

A linear function is a function whose graph is a straight line.

$$m = \text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}} = \frac{y_1 - y_2}{x_1 - x_2}$$

diff. of y  
diff of x

$$\frac{\Delta y}{\Delta x}$$

1. What is the slope of the line that passes through the given points?

a. (-3, 7) and (-2, 4)

(-2, 4)

$$\frac{7-4}{-3-(-2)} = \frac{3}{-1} = -3$$

$$\frac{4-7}{-2-(-3)} = \frac{-3}{1} = -3$$

b. (3, 1) and (-4, 1)

$$\frac{1-1}{3-(-4)} = \frac{0}{7} = 0$$

m = 0

c. (7, -3) and (7, 1)

$$\frac{-3-1}{7-7} = \frac{-4}{0}$$

undefined

The slope-intercept form of an equation of a line is  $y = mx + b$ , where m is the Slope of the line and b is the y-intercept.

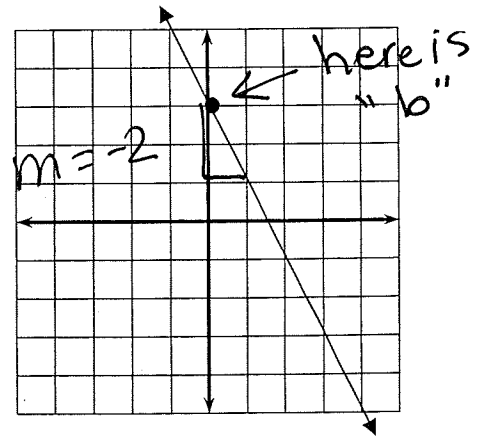
2. What is an equation of each line?

a.  $m = \frac{1}{5}$  and the y-intercept is (0, -3)

$$y = \frac{1}{5}x - 3$$

b.

$$y = -2x + 3$$



3. Write the equation in slope-intercept form. What are the slope and y-intercept?

a.  $5x - 4y = 16$

$$\frac{-4y}{-4} = \frac{-5x+16}{-4}$$

$$y = \frac{5}{4}x - 4$$

Slope = m =  $\frac{5}{4}$

y-intercept = -4

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

$$2 \cdot \frac{1}{2}y = 2 \cdot \left(-\frac{3}{4}x - 1\right)$$

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

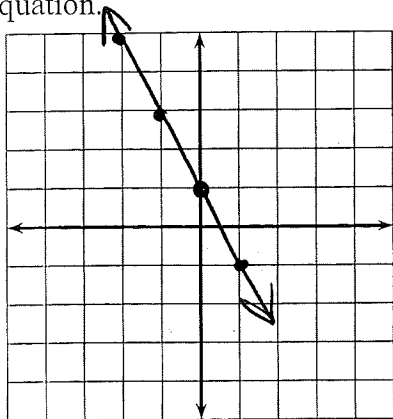
Slope = m =  $\frac{3}{2}$

y-intercept = -2

4. Graph each equation.

a.  $2x + y = 1$

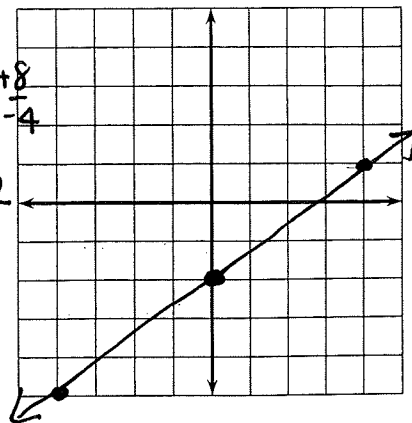
$y = -2x + 1$   
 $m = -\frac{2}{1}$      $b$



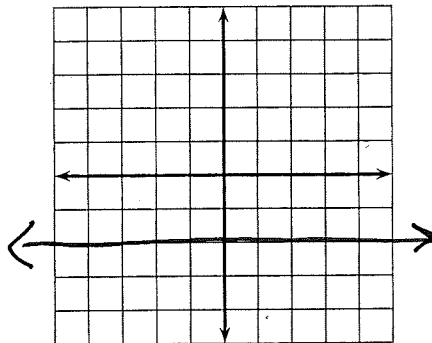
b.  $3x - 4y = 8$

$$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$$

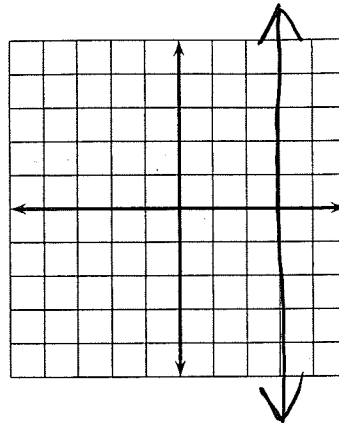
$$y = \frac{3}{4}x - 2$$



c.  $y = -2$



d.  $x = 3$



**Key Concept Point-Slope Form**  
 The equation of a line in **point-slope form** through point  $(x_1, y_1)$  with slope  $m$ :  

$$y - y_1 = m(x - x_1)$$

Write the equation of the line in point-slope form.

5. slope =  $\frac{3}{5}$ ; through  $(-5, 2)$

$y - y_1 = m(x - x_1)$   
 $y - 2 = \frac{3}{5}(x - (-5))$   
 $y - 2 = \frac{3}{5}(x + 5)$

Write the equation of the line in slope-intercept form that passes through the given points.

6.  $(3, 2)$  and  $(5, 8)$

$m = \frac{8-2}{5-3} = \frac{6}{2} = 3$

$y - y_1 = m(x - x_1)$   
 $y - 2 = 3(x - 3)$   
 $y - 2 = 3x - 9$   
 $\begin{array}{r} y - 2 = 3x - 9 \\ +2 \qquad +2 \\ \hline y = 3x - 7 \end{array}$

$y = mx + b$

To write the equation of a line given 2 points:

1. find the slope of the line
2. pick one point and substitute the point and slope into point-slope form
3. rewrite in slope-intercept form

Another form of the equation of a line is *standard form*, in which the sum of the  $x$  and  $y$  terms are set equal to a constant. When possible, you write the coefficients of  $x$  and  $y$  and the constant term as integers.



### Key Concept Standard Form of a Linear Equation

A standard form of a linear equation is  $Ax + By = C$ , where  $A$ ,  $B$ , and  $C$  are real numbers and  $A$  and  $B$  are not *both* zero.

7. Write an equation of the line in standard form with **integer** coefficients.

a.  $y = \frac{3}{4}x - 5$

Handwritten work for part a:

$$4y = 3x - 20$$

$$-3x + 4y = -20$$

$$3x - 4y = 20$$

b.  $y = 5.4x - 2.8$  ← mult by 10

Handwritten work for part b:

$$10y = 54x - 28$$

$$-54x + 10y = -28$$

$$54x - 10y = 28$$

To write the equation of a line in standard form:

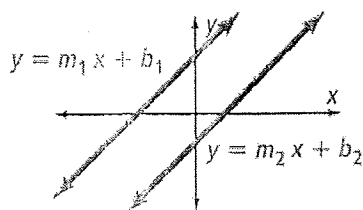
1. Rewrite the equation in the form  $Ax + By = C$  (get  $x$  and  $y$  on the left side of the  $=$  and the constant term on the right side)
2. Get rid of the fractions or decimals by multiplying EVERY TERM by the LCD for the fractions or a multiple of ten for the decimals
3.  $A$ ,  $B$ , and  $C$  can have **no** common factors!!!

**Remember:**  
Standard form can have **NO** fractions or decimals!!!



### Key Concepts Parallel and Perpendicular Lines

The slopes of parallel lines are equal.

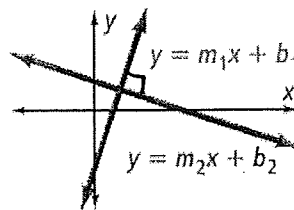


$$m_1 = m_2$$

$$b_1 \neq b_2$$

No line can be vertical.

The slopes of **perpendicular** lines are negative reciprocals of each other.



$$m_1 \cdot m_2 = -1$$

$$m_1 = -\frac{1}{m_2}$$

$$m_2 = -\frac{1}{m_1}$$

$m_1$  and  $m_2$  are negative reciprocals of each other.

find m

8. Given the line  $6x - 2y = 7$ , what would be the slope of the line that is :

$$6x - 2y = 7$$

$$\frac{-2y}{-2} = \frac{-6x + 7}{-2}$$

$$y = 3x - \frac{7}{2}$$

a. parallel to the given line

$$m = 3$$

b. perpendicular to the given line

$$m = -\frac{1}{3}$$

9. What is the equation of each line in slope-intercept form?

a. the line parallel to  $4x + 2y = 7$  through  $(4, -2)$

$$\frac{2y}{2} = \frac{-4x + 7}{2}$$

$$y = -2x + \frac{7}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y + 2 = -2(x - 4)$$

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

$$y = -2x + 6$$

b. the line perpendicular to  $y = -4x + \frac{2}{3}$  through  $(8, 5)$

$$m = \frac{1}{4}$$

$$y - 5 = \frac{1}{4}(x - 8)$$

$$y - 5 = \frac{1}{4}x - \frac{2}{5}$$

$$y = \frac{1}{4}x + 3$$

The *intercept* of a line is a point where the line crosses an axis.

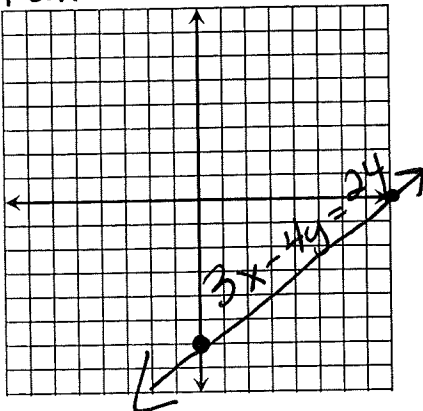
- The *y-intercept* of a non-vertical line is the point at which the line crosses the *y*-axis.  
All *y*-intercepts have coordinates in this form:  $(0, y)$
- The *x-intercept* is the point at which the line crosses the *x*-axis.  
All *x*-intercepts have coordinates in this form:  $(x, 0)$

Graph each equation using intercepts.

Standard Form

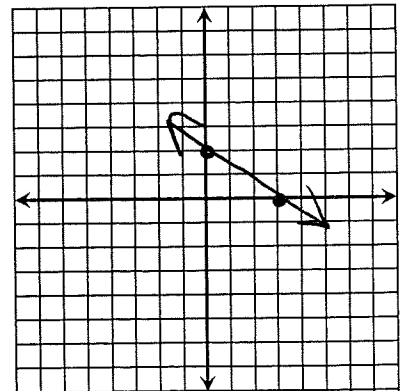
10.  $3x - 4y = 24$

x	y
0	-6
8	0



11.  $6x + 9y = 18$

x	y
0	2
3	0



Algebra 2  
Practice 2.3-2.4

Name \_\_\_\_\_  
Date \_\_\_\_\_ Hour \_\_\_\_\_

Find the slope of the line through each pair of points.

1.  $(1,6)$  and  $(8,-1)$

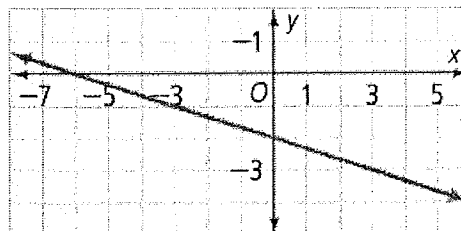
2.  $(-4,-3)$  and  $(7,1)$

3.  $(-7,4)$  and  $(-7,-2)$

Write an equation of the line.

4.  $m = 3$  and the  $y$ -intercept is  $(0,2)$

5.

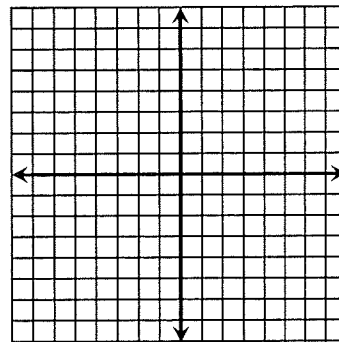
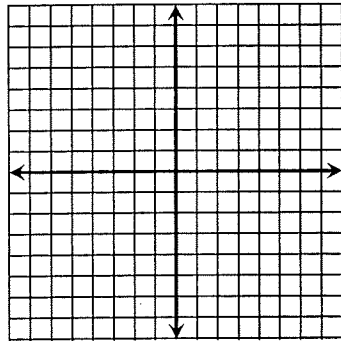
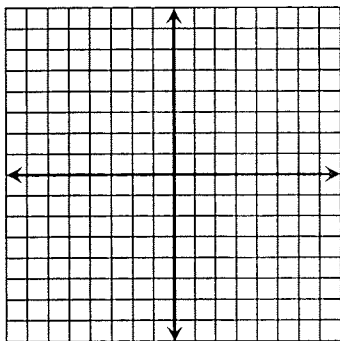


Write each equation in slope-intercept form, identify the slope and  $y$ -intercept, and graph the line.

6.  $3x + y = 4$   $m =$  \_\_\_\_\_  
 $b =$  \_\_\_\_\_

7.  $5x - 2y = 8$   $m =$  \_\_\_\_\_  
 $b =$  \_\_\_\_\_

8.  $-2x + 5y = -10$   $m =$  \_\_\_\_\_  
 $b =$  \_\_\_\_\_



Write an equation of each line in **point-slope form**.

9. slope =  $-1$ ;  $(2, 0)$

10. slope =  $0$ ;  $(-2, 3)$

11. slope =  $\frac{3}{4}$ ;  $(-3, 5)$

Write in **slope-intercept form** an equation of the line through each pair of points.

12.  $(-2, 3)$  and  $(2, 9)$

13.  $(0, 7)$  and  $(3, 5)$

14.  $(-5, -2)$  and  $(-3, 8)$

Write an equation of each line in **standard form** with **integer** coefficients.

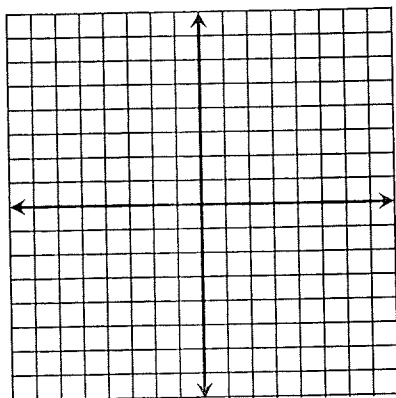
15.  $y = -\frac{4}{5}x + 5$

16.  $y = -\frac{3}{2}x - \frac{1}{4}$

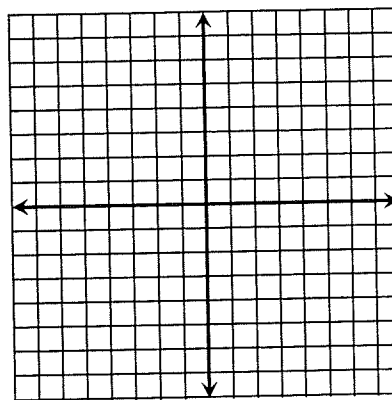
17.  $y = 4.2x + 1.8$

Graph each equation using the intercepts.

18.  $4x + 5y = 20$



19.  $3x - 4y = 24$



Write the equation of the line through each point. Use slope-intercept form.

20. through  $(-2, -2)$  and parallel to  $y = -5x - 4$

21. through  $(-4, 1)$  and parallel to  $2x - 6y = 15$

22. through  $(0, 5)$  and perpendicular to  $x - 2y = 10$

23. through  $(3, -1)$  and perpendicular to  $5x - y = 2$

24. through  $(-5, -4)$  and perpendicular to  $y = 4$

25. through  $(8, 9)$  and parallel to  $x = 3$