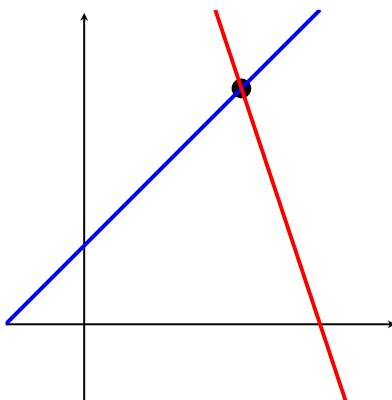


## Lesson #10

### Finding the Slope and Y-Intercept of a Line in Standard Form

#### What are Slope and Y-Intercept?

- The **slope** of a line is a numerical measure of how steep the line is and in what direction it rises.
- The **y-intercept** of a line is the point on the coordinate plane (or the x-y grid) where the line crosses the y-axis.
- The y-intercept is often expressed as a point (0, #)



*Image: Jim.belk / Public Domain*

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#### Equations of Lines

**A Line in Standard Form** is expressed in the form  $Ax + By = C$ , where A, B and are integers (no decimals or fractions) and A is usually positive

- The standard form equation does not immediately tell us the slope or y-intercept (though we can use algebra to find them)

**A Line in Slope-Intercept Form** is expressed in the form  $y = mx + b$ , where m and b are any real numbers and can be either positive or negative

- The advantage of this form is that we can immediately tell the slope (**m**) of a line and its y-intercept (**b**)

## How Do I Convert A Line in Standard Form into Slope-Intercept Form?

- Simple! We use algebra! The goal is to solve the equation for **y**
- Here's a sample problem: Convert the equation  $3x - 6y = 15$  into slope-intercept form:

$$3x - 6y = 15$$

$$-6y = -3x + 15$$

$$y = \frac{-3}{-6}x + \frac{15}{-6}$$

$$y = \frac{1}{2}x - \frac{5}{2}$$

So the Line is in Slope-Intercept Form... Now What?

$$y = mx + b$$

$$y = \frac{1}{2}x - \frac{5}{2}$$

- The slope (m) of this line is  $\frac{1}{2}$
  - The y-intercept (b) of this line is  $-\frac{5}{2}$
  - Expressed as a point, the y-intercept is  $(0, -\frac{5}{2})$
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## Another Way to Find Intercepts

- The methods we just explained allow you to find the slope and y-intercept of a line by converting it from standard form to slope-intercept form
- There is another way to find the y-intercept (and also the x-intercept) without converting the equation. This can be faster if you are not also asked for the slope
- To find our y-intercept, we use the fact that the y-intercept of a line is the point where it crosses the y axis. **At this point, x will equal 0!**
- To find our x-intercept, we use the fact that the x-intercept of a line is the point where it crosses the x axis. **At this point, y will equal 0!**

**Sample Problem:** Find the x- and y-intercepts for the line  $3x - 7y = 18$

**To Find the X-Intercept:** The x-intercept is the value of x when y=0. Substitute 0 for y, and solve for x:

$$3x - 7y = 18$$

$$3x - 7(0) = 18$$

$$3x - 0 = 18$$

$$3x = 18$$

$$x = 6$$

**The x-intercept is 6. Expressed as a point, the x-intercept is (6, 0)**

**To Find the Y-Intercept:** The y-intercept is the value of y when x=0. Substitute 0 for x, and solve for y:

$$3x - 7y = 18$$

$$3(0) - 7y = 18$$

$$0 - 7y = 18$$

$$-7y = 18$$

$$y = -\frac{18}{7}$$

**The y-intercept is  $-\frac{18}{7}$ . Expressed as a point, the y-intercept is  $(0, -\frac{18}{7})$**

**Now For Some More Practice:**

**Sample Question:** What is the y-intercept of the line  $-4x + 6y = 30$ ?

**Solution:** Use algebra to convert the equation into  $y = mx + b$  form:

$$-4x + 6y = 30$$

$$6y = 4x + 30$$

$$y = \frac{4}{6}x + \frac{30}{6}$$

$$y = \frac{2}{3}x + 5$$

The problem asked for the y-intercept (b), which equals 5. Expressed as a point, the y-intercept is (0, 5)

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**Sample Question:** What is the x-intercept of the line  $5x - 12y = -30$ ?

**Solution:** Converting the equation to  $y = mx + b$  form will not help us find this!

Instead, we substitute 0 in for y and solve for x:

$$5x - 12y = -30$$

$$5x - 12(0) = -30$$

$$5x - 0 = -30$$

$$5x = -30$$

$$x = -6$$

The x-intercept equals -6. Expressed as a point, the x-intercept is (-6,0)