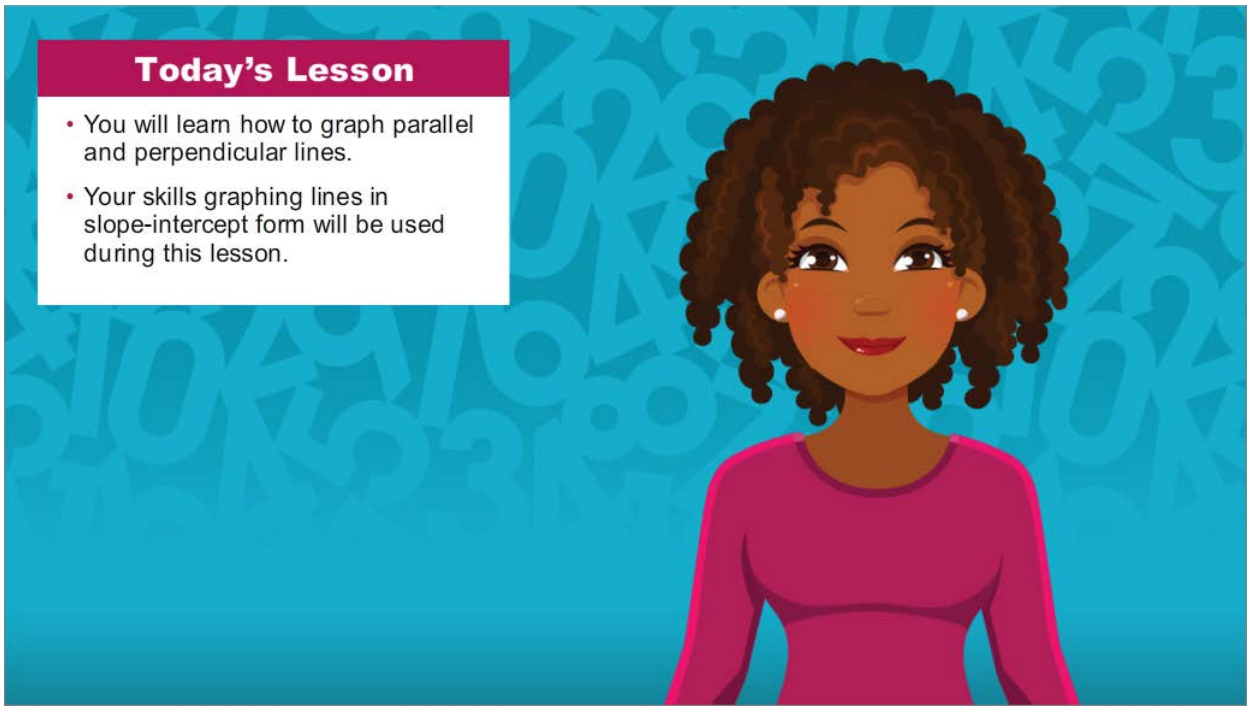
Module 8: Graphing Linear Equations

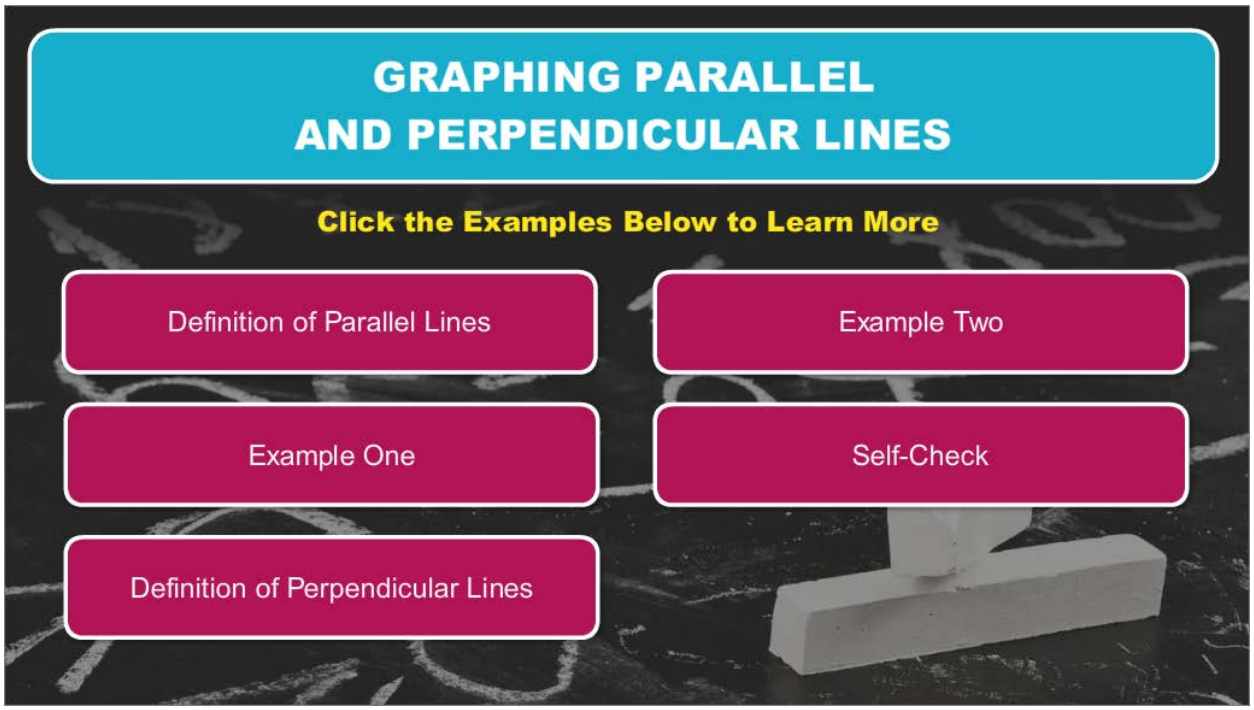
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Introduction



I'm so glad you could join me for this lesson in Algebra I, where you will learn how to graph parallel and perpendicular lines. Your skills graphing lines in slope-intercept form will be extremely helpful to you during this lesson.

Graphing Parallel and Perpendicular Lines



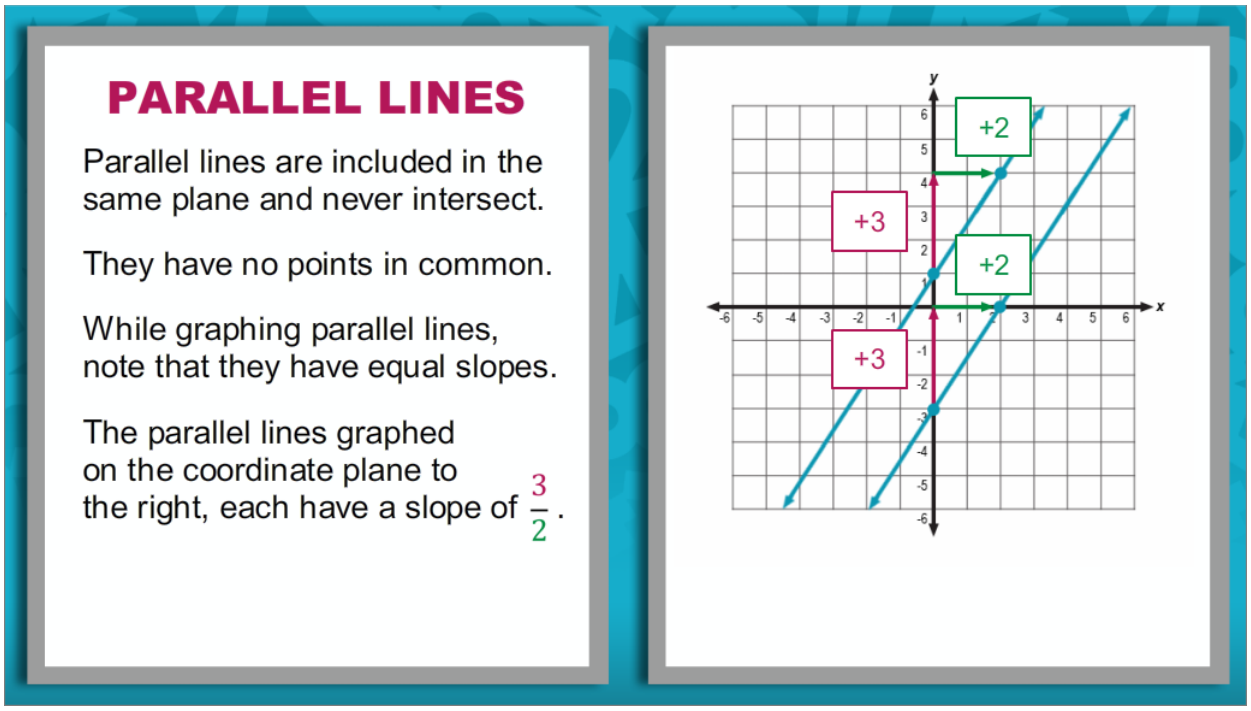
Click the examples below to learn more.

- Definition of Parallel Lines
- Example One
- Definition of Perpendicular Lines
- Example Two
- Self-Check

Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Definition of Parallel Lines

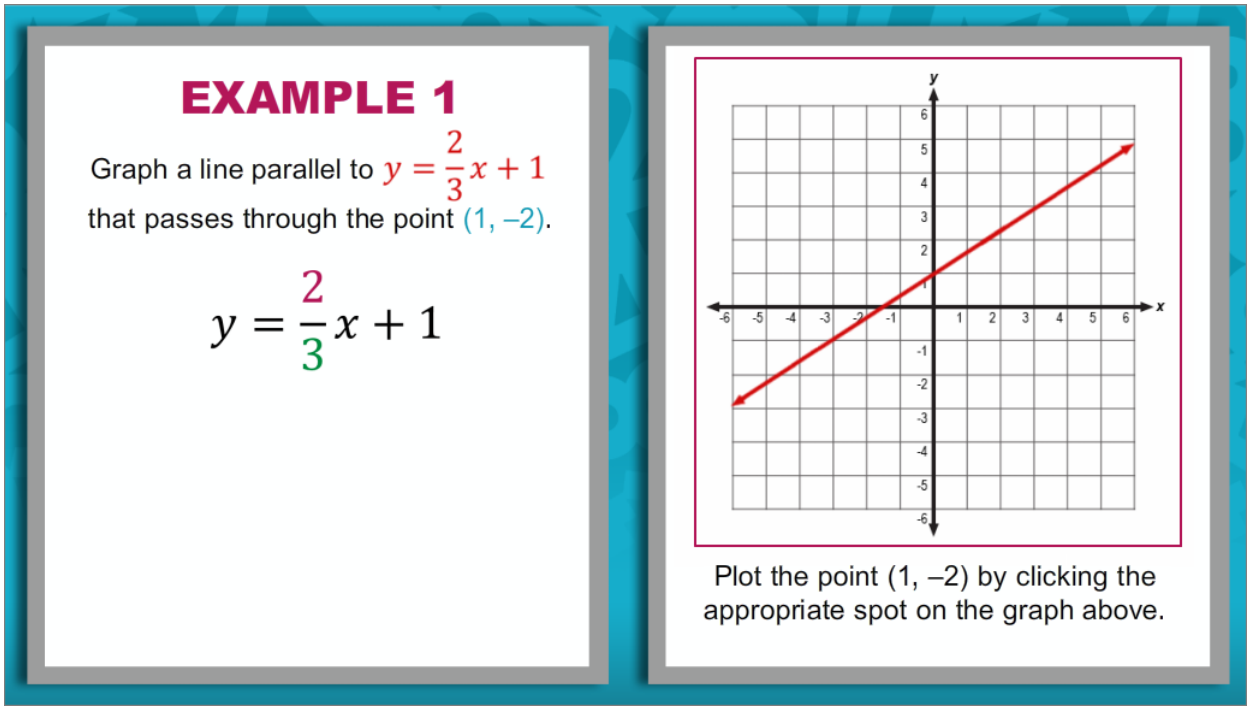


As you've learned in your earlier math studies, parallel lines are lines that are included in the same plane and never intersect. They have no points in common.

When graphing parallel lines on the coordinate plane is important to know another characteristic of parallel lines: they have equal slopes.

The two lines graphed on the coordinate plane are parallel. They each have a slope of $\frac{3}{2}$.

Example 1



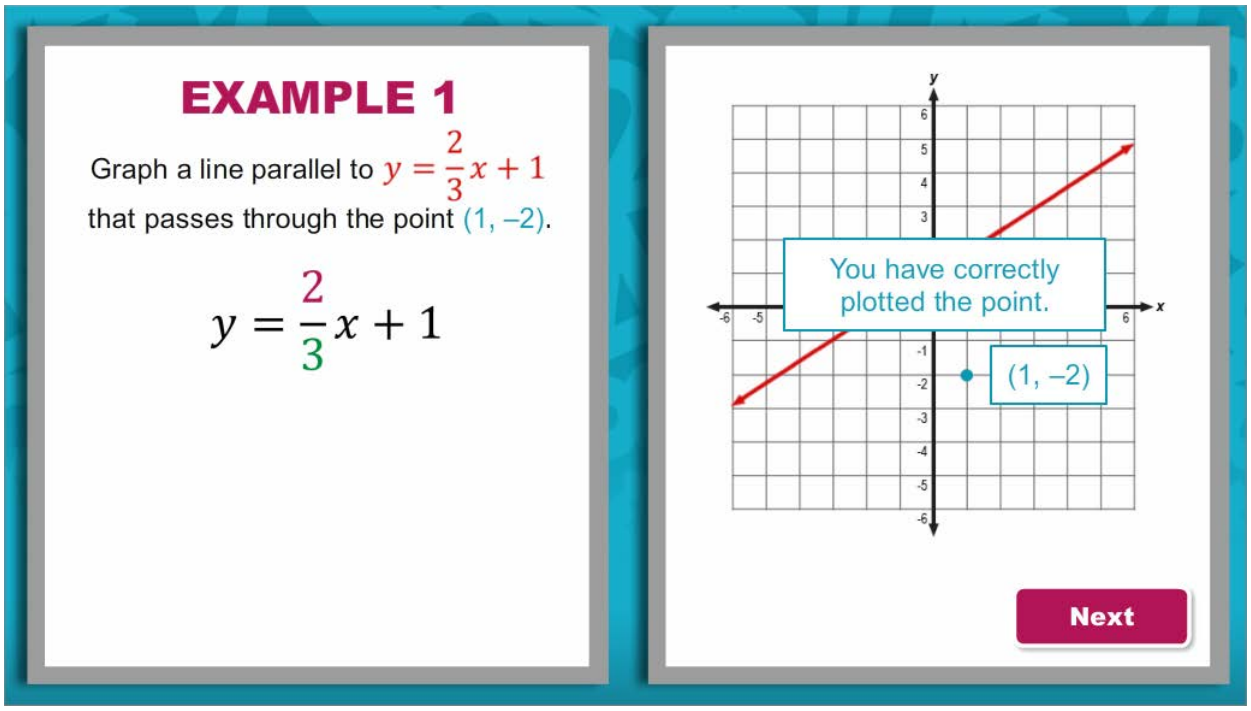
Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

For lines to be parallel, they must have the same slope. Therefore, a line parallel to $y = \frac{2}{3}x + 1$ must have a slope of $\frac{2}{3}$. In this example, the line will also pass through the point $(1, -2)$.

The first step to graphing this line is to plot the point $(1, -2)$.

Plot the point $(1, -2)$ by clicking the appropriate spot on the graph above.

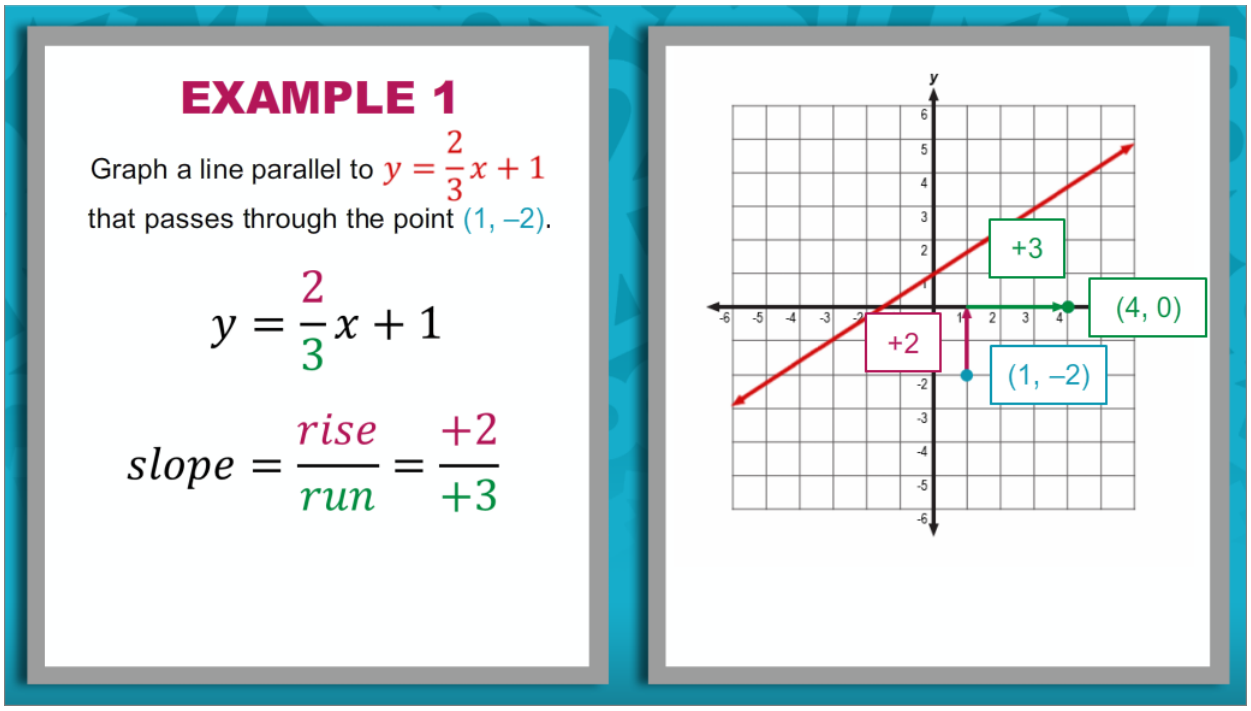
Example 1 (continued)



Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

You have correctly plotted the point $(1, -2)$.

Example 1 (continued)

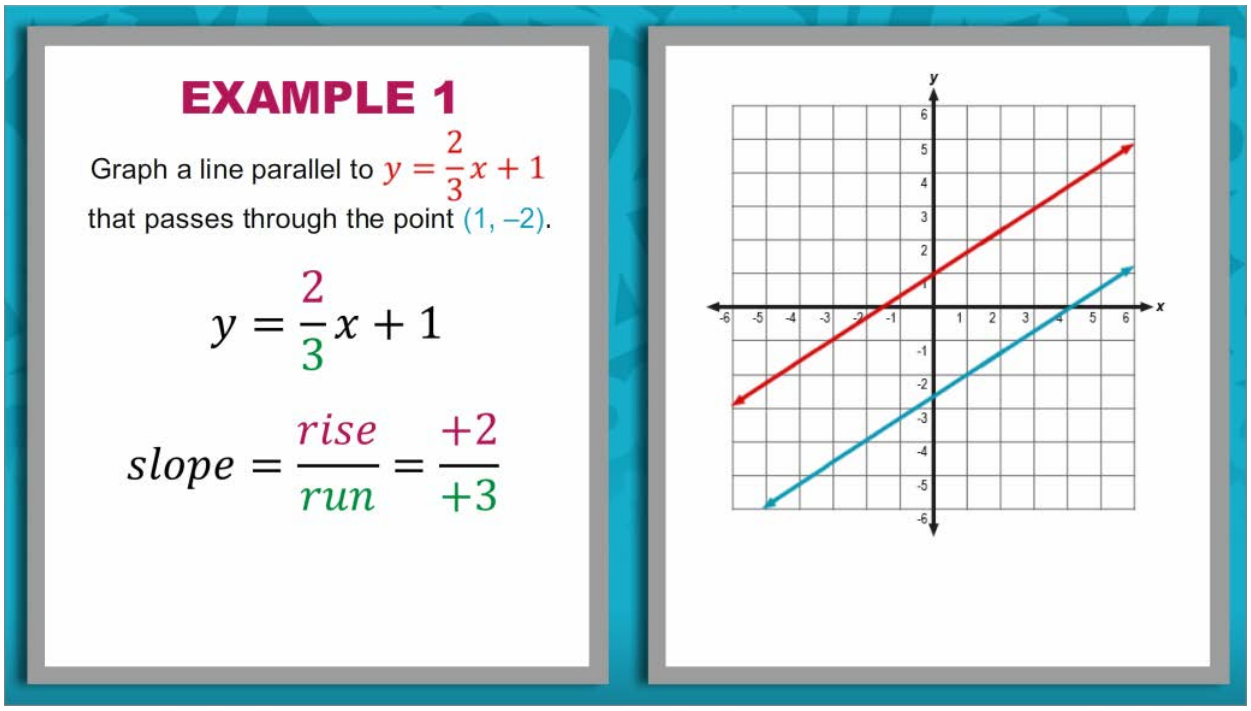


Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

After you have plotted the point, use the slope to find another point on the line. The slope of the parallel line is $\frac{2}{3}$.

Recall that slope is described as $\frac{rise}{run}$. So in this case, start at the point $(1, -2)$ and move 2 units up and 3 units to the right. The point where you end is another point on the parallel line: $(4, 0)$.

Example 1 (continued)

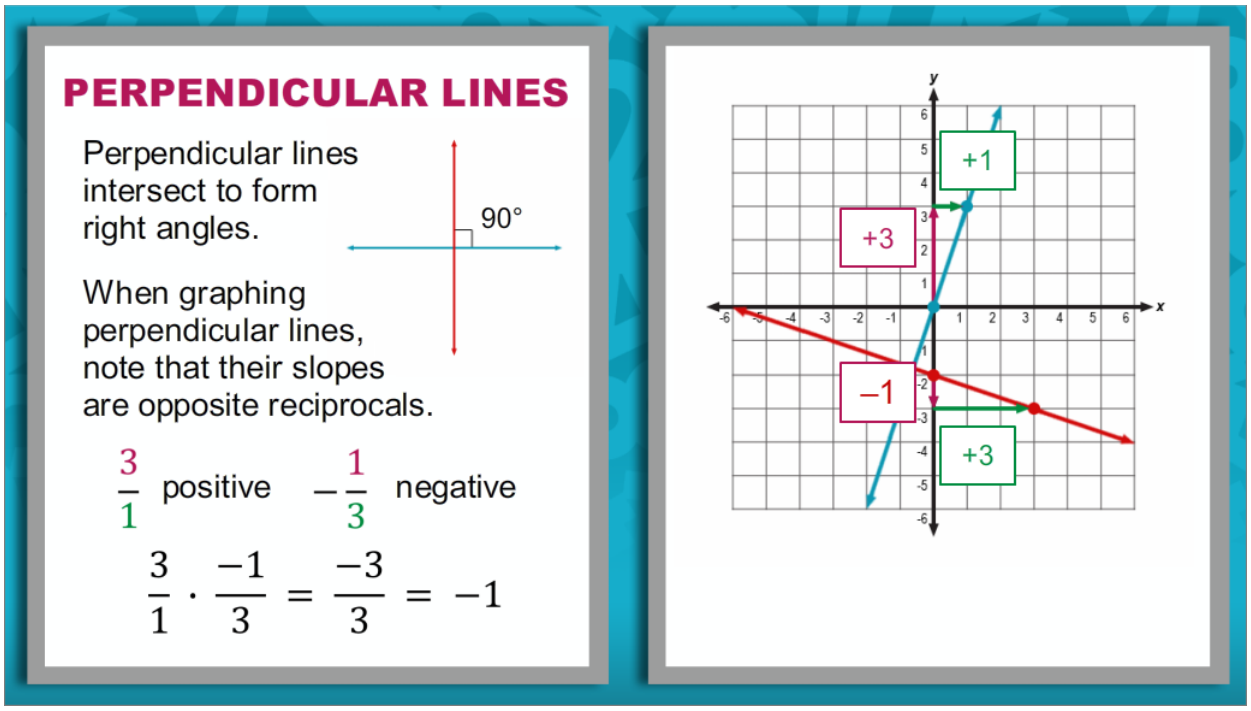


Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

Now that you have plotted two points on the line, you can draw the line that passes through the points.

Your work is complete. You have graphed a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

Definition of Parallel Lines



In prior math courses, you learned that perpendicular lines are lines that intersect to form right angles.

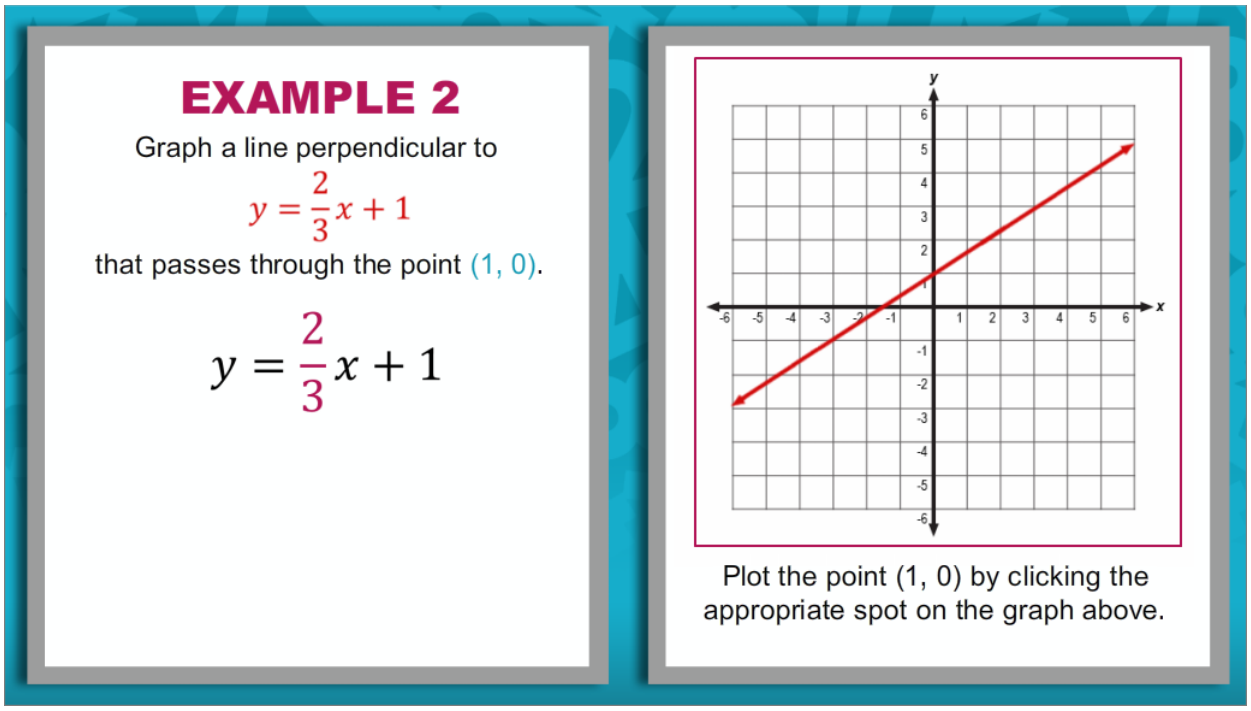
When graphing perpendicular lines on the coordinate plane is important to know another characteristic of perpendicular lines: they have slopes that are opposite reciprocals.

The blue line has a slope of $\frac{3}{1}$. The red line has a slope of $\frac{-1}{3}$.

The slopes have opposite signs and they are reciprocals of one another.

Also notice that the product of the slopes is -1.

Example 2

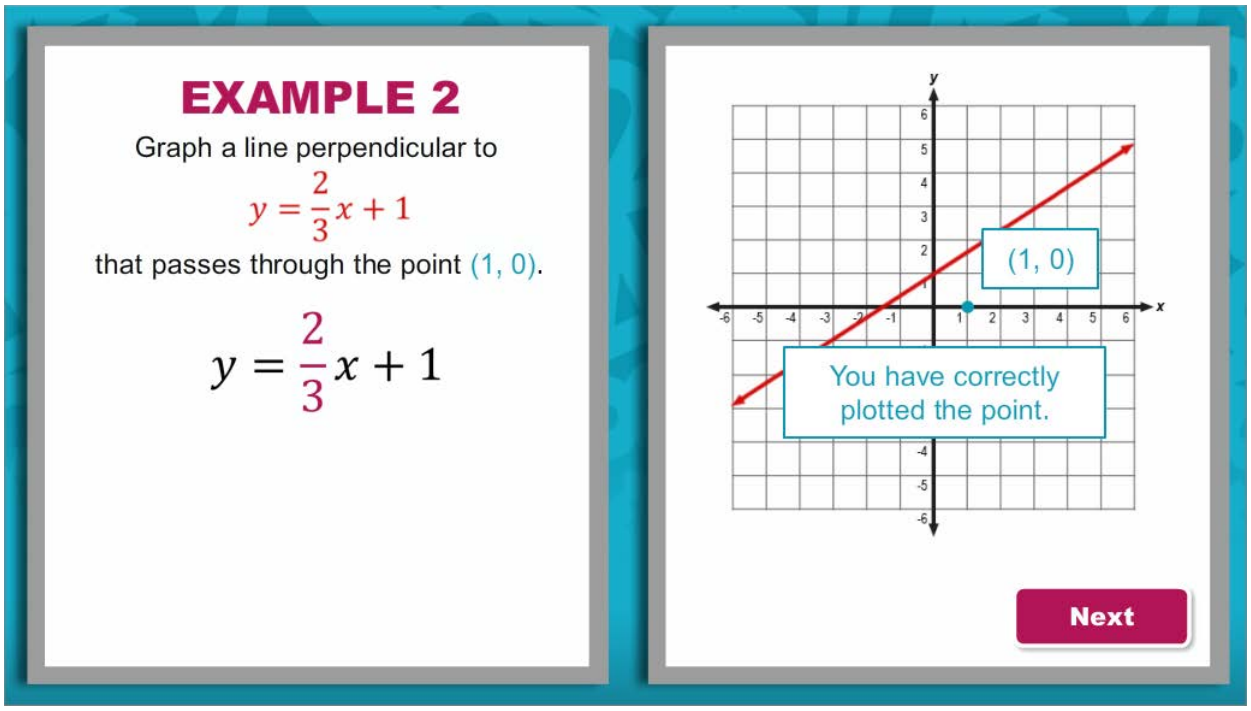


Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

A line perpendicular to $y = \frac{2}{3}x + 1$ must have a slope that is the opposite reciprocal of $\frac{2}{3}$. In this example, the perpendicular line will also pass through the point $(1, 0)$.

The first step to graphing the line is to plot the point $(1, 0)$.

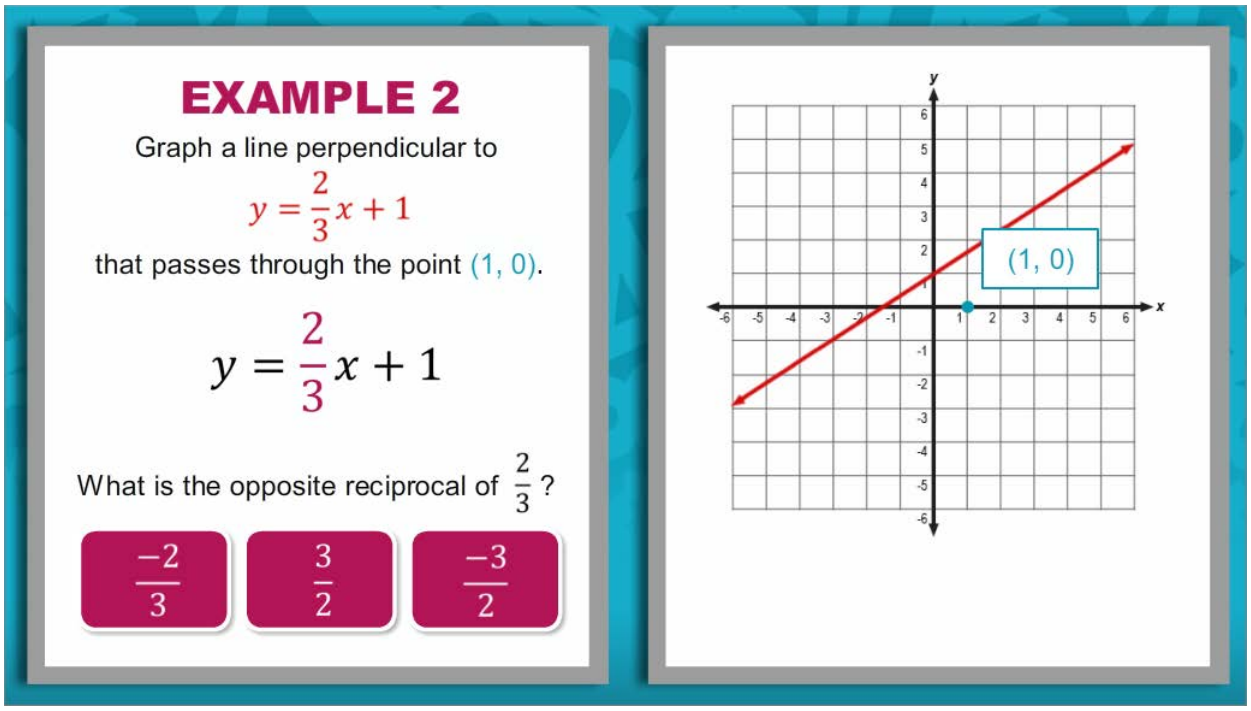
Example 2 (continued)



Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

You have correctly plotted the point $(1, 0)$.

Example 2 (continued)



Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

After you have plotted the point, use the slope to find another point on the line. As you learned earlier, a line perpendicular to $y = \frac{2}{3}x + 1$ must have a slope that is the opposite reciprocal of $\frac{2}{3}$.

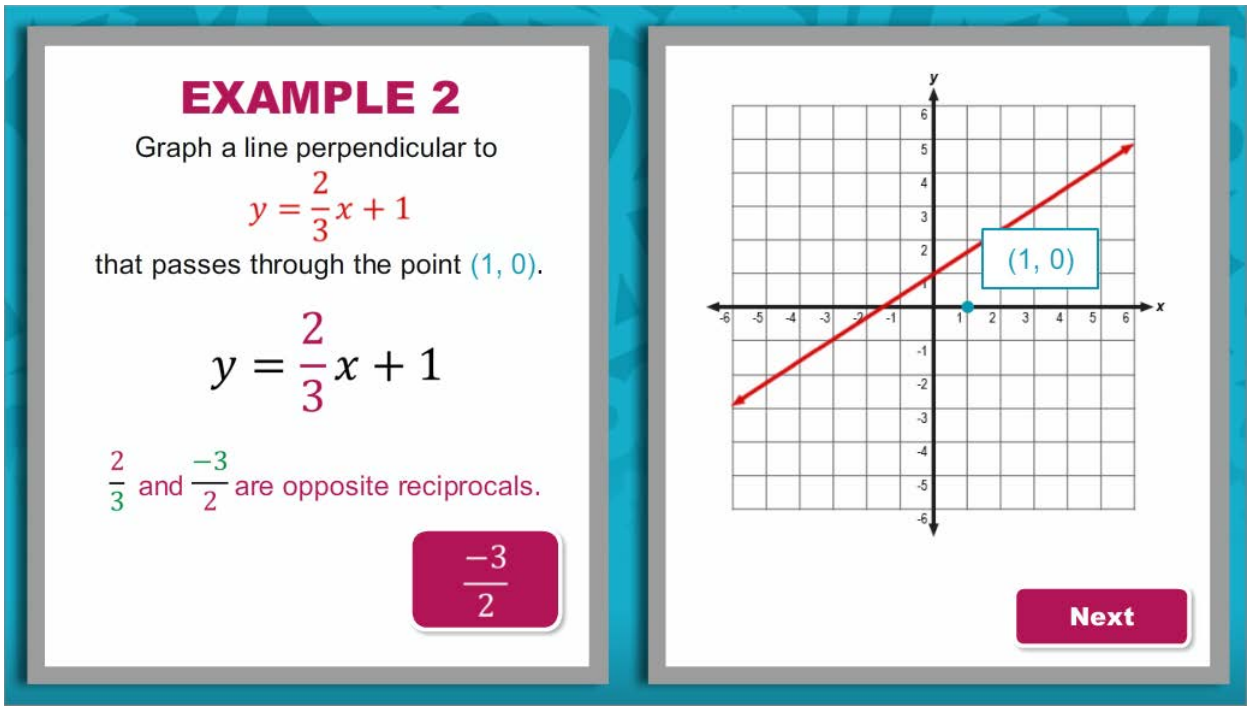
What is the opposite reciprocal of $\frac{2}{3}$?

A) $\frac{-2}{3}$

B) $\frac{3}{2}$

C) $\frac{-3}{2}$

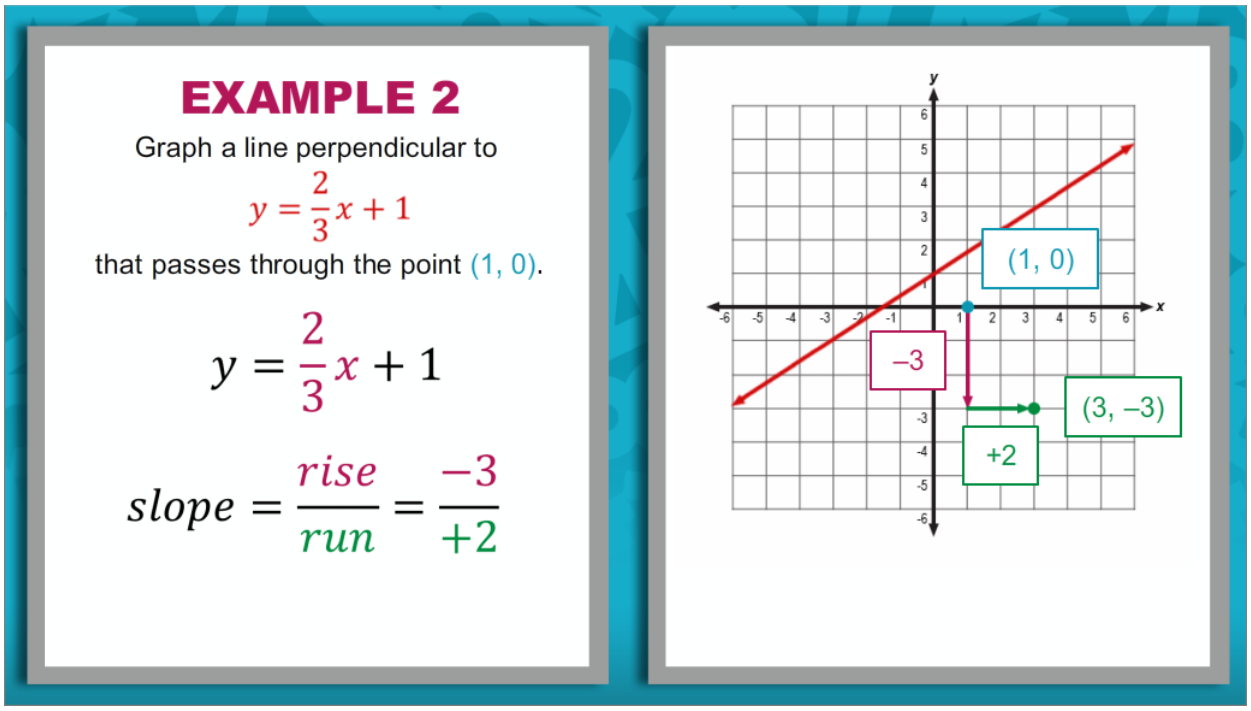
Example 2 (continued)



Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

$\frac{2}{3}$ and $\frac{-3}{2}$ are opposite reciprocals.

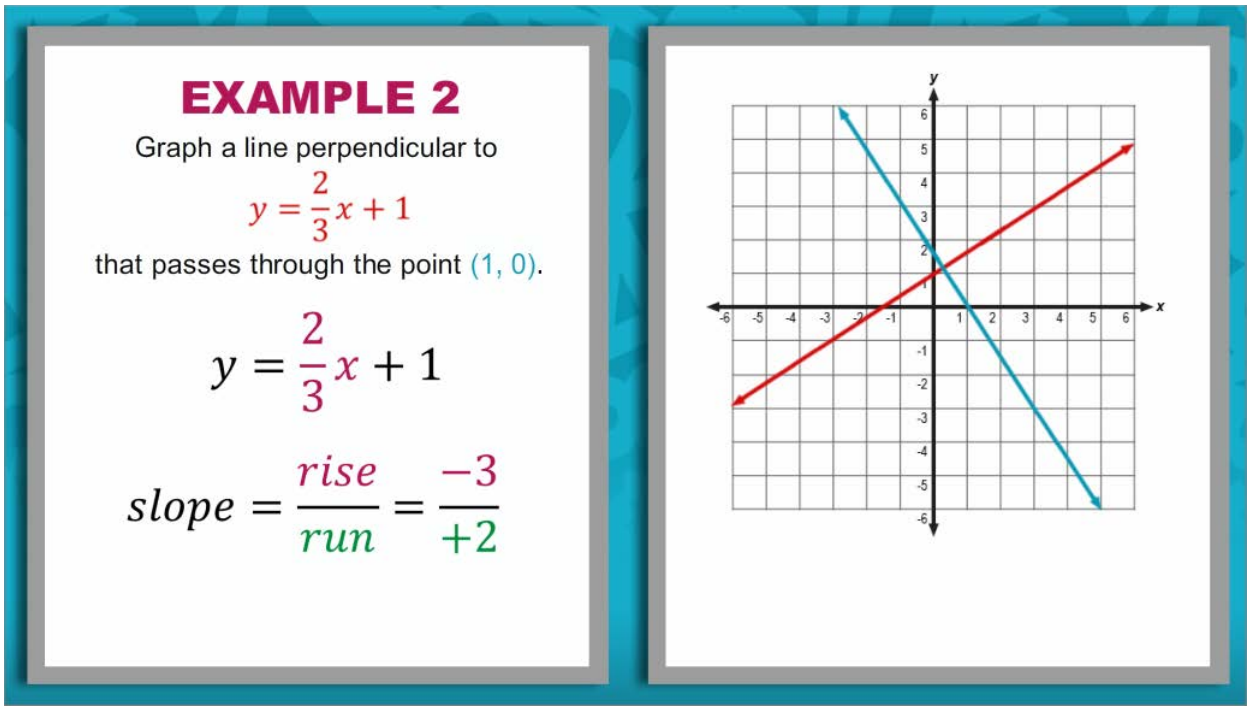
Example 2 (continued)



Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

Recall that slope is described as $\frac{rise}{run}$. So in this case, start at the point $(1, 0)$ and move 3 units down and 2 units to the right. The point where you end is another point on the perpendicular line: $(3, -3)$.

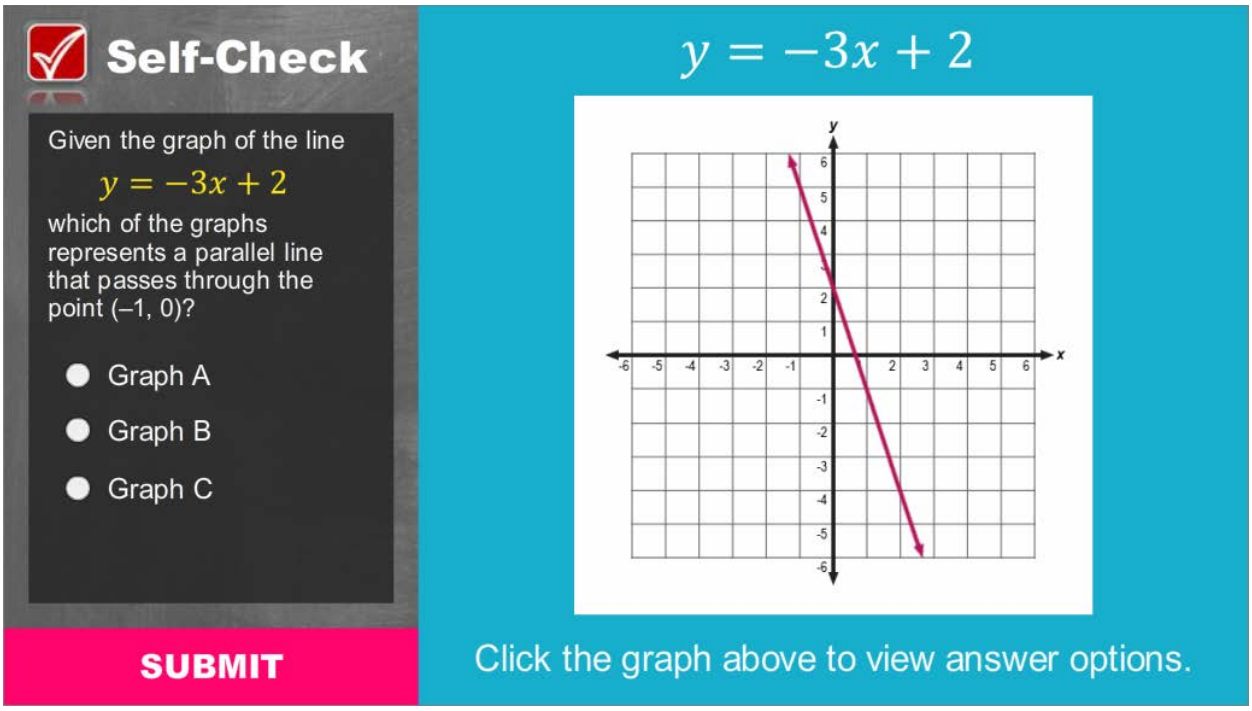
Example 2 (continued)



Now that you have plotted two points on the line, you can draw the line that passes through the points.

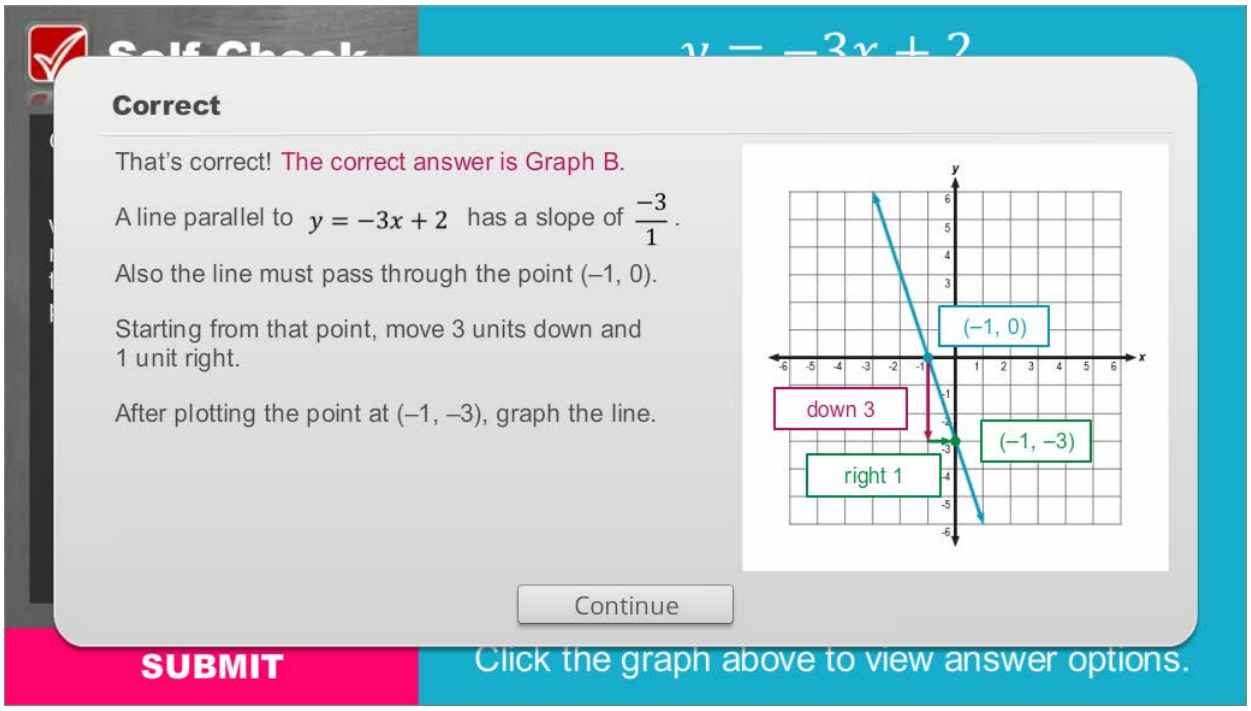
Your work is complete. You have graphed a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

Self-Check 1



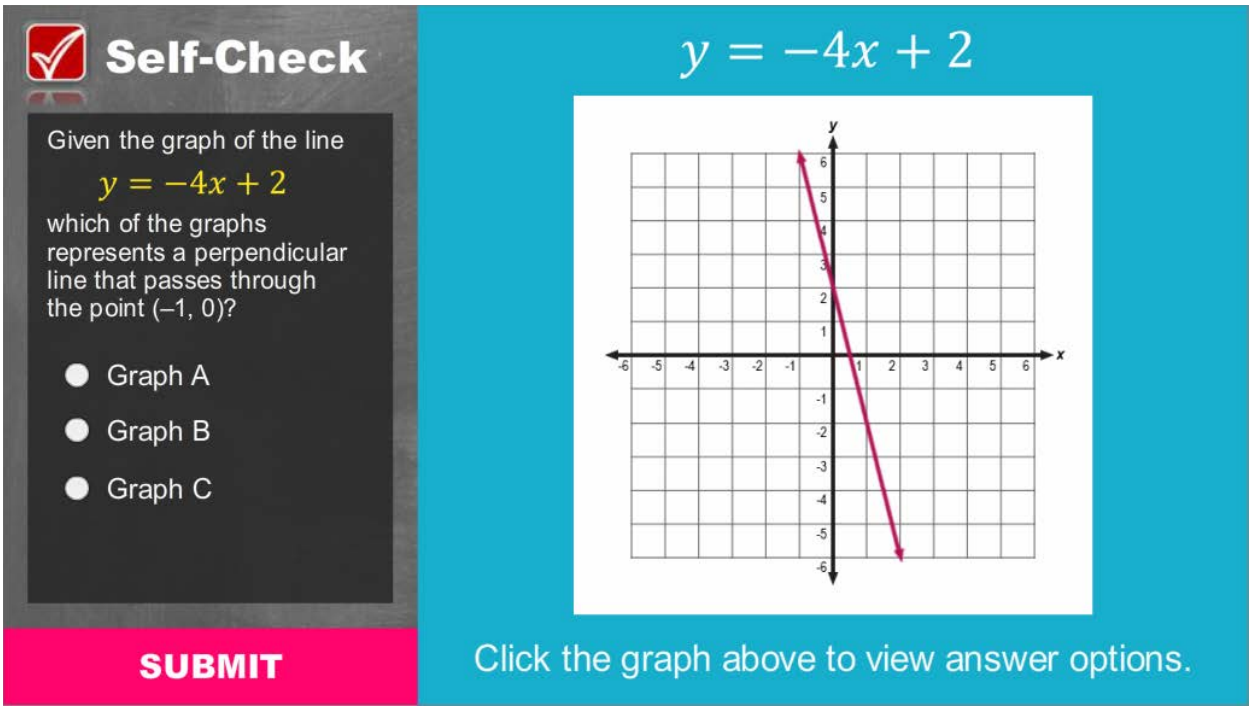
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



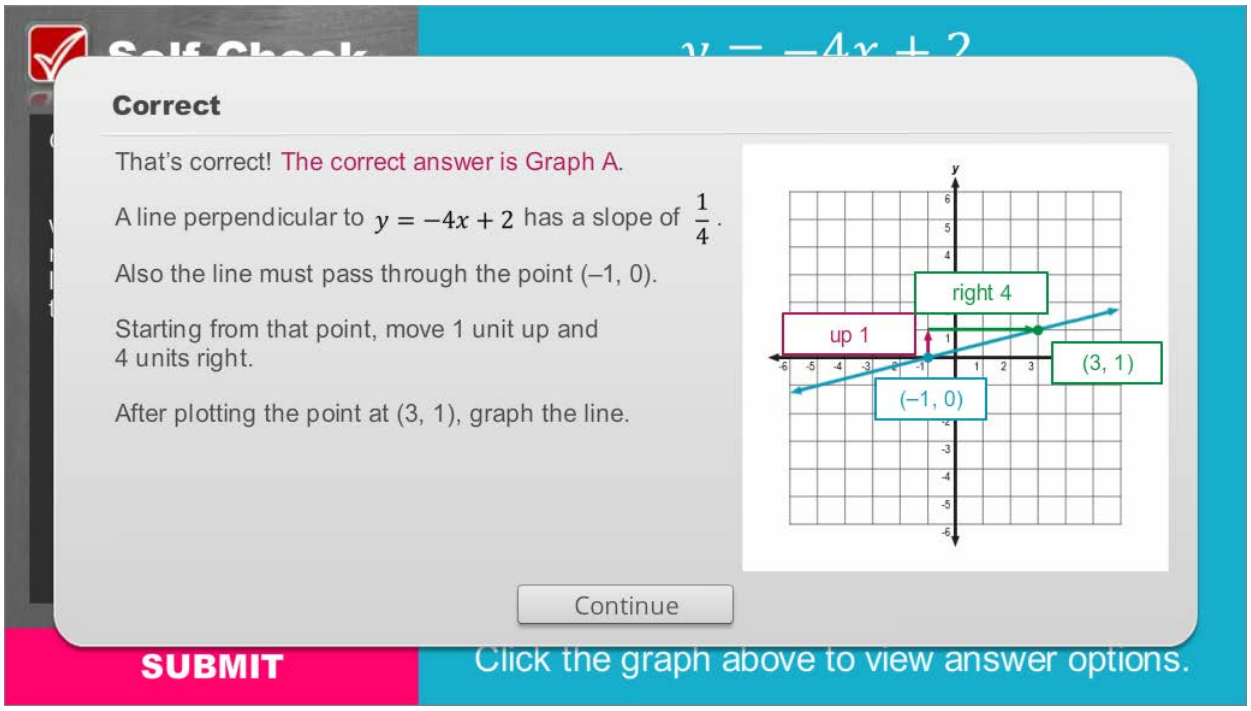
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



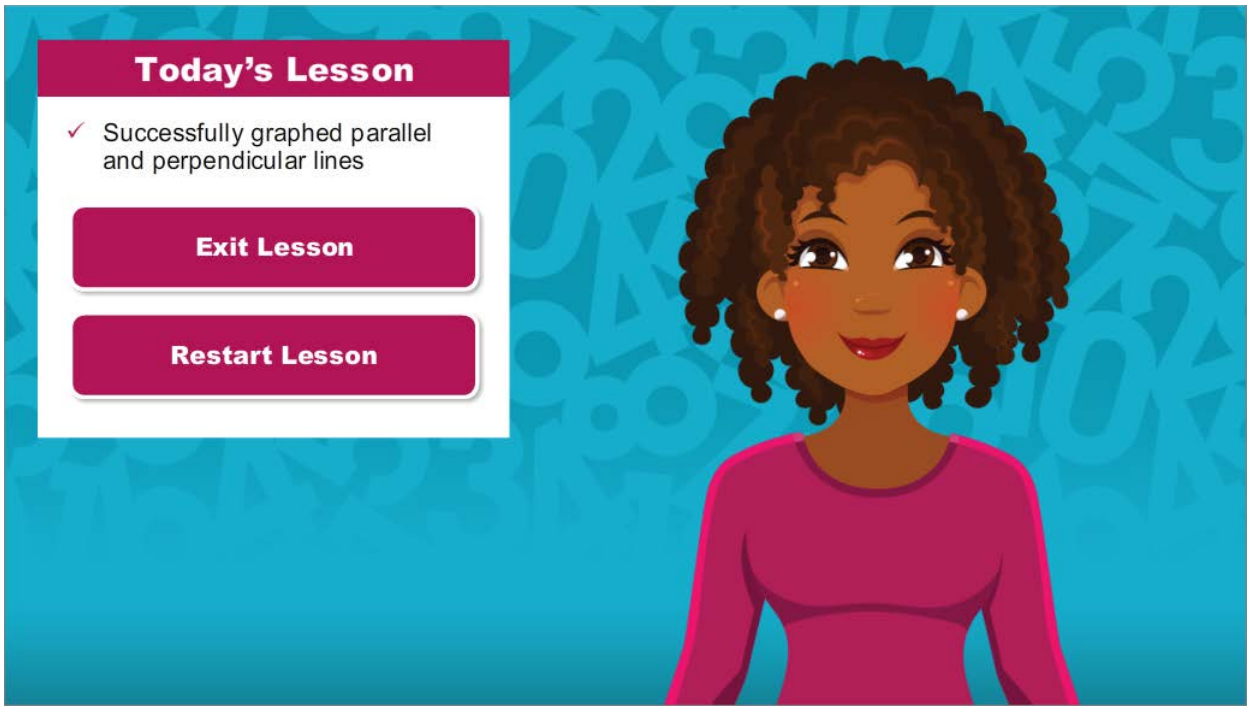
Solve the problem in the image above to check your understanding of the content.

Self-Check 2: Answer



For your reference, the 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 graph parallel and perpendicular lines.