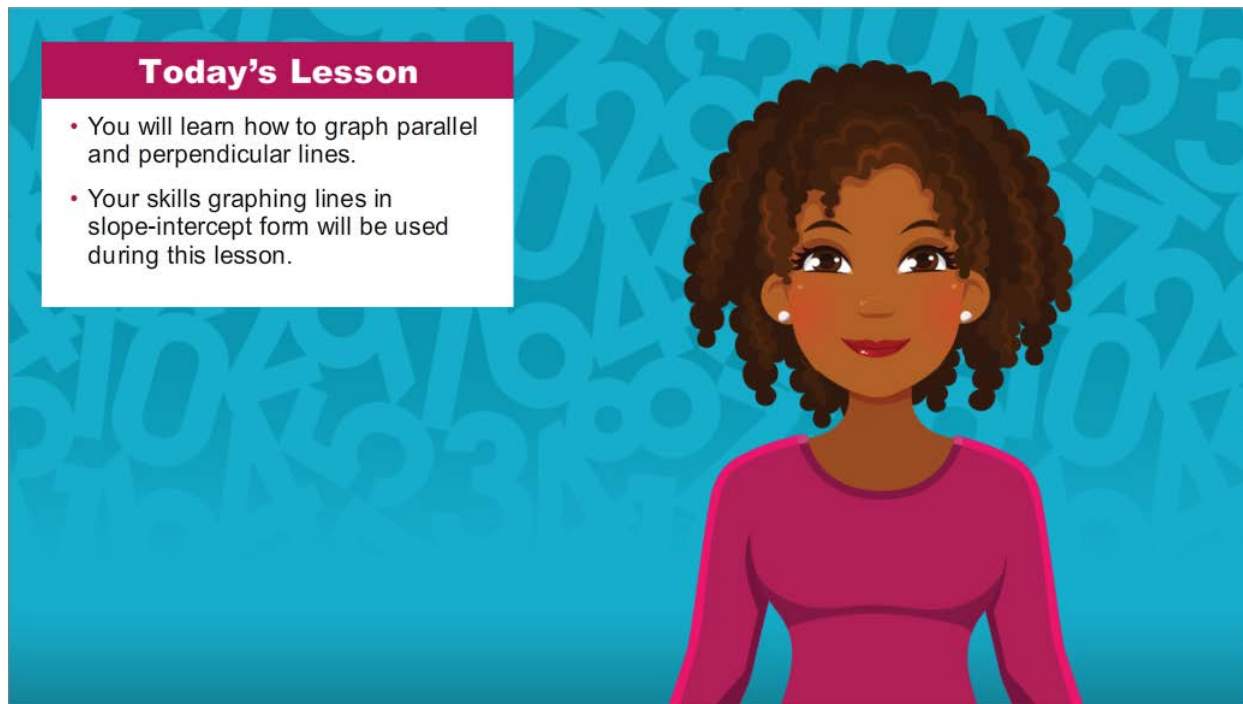


Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Introduction



Today's Lesson

- You will learn how to graph parallel and perpendicular lines.
- Your skills graphing lines in slope-intercept form will be used during this lesson.

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.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Graphing Parallel and Perpendicular Lines

**GRAPHING PARALLEL
AND PERPENDICULAR LINES**

Click the Examples Below to Learn More

Definition of Parallel Lines

Example Two

Example One

Self-Check

Definition of 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

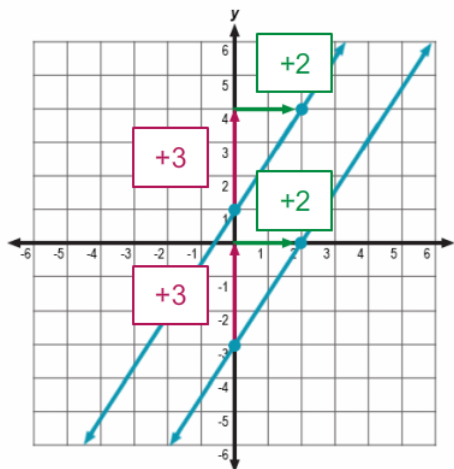
PARALLEL LINES

Parallel lines are included in the same plane and never intersect.

They have no points in common.

While graphing parallel lines, note that they have equal slopes.

The parallel lines graphed on the coordinate plane to the right, each have a slope of $\frac{3}{2}$.



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 $\frac{3}{2}$.

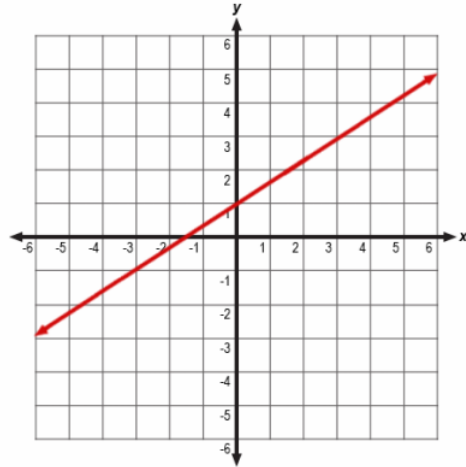
Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 1

EXAMPLE 1

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

$$y = \frac{2}{3}x + 1$$



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

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.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 1 (continued)

EXAMPLE 1

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

$$y = \frac{2}{3}x + 1$$

You have correctly plotted the point.

Next

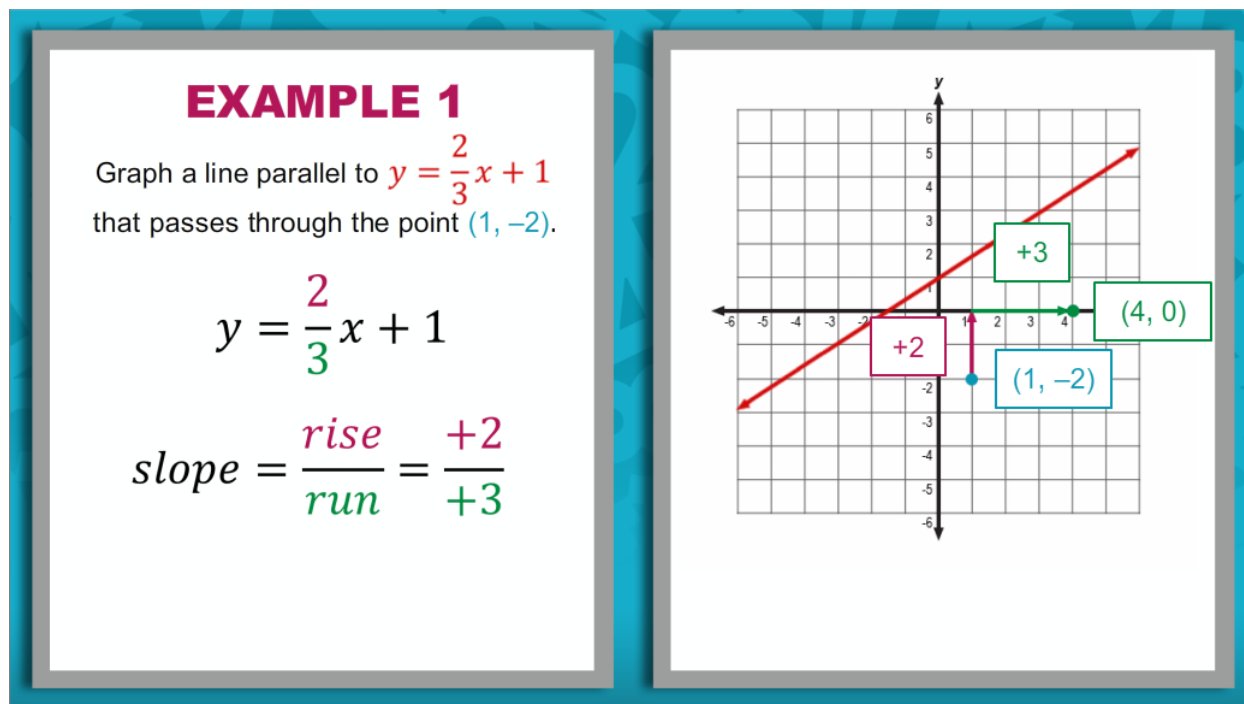
Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

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

Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 1 (continued)



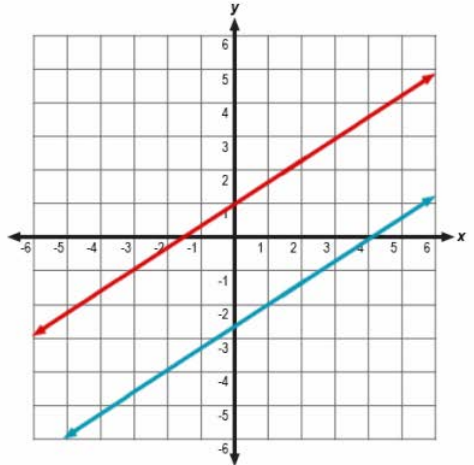
Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.

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 $\frac{\text{rise}}{\text{run}}$. 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: $(4, 0)$.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 1 (continued)

<p>EXAMPLE 1</p> <p>Graph a line parallel to $y = \frac{2}{3}x + 1$ that passes through the point $(1, -2)$.</p> $y = \frac{2}{3}x + 1$ $\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{+2}{+3}$	
--	--

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 $(1, -2)$.

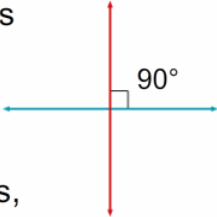
Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Definition of Parallel Lines

PERPENDICULAR LINES

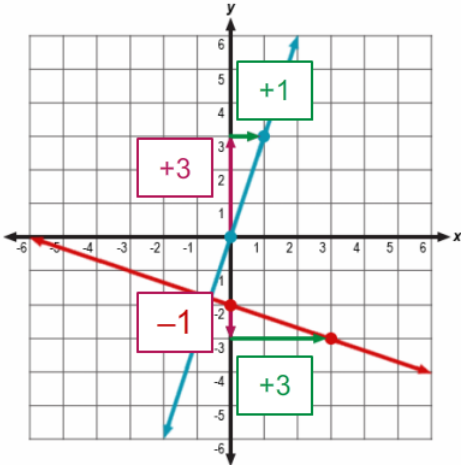
Perpendicular lines intersect to form right angles.



When graphing perpendicular lines, note that their slopes are opposite reciprocals.

$\frac{3}{1}$ positive $-\frac{1}{3}$ negative

$$\frac{3}{1} \cdot \frac{-1}{3} = \frac{-3}{3} = -1$$



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 .

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 2

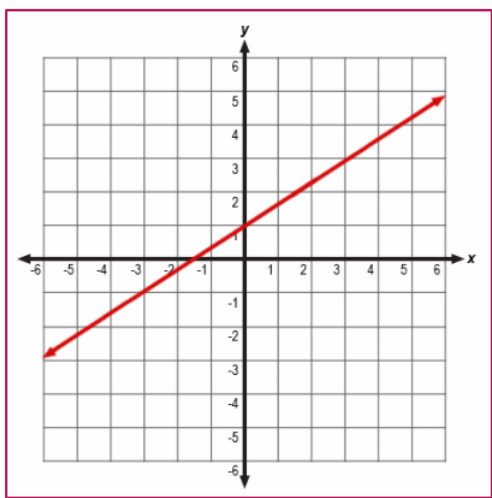
EXAMPLE 2

Graph a line perpendicular to

$$y = \frac{2}{3}x + 1$$

that passes through the point $(1, 0)$.

$$y = \frac{2}{3}x + 1$$



Plot the point $(1, 0)$ by clicking the appropriate spot on the graph above.

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 $(1, 0)$.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 2 (continued)

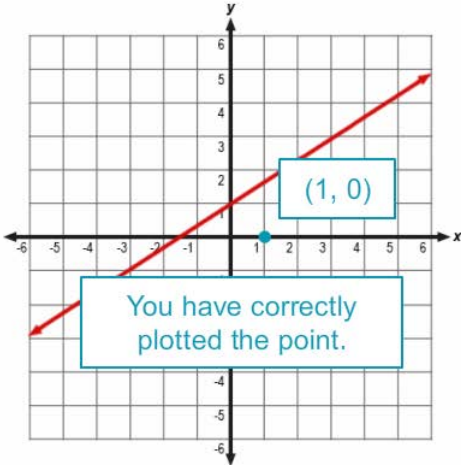
EXAMPLE 2

Graph a line perpendicular to

$$y = \frac{2}{3}x + 1$$

that passes through the point $(1, 0)$.

$$y = \frac{2}{3}x + 1$$



Next

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

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

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 2 (continued)

EXAMPLE 2

Graph a line perpendicular to

$$y = \frac{2}{3}x + 1$$

that passes through the point $(1, 0)$.

$$y = \frac{2}{3}x + 1$$

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

$\frac{-2}{3}$

$\frac{3}{2}$

$\frac{-3}{2}$

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

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 2 (continued)

EXAMPLE 2

Graph a line perpendicular to

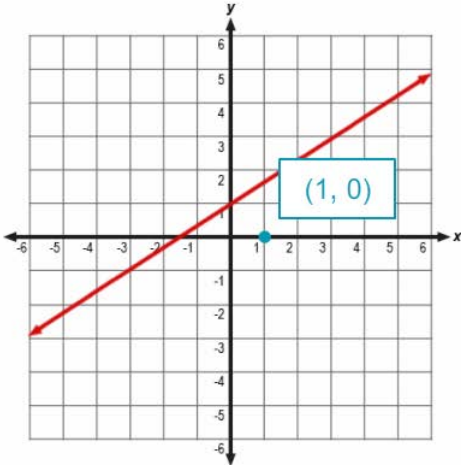
$$y = \frac{2}{3}x + 1$$

that passes through the point $(1, 0)$.

$$y = \frac{2}{3}x + 1$$

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

$\frac{-3}{2}$



Next

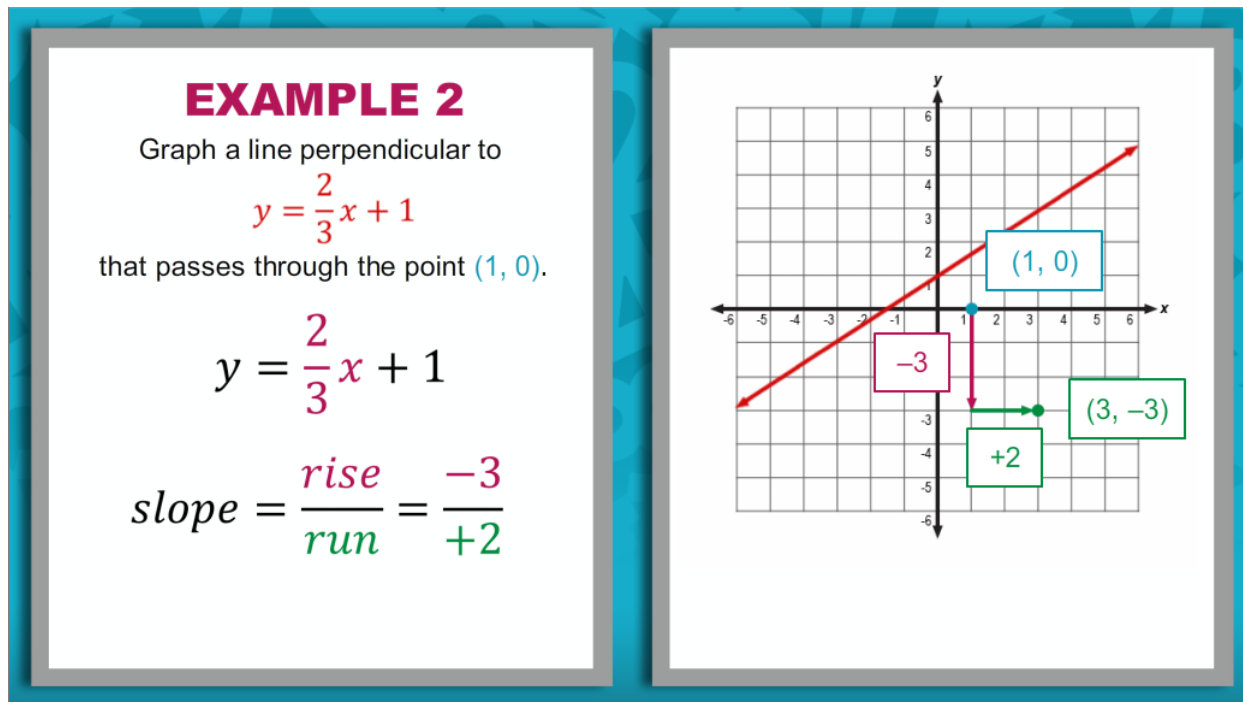
Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

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

Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Example 2 (continued)

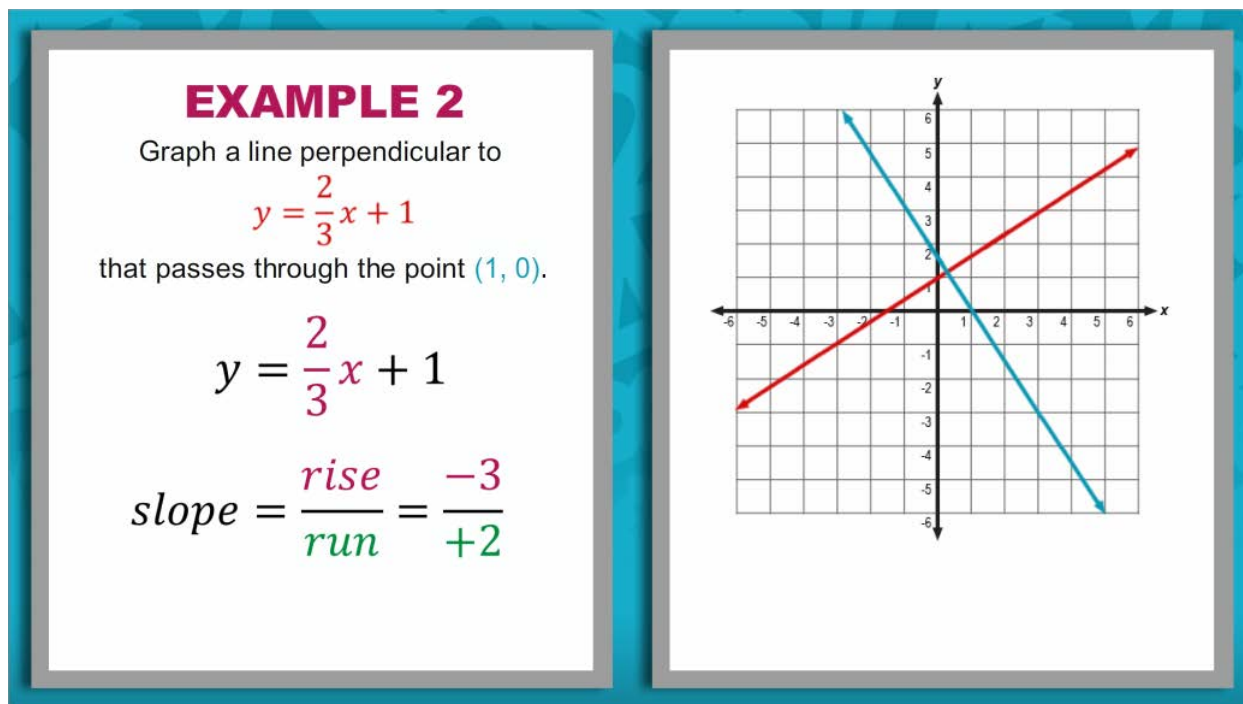


Graph a line perpendicular to $y = \frac{2}{3}x + 1$ that passes through the point $(1, 0)$.

Recall that slope is described as $\frac{\text{rise}}{\text{run}}$. 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: $(3, -3)$.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

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 $(1, 0)$.

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Self-Check 1

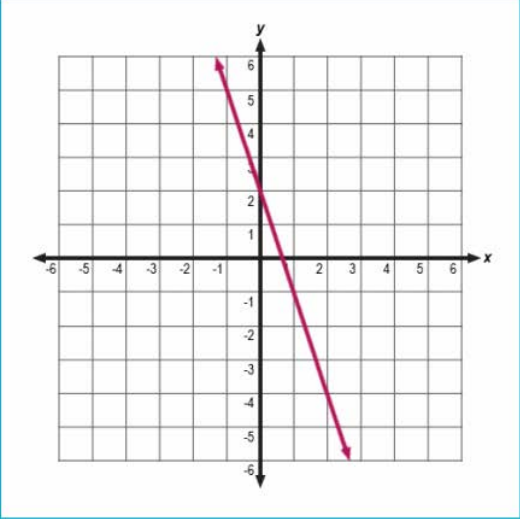
 **Self-Check**

Given the graph of the line
 $y = -3x + 2$
which of the graphs
represents a parallel line
that passes through the
point $(-1, 0)$?

- Graph A
- Graph B
- Graph C

SUBMIT

$y = -3x + 2$



Click the graph above to view answer options.

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

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Self-Check 1: Answer

Correct

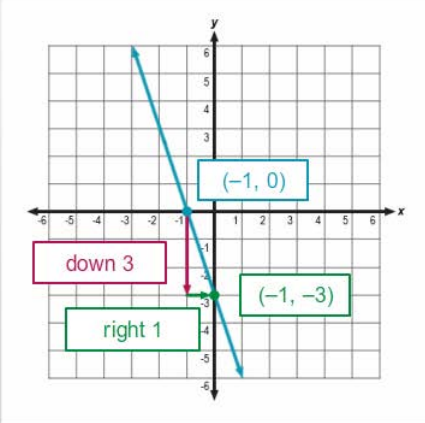
That's correct! The correct answer is Graph B.

A line parallel to $y = -3x + 2$ has a slope of $\frac{-3}{1}$.

Also the line must pass through the point $(-1, 0)$.

Starting from that point, move 3 units down and 1 unit right.

After plotting the point at $(-1, -3)$, graph the line.




Continue

SUBMIT Click the graph above to view answer options.

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

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Self-Check 2

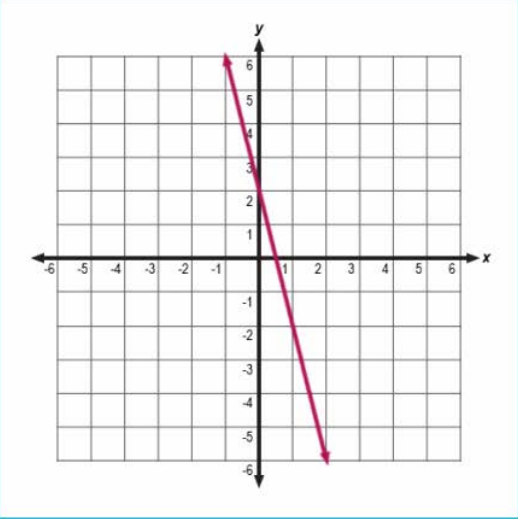
 **Self-Check**

Given the graph of the line
 $y = -4x + 2$
which of the graphs
represents a perpendicular
line that passes through
the point $(-1, 0)$?

- Graph A
- Graph B
- Graph C

SUBMIT

$y = -4x + 2$



Click the graph above to view answer options.

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

Module 8: Graphing Linear Equations
Topic 1 Content: Graphing Parallel and Perpendicular Lines

Self-Check 2: Answer

Correct

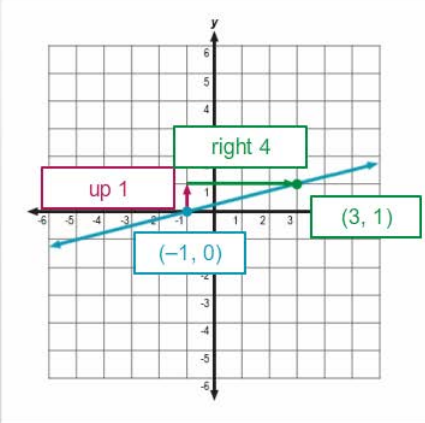
That's correct! The correct answer is Graph A.

A line perpendicular to $y = -4x + 2$ has a slope of $\frac{1}{4}$.

Also the line must pass through the point $(-1, 0)$.

Starting from that point, move 1 unit up and 4 units right.

After plotting the point at $(3, 1)$, graph the line.



Continue

SUBMIT Click the graph above to view answer options.

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

Module 8: Graphing Linear Equations

Topic 1 Content: Graphing Parallel and Perpendicular Lines

Conclusion



You have reached the conclusion of this lesson where you learned how to graph parallel and perpendicular lines.