Teaching Guide

Slope-Intercept Form

Preparing for Your Class

Common Vocabulary

- Slope-intercept form

Instruction Tips

- Students sometimes mistakenly associate the slope as the first number they see on the right-hand side of the equation and the *y*-intercept as the second number they see on the right-hand side of the equation. Make sure you emphasize the slope as the *coefficient* of the *x*-term.
- If students have weak fraction skills, they will not easily see that $\frac{x}{2}$ is the same as $\frac{1}{2}x$. You may have to go back through the multiplication: $\frac{1}{2}x = \frac{1}{2}\cdot\frac{x}{1} = \frac{x}{2}$ to help them.
- An interesting note about *m* for slope: In the U.S. we use *m* for slope. In many other parts of the world, $y = ax + b$ or $y = kx + b$ are used for the slope-intercept form. Math historians have some speculative theories about why *m* is used for slope, but none are definitive. There are written references as far back as 1757 that use *m* as the slope in the slope-intercept equation $y = mx + n$. (Source: http://jeff560.tripod.com/geometry.html)
- When you are showing how to graph using the slope-intercept form, it is important to show the students that you can move in both directions to create the line from the slope. For example, $-\frac{3}{2}$ can be interpreted as $\frac{-3}{2} = \frac{\text{down } 3}{\text{right } 2}$ or $\frac{3}{-2} = \frac{\text{up } 3}{\text{left } 2}$.

Teaching Your Class

Slope-Intercept Form

- $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept.

Examples: Graph.

- $y = 3x + 2$
- $y = -\frac{2}{3}x$ (*y*-intercept is "invisible"…0)
- $y = \frac{x}{2} - 1$ ($\frac{x}{2}$ must be interpreted as $\frac{1}{2}x$)
- $y = 3 - x$ (order is backwards)
- $3x + 4y = 2$ (must be rearranged first)
- Write the equation of a line that has slope -3 and a *y*-intercept of $(0, 4)$.
- Write the equation of a line that has slope $\frac{1}{2}$ and intercepts $(-1, 0)$ and $(0, 3)$.

Student Activity: *Match Up on Slope-Intercept Form.* This activity works well in groups or with students working in pairs at a whiteboard (have students draw an empty grid on the board for their answers). Unlike other match-ups in this binder, this is a double match-up. Students must match up the slope and the *y*-intercept for each box in the grid. (LINE-18)

Guided Learning Activity: *Graphing with Slope-Intercept Form.* This guided lecture/discussion gives you and the students the materials to learn how to graph using slope-intercept form together. Blank graphs are provided in the worksheet for the examples and a variety of examples are given. (LINE-19)

Student Activity: *Evidence from the Graph.* Students have to work backwards using the "evidence" from the graphs in order to write the linear equations. This is a good critical thinking activity (LINE-20)

Revisiting Parallel and Perpendicular

- Parallel lines have the same slope.
- Perpendicular lines have slopes that are negative reciprocals.
- Now that we can identify the slope from the slope-intercept form, it is easier to tell whether lines are parallel or perpendicular.

Student Activity: *What's the Verdict? Parallel or Perpendicular?* Here is an activity to try to dispel the notion that perpendicular lines have only reciprocal slopes or only negative slopes. Students graph pairs of lines on coordinate axes and give a "verdict" on each one: parallel, perpendicular, or neither (a mistrial). (LINE-21)

Writing linear equations to model data

- Although we often write a linear equation as $y = mx + b$, we can change the variables to be more descriptive of the model we are looking at.

Student Activity: *Modeling Data with Linear Equations.* In this activity, students practice with interpreting linear models (including the slope and intercept) and writing some models of their own. These models involve variables other than x and y. (LINE-22)

Student Activity

Match Up on Slope-Intercept Form

Match-up: In each box of the grid below, you will find either the equation of a line or a description of a line. For each, determine the slope **and** the y-intercept and match it with the appropriate letters. If the slope or the y-intercept is not found among the choices or cannot be determined from the information given, then choose E or N respectively.

Slope: **A** 2 **B** $\frac{1}{2}$ **C** -1 **D** 0 **E** None of these or cannot be determined

y**-Intercept:** **J** 3 **K** -2 **L** 0 **M** 1 **N** None of these or cannot be determined

$y=\frac{1}{2}x-3$	$y=-x+3$	$x+y=0$	The line is a vertical line passing through $(-2,3)$.
$6x-3y=6$	$y=1-3x$	The line passes through $(0,3)$ and $(2,1)$.	The line passes through $(0,-2)$ and $(2,-1)$.
The line is a vertical line passing through $(2,1)$.	The line is a horizontal line passing through $(-2,3)$.	The line has intercepts $(0,1)$ and $(-2,0)$.	The line is parallel to a horizontal line and passes through $(0,1)$.
The line is perpendicular to a line with a slope of -2 and passes through $(0,3)$.	$10x-5y=10$	$4y-2x=0$	The line is parallel to a line with a slope of 2 and passes through the origin.

Guided Learning Activity

Graphing with Slope-Intercept Form

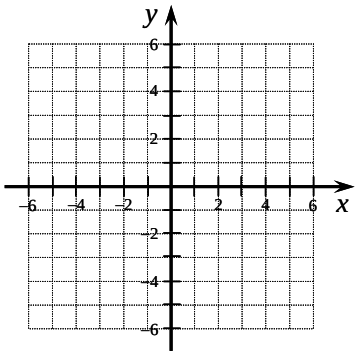
Slope-Intercept Form: $y = mx + b$ where m is the slope and $(0, b)$ is the y-intercept.

To graph using slope-intercept form:

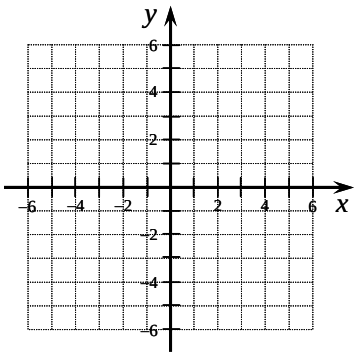
1. Graph a point (the y-intercept).

2. Use $m = \dfrac{\text{rise}}{\text{run}}$ to move from that point to locate another point on the line.

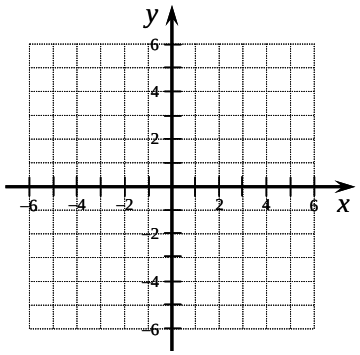
1. Graph: $y = \frac{1}{2}x + 3$



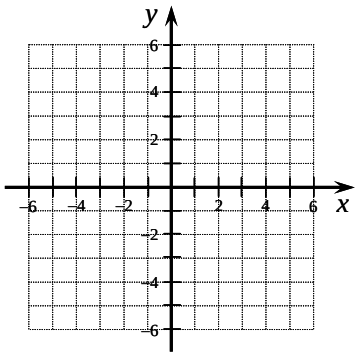
2. Graph: $y = 3x - 2$



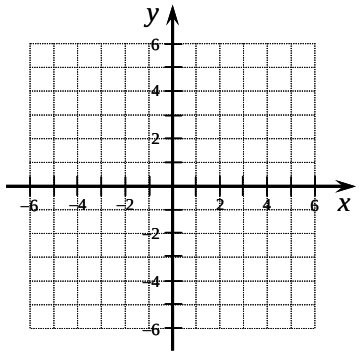
3. Graph: $y = -\frac{3}{2}x + 3$



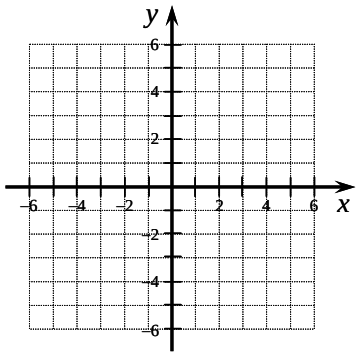
4. Graph: $y = -2x$



5. Graph: $3x - 4y = -4$



6. Graph: $y - x = 2$

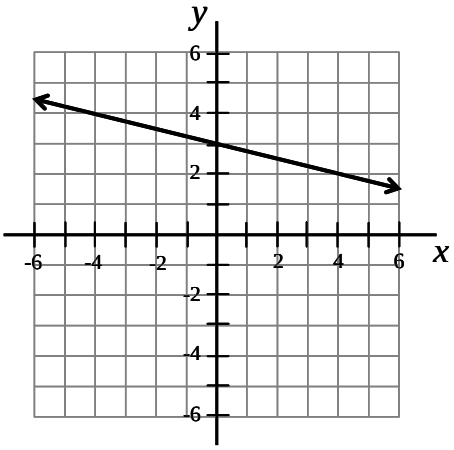


Student Activity

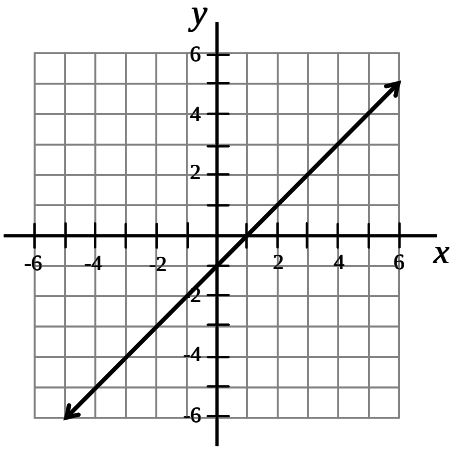
Evidence from the Graph

Directions: For each line that is graphed below, determine the equation of the line and write it in slope-intercept form.

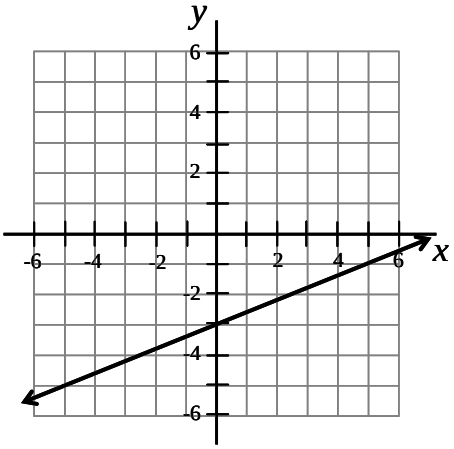
1.



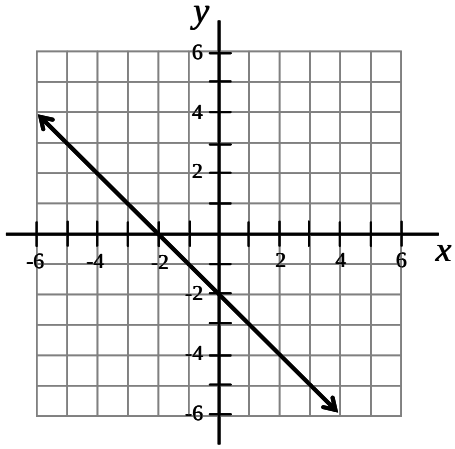
2.



3.



4.



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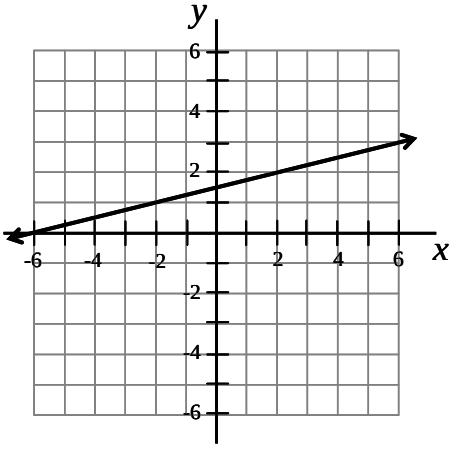

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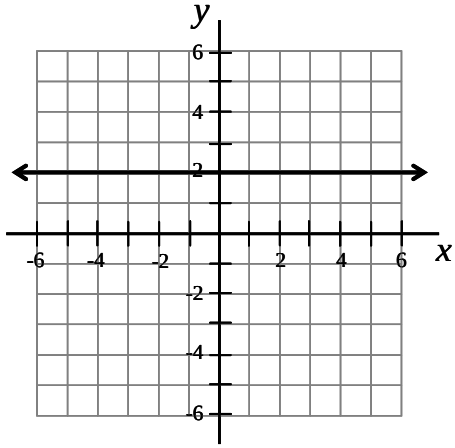
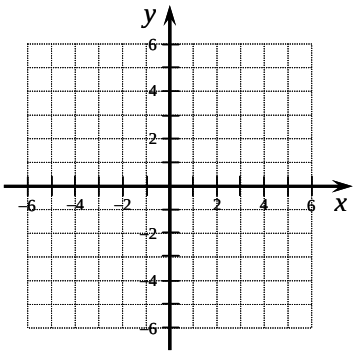


Student Activity

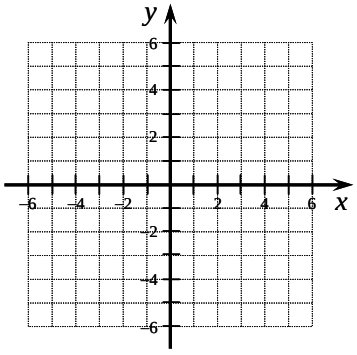
What's the Verdict, Parallel or Perpendicular?

Directions: Each of the "accused" pairs of lines is going to trial. Your task is to graph each pair of lines, and then assign each pair a verdict: parallel or perpendicular. If the pair of lines is neither parallel nor perpendicular, you may declare a mistrial.

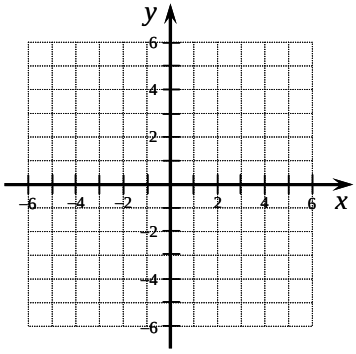
1. $y = \frac{1}{2}x + 3;\quad y = \frac{1}{2}x + 1$



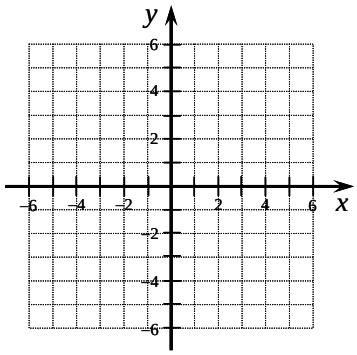
2. $y = \frac{1}{3}x - 1;\quad y = 3x$



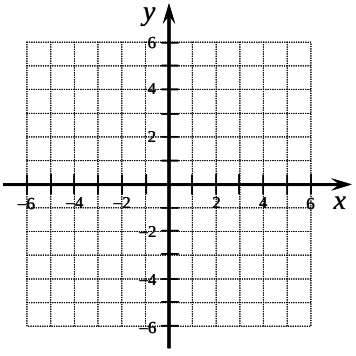
3. $y = \frac{1}{2}x + 1;\quad y = -\frac{1}{2}x + 2$



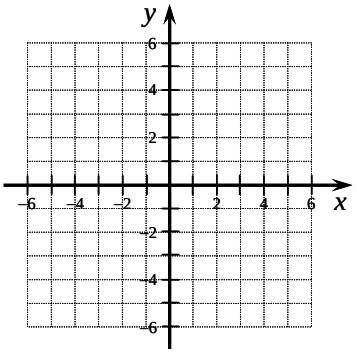
4. $y = 2x - 3;\quad y = -\frac{1}{2}x + 4$



5. $y = 3;\quad y = -1$



6. $y = -x + 4;\ y = x - 2$



Student Activity

Modeling Data with Linear Equations

Directions: Fill in the missing information in the table below. The first one has been done for you.

Mathematical model	Description	Slope and meaning of the slope	y-intercept and meaning of the y-intercept
$C = 4.5x + 250$	The cost C of producing x items.	$m = 4.5$ It costs \$4.50 to produce each item.	$(0, 250)$ Regardless of the number of items produced, the fixed costs are \$250.
$C = 0.10n + 25$	The cost C of renting a car for a day and driving it for n miles.		
$R = 8.5t$	The revenue R from selling t movie tickets.		
$P = 10h$	The weekly pay P from working h hours.		
$P = 25t - 500$	The profit P from selling t tickets to a benefit concert.		
$v = 32t$	The velocity v of a falling object (in feet per second) t seconds after it is dropped.		
	The distance d a Toyota Prius hybrid car can travel on g gallons of gasoline.	$m = 55$ A Toyota Prius gets 55 miles per gallon of gasoline. (Source: www.toyota.com/prius/specs.html)	$(0, 0)$ The car can travel zero miles with zero gallons of gasoline in the tank.
	The cost C of taking n credit hours at a community college.	$m = 66$ The cost is \$66 per credit hour.	$(0, 25)$ There is a \$25 registration fee regardless of the number of credit hours taken.