6.1 Graphing with Slope-Intercept Form

Before we begin looking at systems of equations, let’s take a moment to review how to graph linear equations using slope-intercept form. This will help us because one way we can solve systems of equations is to graph the equations and see where the lines cross.

Slope-Intercept Form

Any linear equation can be written in the form $y = mx + b$ where $m$ is the slope and $b$ is the $y$-intercept. Sometimes the equation we need to graph will already be in slope-intercept form, but if it’s not, we’ll need to rearrange the equation to get it into slope-intercept form. Take a look at the following equations:

Example 1

$y = 2x - 1$

This equation is already in slope-intercept form. Nothing needs to be done.

Example 2

$2x + y = 7$

This equation is not in slope-intercept form. We need to subtract $2x$ from both sides to get the $y$ by itself.

$2x - 2x + y = 7 - 2x$

$y = -2x + 7$

Example 3

$3x - 2y = 4$

This example is also not in slope-intercept form. We’ll first subtract $3x$, but then notice that we’ll be left with a $-2y$. Be careful because that negative sign is important. Next divide by $-2$ to get $y$ by itself.

$3x - 3x - 2y = 4 - 3x$

$-2y = -3x + 4$

$-2y = -3x + 4$

$\frac{-2y}{-2} = \frac{-3x + 4}{-2}$

$y = \frac{3}{2}x - 2$

Example 4

$-4x + 2y = 8$

This is not in slope-intercept form. We’ll first need to get rid of the $-4x$ by adding $4x$ and then we’ll have to get rid of the times by 2 by dividing by 2. That will get $y$ by itself.

$-4x + 4x + 2y = 8 + 4x$

$2y = 4x + 8$

$2y = \frac{4x + 8}{2}$

$y = 2x + 4$

So, step one in graphing is to get the equation in slope-intercept form.
The y-Intercept and the Slope

Once you have an equation in slope-intercept form, start by graphing the y-intercept on the coordinate plane. From the y-intercept, move the rise and run of the slope to plot another point. Finally, draw the line that connects the two points. Let’s use our previous equations to graph step-by-step.

**Example 1**

\[ y = 2x - 1 \]

**Step 1**
The y-intercept is \(-1\), so we plot a point at \(-1\) on the y-axis to begin.

**Step 2**
Next, the slope is \(2\) which means a rise of 2 and a run of 1. So we’ll move up two and right one to plot the next point.

**Step 3**
Finally, connect the dots with a line. This completes the graph of our linear function.

Here are the rest of the examples graphed.

**Example 2**
\[ y = -2x + 7 \]

**Example 3**
\[ y = \frac{3}{2}x - 2 \]

**Example 4**
\[ y = 2x + 4 \]
Lesson 6.1

Identify the slope as a fraction and the y-intercept of each equation. Then graph on the coordinate plane.

1. \( y = 2x + 1 \)  
   Slope:  
   y-int:  

2. \( y = 3x - 4 \)  
   Slope:  
   y-int:  

3. \( y = \frac{2}{3}x + 5 \)  
   Slope:  
   y-int:  

4. \( y = 7 \)  
   Slope:  
   y-int:  

5. \( y = -3x - 2 \)  
   Slope:  
   y-int:  

6. \( y = -\frac{1}{3}x + 5 \)  
   Slope:  
   y-int:
7. \( y = \frac{2}{3}x - 2 \)  
Slope:  
y-int:  

8. \( y = -\frac{3}{4}x - 1 \)  
Slope:  
y-int:  

9. \( y = -4 \)  
Slope:  
y-int:  

10. \( x = 2 \)  
\text{Hint: This is not a function!}  
Slope:  
y-int:  

11. \( x = -6 \)  
\text{Hint: This is not a function!}  
Slope:  
y-int:  

12. \( y = 4x - 5 \)  
Slope:  
y-int:  

\text{Hint: This is not a function!}  
Slope:  
y-int:
Put the following equations in slope-intercept form and then graph them on the coordinate plane.

13. $2x + y = 2$

14. $-3x + y = 4$

15. $4x + y = -5$

16. $4x + 2y = 6$

17. $-6x + 3y = -9$

18. $x + 3y = 6$
19. \(-2x + 3y = 12\)  
20. \(4x - 2y = 8\)  
21. \(-2x - 3y = -9\)  
22. \(-2x + y = 4\)  
23. \(6x + 2y = -8\)  
24. \(2x - 3y = 9\)