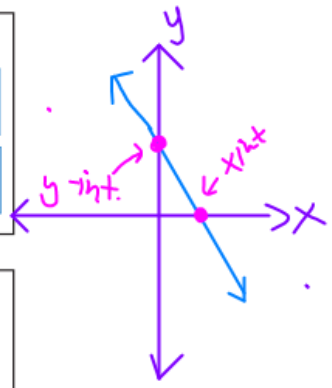
8.3 Using Intercepts

Goal: Use *x*- and *y*-intercepts to graph linear equations.

Vocabulary

x-intercept: where the graph crosses the x-axis

y-intercept: where the graph crosses the y-axis



Finding Intercepts

To find the *x*-intercept of a line, substitute 0 for *y* in the line's equation and solve for x.

To find the *y*-intercept of a line, substitute 0 for *x* in the line's equation and solve for y.

Example 1 *Finding Intercepts of a Graph*

Find the intercepts of the graph of $2x - 5y = -10$. x & y

To find the *x*-intercept, let $y =$ 0 and solve for *x*.

$2x - 5y = -10$ Write original equation.

$2x - 5(0) = -10$ Substitute for *y*.

$2x = -10$ Simplify.

$x = -5$ Divide each side by 2.

(-5, 0) (x, y)

To find the y-intercept, let $x =$ 0 and solve for y.

$2x - 5y = -10$ Write original equation.

$2(0) - 5y = -10$ Substitute for x.

$-5y = -10$ Simplify.

$y = 2$ Divide each side by -5

The intercepts of a graph are numbers, not ordered pairs.

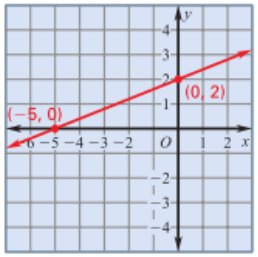
Answer: The x-intercept is -5, and the y-intercept is 2.

Example 2 ***Using Intercepts to Graph a Linear Equation***

Graph the equation $2x - 5y = -10$ from Example 1.

The x-intercept is -5, so plot the point $(-5, 0)$. The y-intercept is 2, so plot the point $(0, 2)$.

Draw a line through the two points.

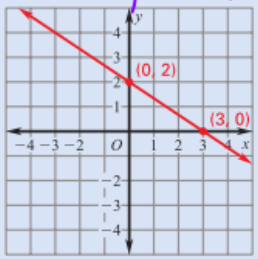


Checkpoint **Find the intercepts of the equation's graph. Then graph the equation.**

1. $2x + 3y = 6$

x-int.
$2x + 3(0) = 6$
$2x = 6$
$x = 3$
$(3, 0)$

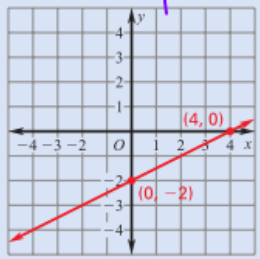
y-int.
$2(0) + 3y = 6$
$3y = 6$
$y = 2$
$(0, 2)$



2. $3x - 6y = 12$

x-int
$3x - 6(0) = 12$
$3x = 12$
$x = 4$
$(4, 0)$

y-int
$3(0) - 6y = 12$
$\frac{-6y}{-6} = \frac{12}{-6}$
$y = -2$
$(0, -2)$



Example 3 *Writing and Graphing an Equation*

Fitness You run and walk on a fitness trail that is 12 miles long. You can run 6 miles per hour and walk 3 miles per hour. Write and graph an equation describing your possible running and walking times on the fitness trail. Give three possible combinations of running and walking times.

Solution

1. To write an equation, let x be the running time and let y be the walking time (both in hours). First write a verbal model.

Running time			Walking time			
running rate	·	running time	+	walking rate	·	walking time	=	total distance

Then use the verbal model to write the equation.

$6x + 3y = 12$

2. To graph the equation, find and use the intercepts.

Find x-intercept: $6x + 3(0) = 12$

$6x = 12$

$x = 2$

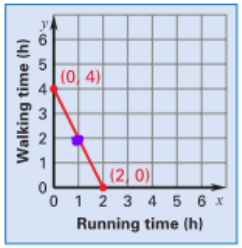
$(2, 0)$

Find y-intercept: $6(0) + 3y = 12$

$3y = 12$

$y = 4$

$(0, 4)$



3. Three points on the graph are $(2,0)$; $(0,4)$; $(1,2)$. So, you can run for 2 hours; walk for 4 hrs; run for 1 hr. & walk for 2 hrs.