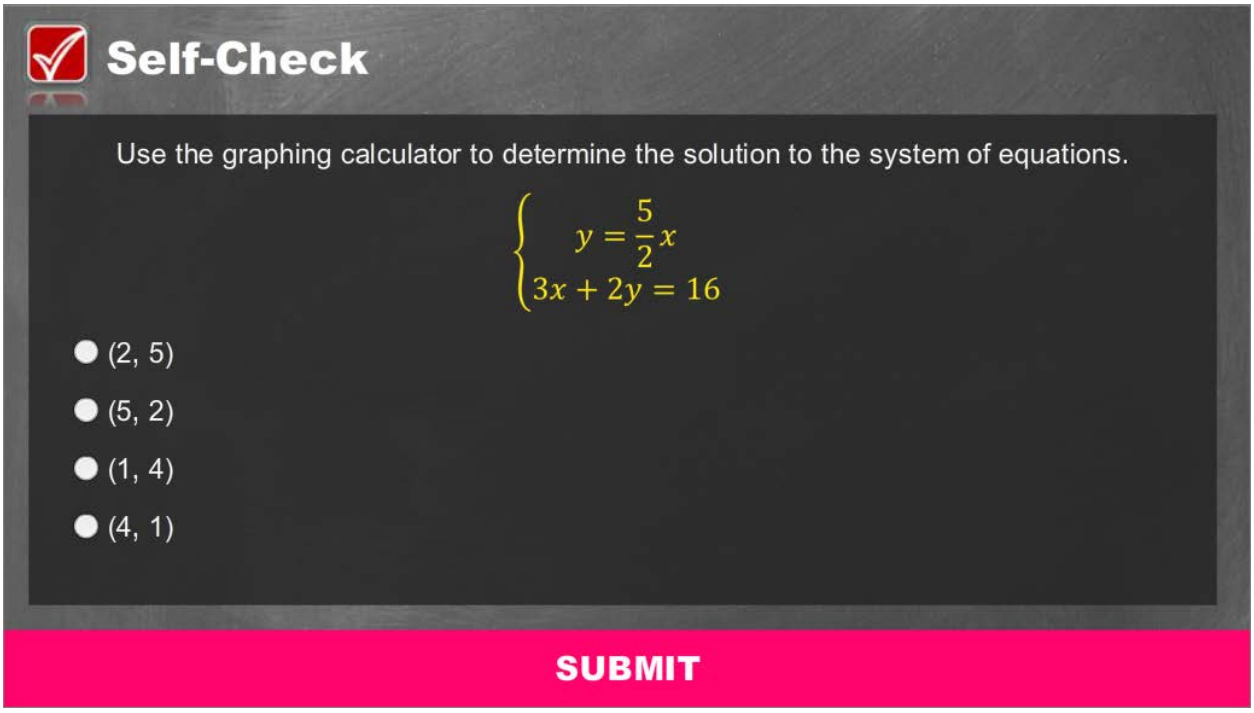


Press ENTER.

Notice that the cursors have moved to the point of intersection and the coordinates of the point are provided below: $x = -3.3$ and $y = 1.6$.

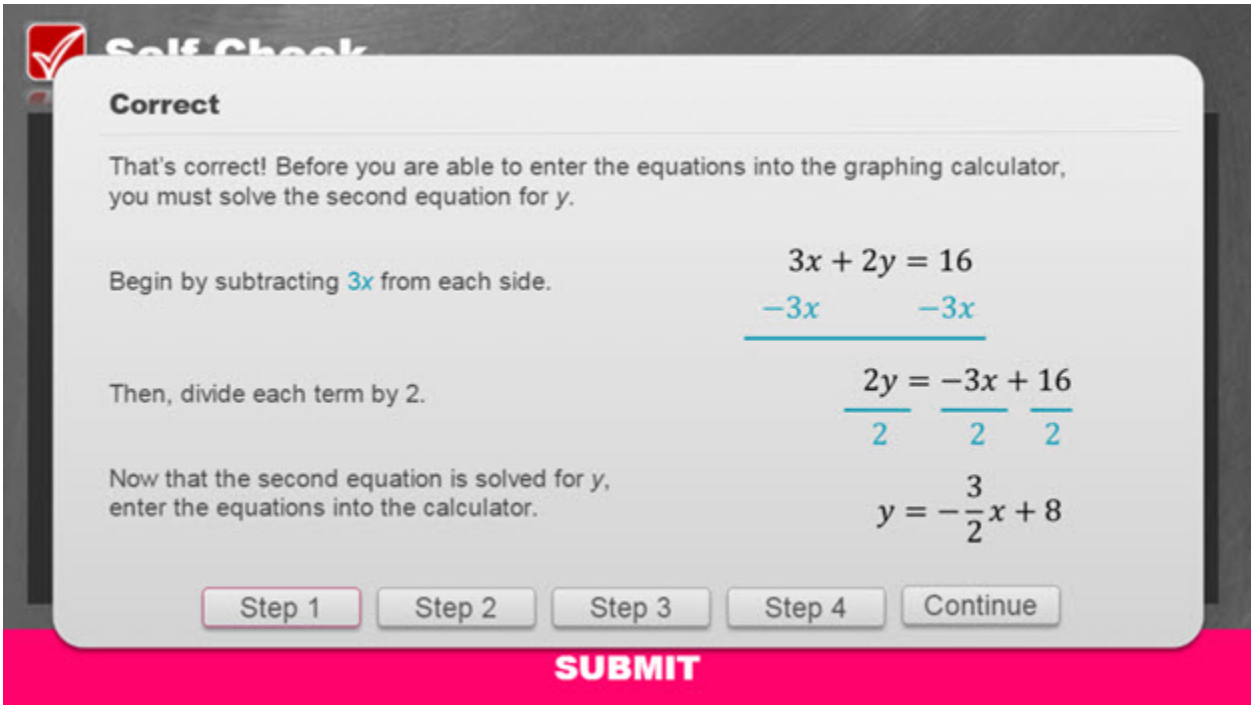
The solution to the system can be represented by the ordered pair $(-3.3,1.6)$.

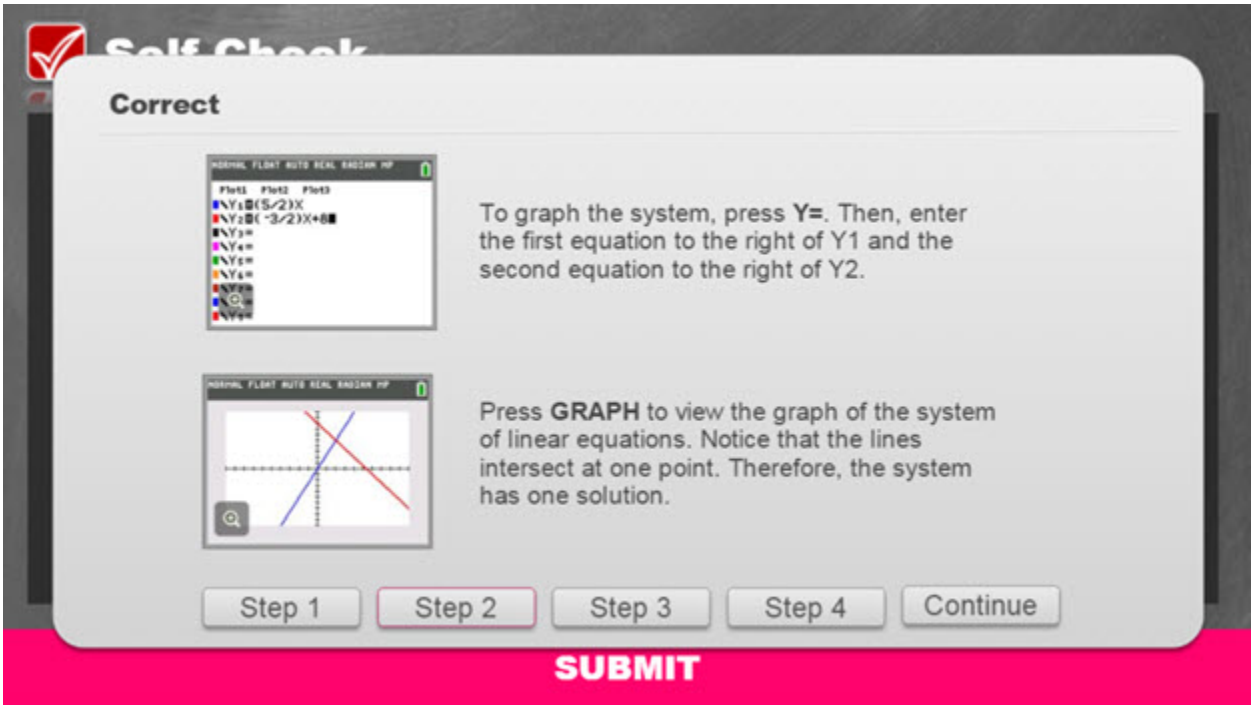
Self-Check



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

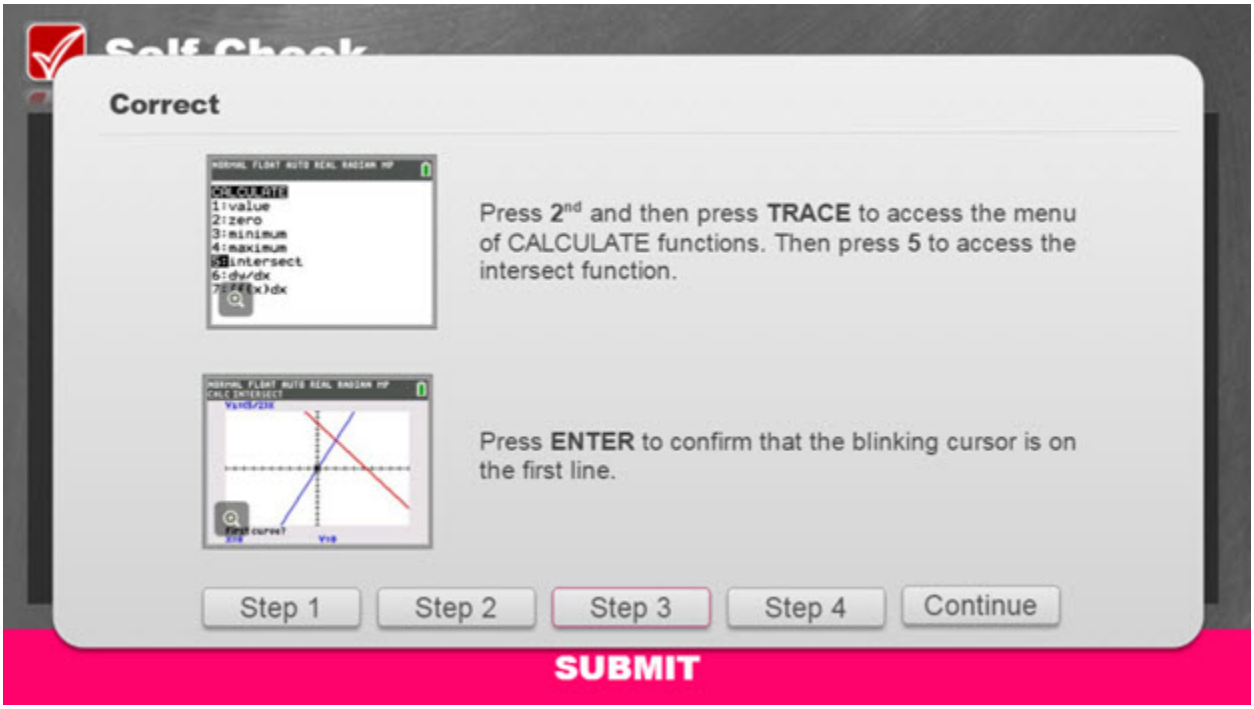
Self-Check: Answer

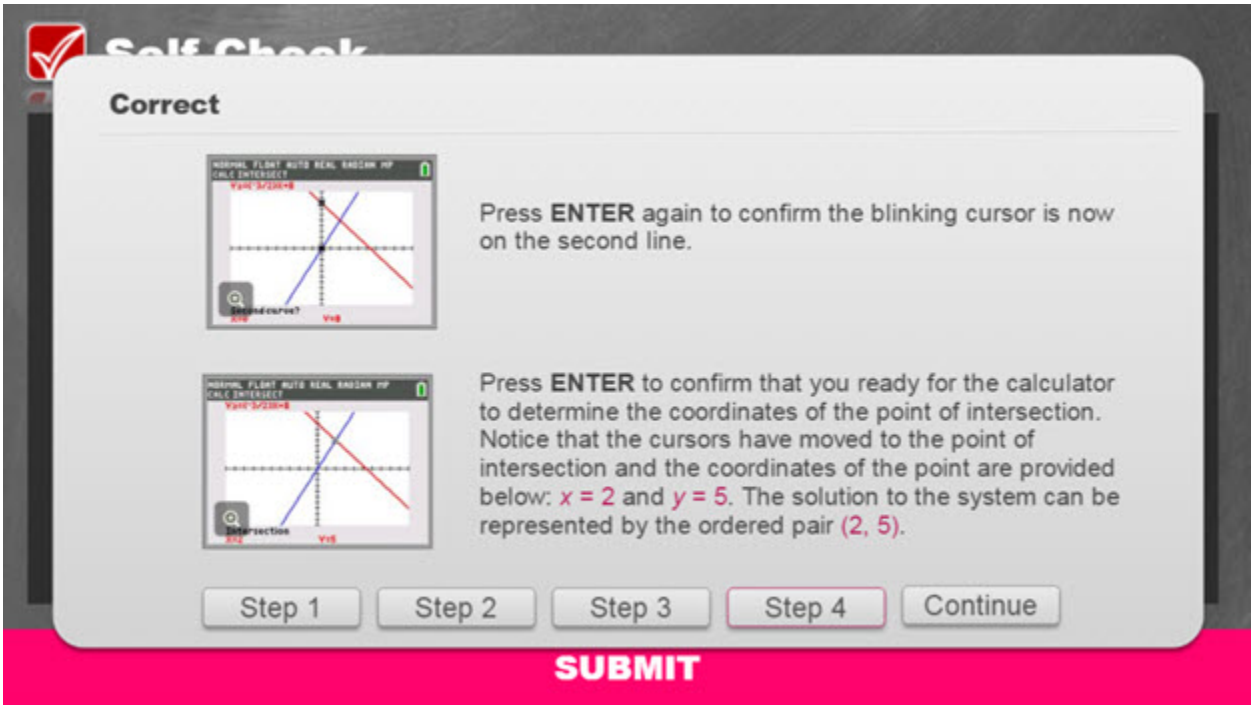




For your reference, the images above show the correct solution to the self-check problem.

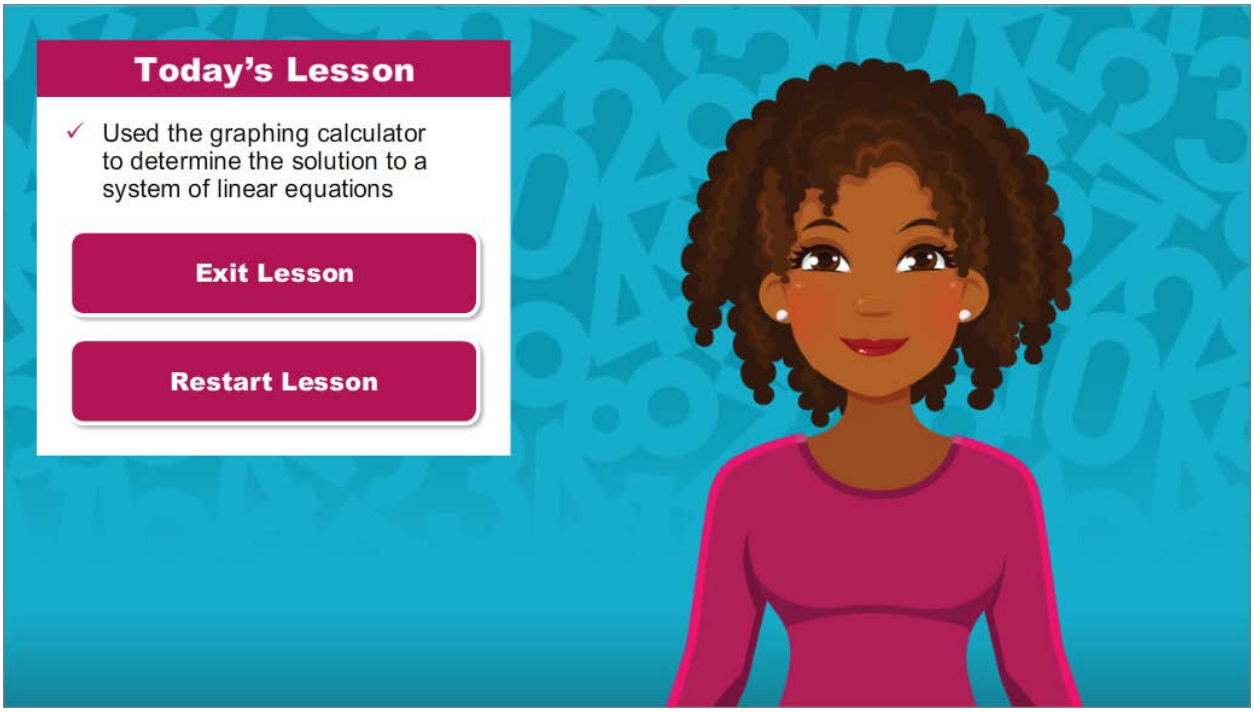
Self-Check: Answer (continued)





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

Conclusion



You have reached the conclusion of this lesson, where you learned how to use the graphing calculator to determine the solution to a system of linear equations.