Graphs Using Slope-Intercept Form

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CONCEPT 1 Graphs Using Slope-Intercept Form

So far in this chapter, you have learned how to graph the solutions to an equation in two variables by making a table and by using its intercepts. The last lesson introduced the formulas for slope. This lesson will combine intercepts and slope into a new formula.

You have seen different forms of this formula several times in this chapter. Below are several examples.

$$2x+5=y$$
$$y=\frac{-1}{3}x+11$$
$$d=60(h)+45$$

The proper name given to each of these equations is **slope-intercept form** because each equation tells the slope and the $y-$intercept of the line.

The **slope-intercept form of an equation** is: $y=(slope)x+(y-$intercept).

$y=(m)x+b$, where $m=slope$ and $b=y-$intercept

This equation makes it quite easy to graph the solutions to an equation of two variables because it gives you two necessary values:

a. The starting position of your graph (the $y-$intercept)
b. The directions to find your second coordinate (the slope)

Example 1: *Determine the slope and the $y-$intercept of the first two equations in the opener of this lesson.*

Solution: Using the definition of slope-intercept form; $2x+5=y$ has a slope of 2 and a $y-$intercept of

(0, 5)

$y=\frac{-1}{3}x+11$ has a slope of $\frac{-1}{3}$ and a $y-$intercept of (0, 11)

Slope-intercept form applies to many equations, even those that do not look like the "standard" equation.

Example: *Determine the slope and $y-$intercept of $7x=y$.*

Solution: At first glance, this does not look like the "standard" equation. However, we can substitute values for the slope and $y-$intercept.

$$7x+0=y$$

This means the slope is 7 and the $y-$intercept is 0.

Example: *Determine the slope and $y-$intercept of $y=5$.*

Solution: Using what you learned in the last lesson, the slope of every line of the form $y=$ *some number* is zero because it is a horizontal line. Rewriting our original equation to fit slope-intercept form yields:

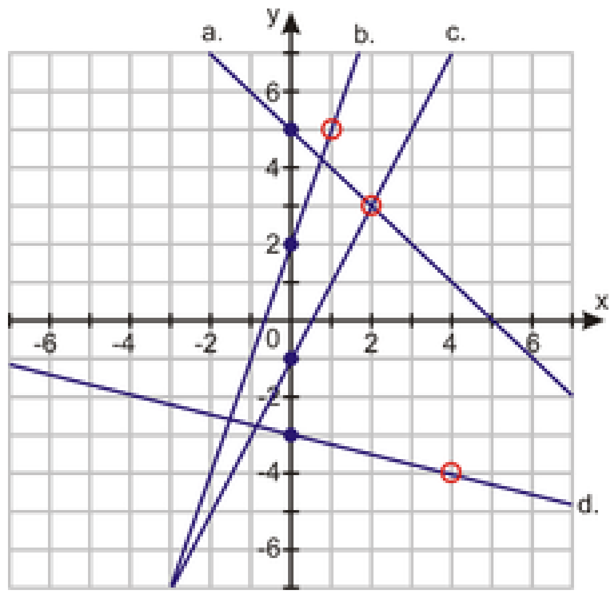
$$y=(0)x+5$$

Therefore, the slope is zero and the $y-$intercept is (0, 5).

You can also use a graph to determine the slope and $y-$intercept of a line.

Example: *Determine the slope and y−intercept of the lines graphed below.*

Solution: Beginning with line *a*, you can easily see the graph crosses the $y-$axis (the $y-$intercept) at (0, 5). From this point, find a second coordinate on the line crossing at a **lattice point**.



Line a: The $y-$intercept is (0, 5). The line also passes through (2, 3).

$$\text{slope } m = \frac{\triangle y}{\triangle x} = \frac{-2}{2} = -1$$

Line b: The $y-$intercept is (0, 2). The line also passes through (1, 5).

$$\text{slope } m = \frac{\triangle y}{\triangle x} = \frac{3}{1} = 3$$

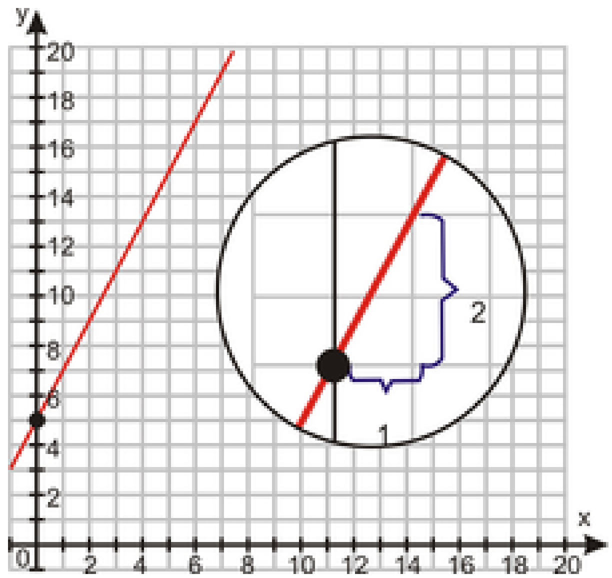
The remaining lines will be left for you in the Practice Set.

Graphing an Equation Using Slope-Intercept Form

Once we know the slope and the $y-$intercept of an equation, it is quite easy to graph the solutions.

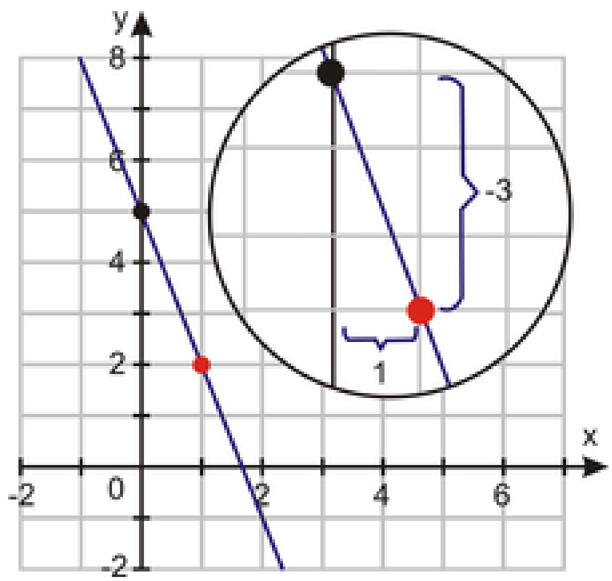
Example: *Graph the solutions to the equation* $y = 2x + 5$.

Solution: The equation is in slope-intercept form. To graph the solutions to this equation, you should start at the $y-$intercept. Then, using the slope, find a second coordinate. Finally, draw a line through the ordered pairs.



Example 2: *Graph the equation* $y = -3x + 5$

Solution: Using the definition of slope-intercept form, this equation has a $y-$intercept of (0, 5) and a slope of $\frac{-3}{1}$.



Slopes of Parallel Lines

Parallel lines will never **intersect**, or cross. The only way for two lines never to cross is if the method of finding additional coordinates is the same.

Therefore, it's true that **parallel lines** have the same slope.

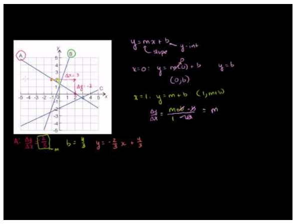
You will use this concept in Chapter 5 as well as in geometry.

Example 3: *Determine the slope of any line parallel to* $y = -3x + 5$

Solution: Because parallel lines have the same slope, the slope of any line parallel to $y = -3x + 5$ must also be –3.

Practice Set

Sample explanations for some of the practice exercises below are available by viewing the following video. Note that there is not always a match between the number of the practice exercise in the video and the number of the practice exercise listed in the following exercise set. However, the practice exercise is the same in both. CK-12 Basic Algebra:Graphs Using Slope-Intercept Form (11:11)



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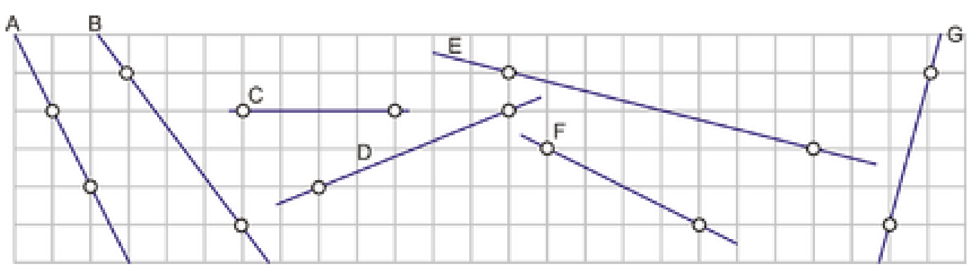
In 1 – 7, identify the slope and $y-$intercept for the equation.

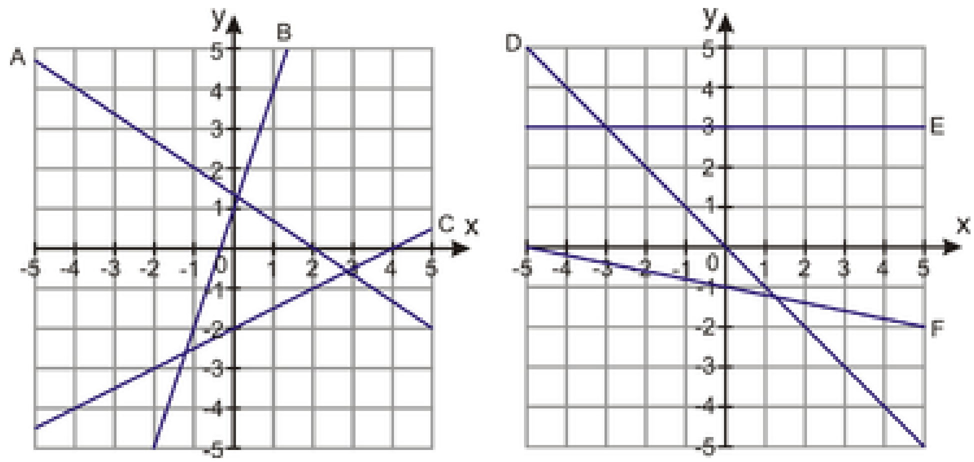
1. $y = 2x+5$
2. $y = -0.2x+7$
3. $y = x$
4. $y = 3.75$
5. $\frac{2}{3}x-9 = y$
6. $y = -0.01x+10,000$
7. $7+\frac{3}{5}x = y$

In 8 – 14, identify the slope of the following lines.



8. F
9. C
10. A
11. G
12. B
13. D
14. E

In 15 – 20, identify the slope and $y-$intercept for the following functions.



15. *D*
16. *A*
17. *F*
18. *B*
19. *E*
20. *C*
21. Determine the slope and $y-$intercept of $-5x+12=20$.

Plot the following functions on a graph.

22. $y=2x+5$
23. $y=-0.2x+7$
24. $y=-x$
25. $y=3.75$
26. $\frac{2}{7}x-4=y$
27. $y=-4x+13$
28. $-2+\frac{3}{8}x=y$
29. $y=\frac{1}{2}+2x$

In 30 – 37, state the slope of the line parallel to the line given.

30. $y=2x+5$
31. $y=-0.2x+7$
32. $y=-x$
33. $y=3.75$
34. $y=-\frac{1}{5}x-11$
35. $y=-5x+5$
36. $y=-3x+11$
37. $y=3x+3.5$

Mixed Review

38. Graph $x=4$ on the Cartesian plane.
39. Solve for $g: |8-11|+4g=99$.
40. What is the Order of Operations? When is the Order of Operations used?
41. Give an example of a negative irrational number.
42. Give an example of a positive rational number.
43. *True or false:* An integer will always be considered a rational number.