4.1 Coordinates and Scatter Plots

Goals:
- You will be able to plot points in a coordinate plane
- You will be able to draw conclusions using scatter plots

EQ:

Vocabulary

coordinate plane:

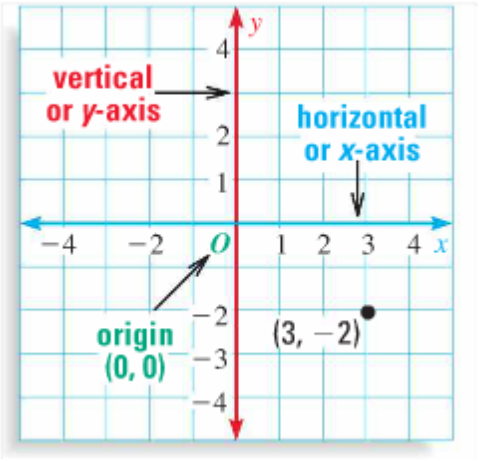
ordered pair:

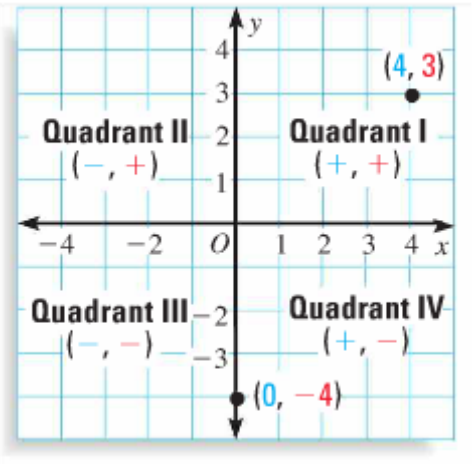
x-coordinate:

y-coordinate:

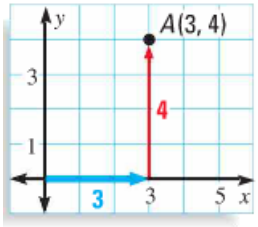
graph:

scatter plot:





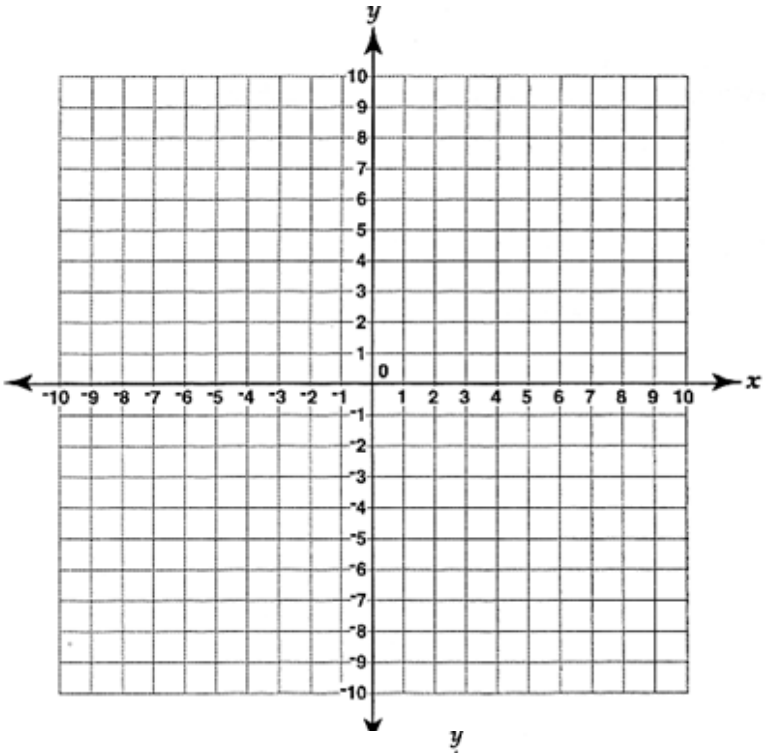
To plot the point (3, 4), start at the origin. Move 3 units to the right and 4 units up.



Example 1: Plotting Points

Plot and label the points

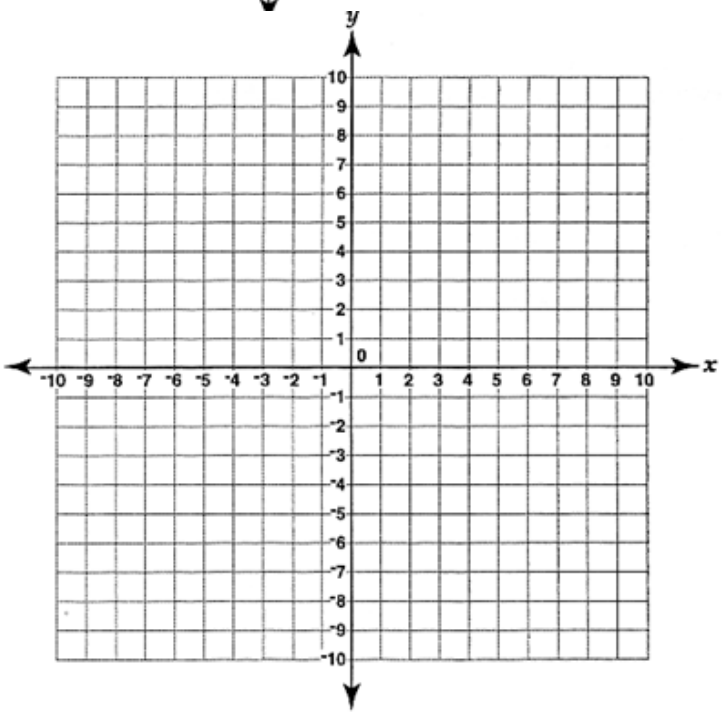
A(-4, 9), B(1, -1), C(2, -3),
D(6, -10), E(0, 4), F(-5, 0)



Try It

Plot and label the following points:

A(2, 1), B(5, -3), C(-3, 0), D(-2, -2),
E(0, 4), and F(-2, 3)



Example 2: Identifying Quadrants

Quadrants:

Name the quadrant the point is in.

a) (-1, 4) b) (4, -2) c) (3, 7) d) (-3, -1)

Example 3: Using a Scatter Plot

The amount (in millions of dollars) spent in the United States on snowmobiles is shown in the table. Make a scatter plot and explain what it indicates.

Year	1990	1991	1992	1993	1994	1995	1996
Spending	322	362	391	515	715	924	970

What are the units on the horizontal axis?

What are the units on the vertical axis?

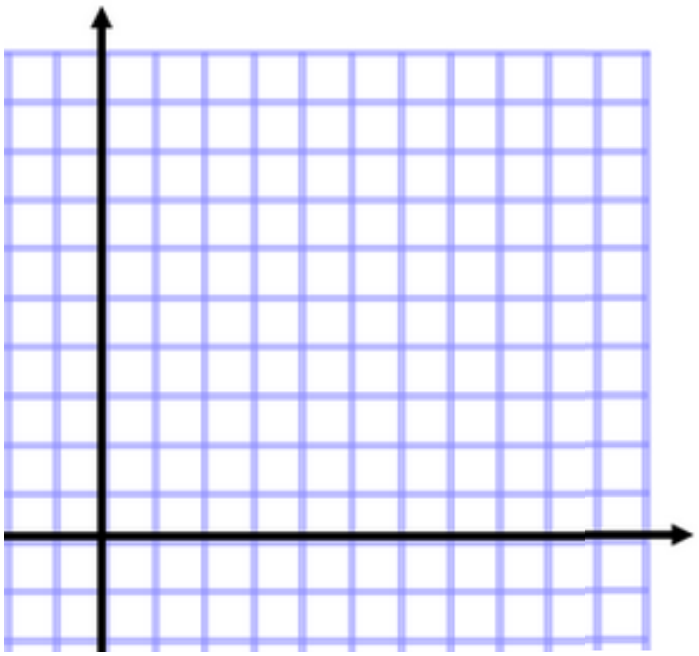
Explain what the data indicates.

Example 4: Making a Scatter Plot

You are the student manager of your high school soccer team. You are working on the team's program and have recorded the height and weight of the eleven starting players in the given table.

Height(in.)	72	70	71	70	69	70	69	73	66	70	76
Weight(lb.)	190	170	180	175	160	160	150	180	150	150	200

a) Make a scatter plot of the data. Put height h on the horizontal axis and weight w on the vertical axis.



b) Use the scatter plot to estimate the weight of a player who is 69 inches tall and one who is 71 inches tall.

c) In general, how does weight change as height changes?

d) What would you expect a player who is 74 inches tall to weigh?

4.2 Graphing Linear Equations

Goals:
- Graph a linear equation using a table.
- Graph horizontal and vertical lines.

EQ:

Vocabulary

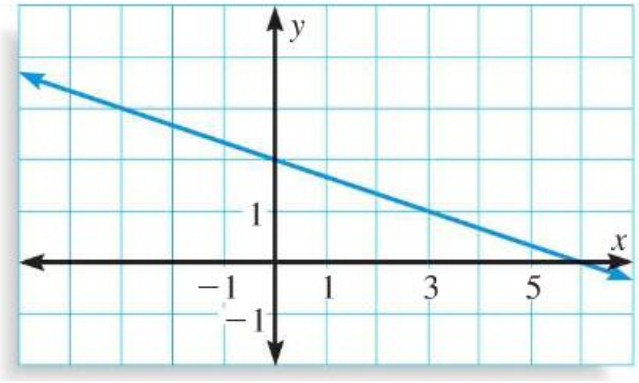
Solution of an equation:

Graph of an equation:

Verifying Solutions of an Equation

Decide whether the point lies on the graph of the line. Justify your answer algebraically.

$$x + 3y = 6$$



(1, 2) (-3, 3) (0, 2)

Graphing a Linear Equation

1. Rewrite the equation in _____ form, if necessary.
2. Choose a few values of ___ and make a _____.
3. Plot the points from the table of values. A line through these points is the _____ of the equation.

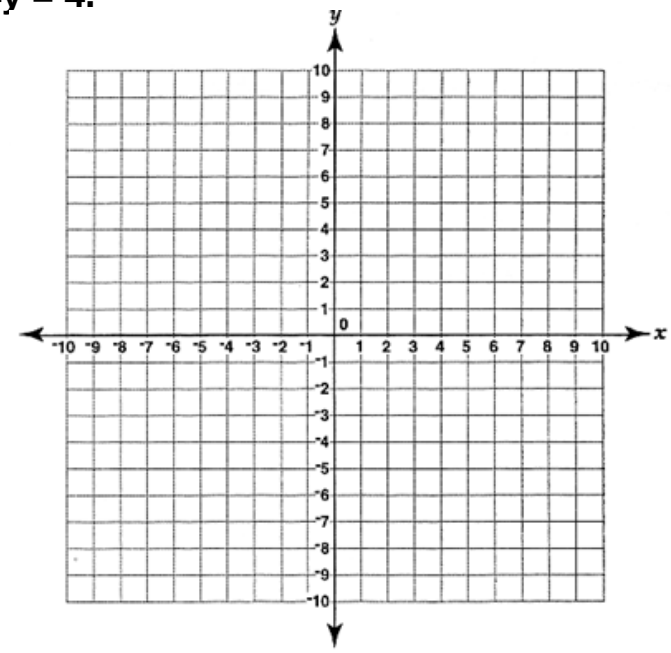
Use a table of values to graph the equation x + 4y = 4.

1. Solve for y.
   x + 4y = 4

2. Make a table.

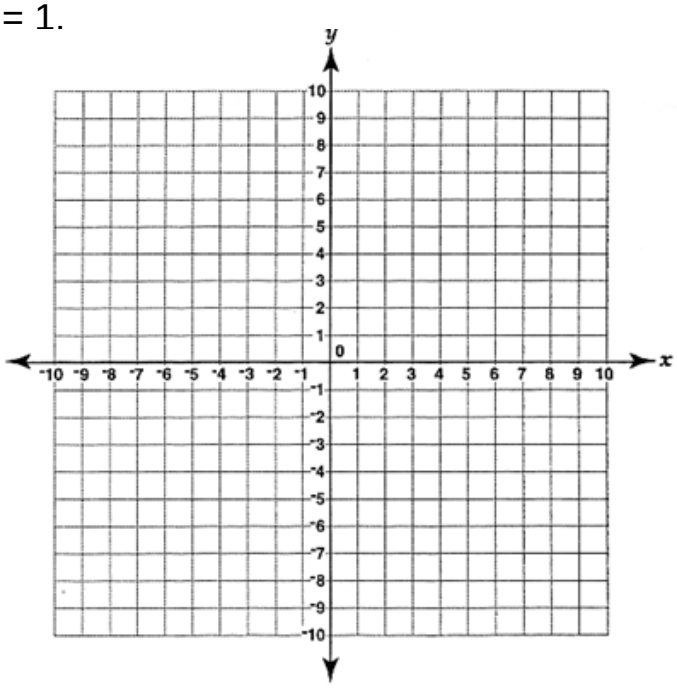
X	Y

3. Plot the points and draw a line through them.



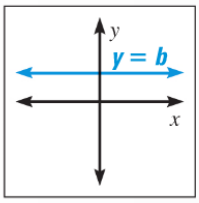
Try it!

Use a table of values to graph the equation x – 2y = 1.

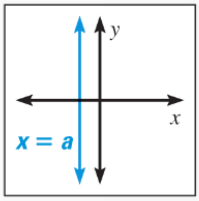


Equations of Horizontal and Vertical Lines

EQUATIONS OF HORIZONTAL AND VERTICAL LINES



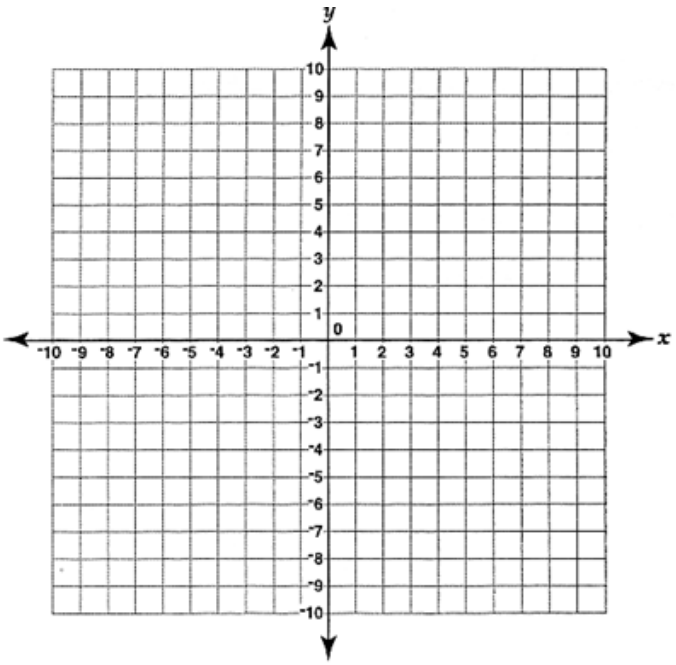
In the coordinate plane, the graph of $y = b$ is a horizontal line.



In the coordinate plane, the graph of $x = a$ is a vertical line.

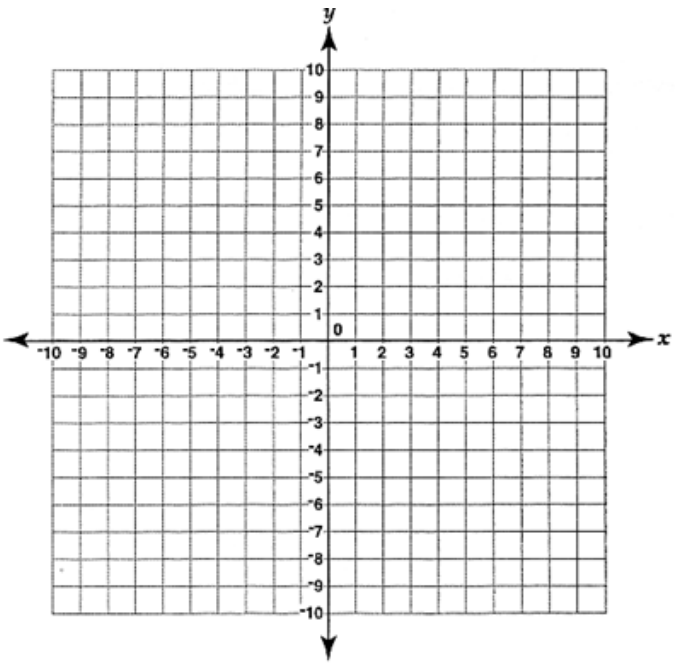
Example

Graph the equation of y = -3.



Try it!

Graph the equation of x = 2.



4.3 Quick Graphs Using Intercepts

Goals:
- Find the intercepts of the graph of a linear equation.
- Use the intercepts to make a quick graph of a linear equation.

EQ:

Vocabulary

x-intercept:

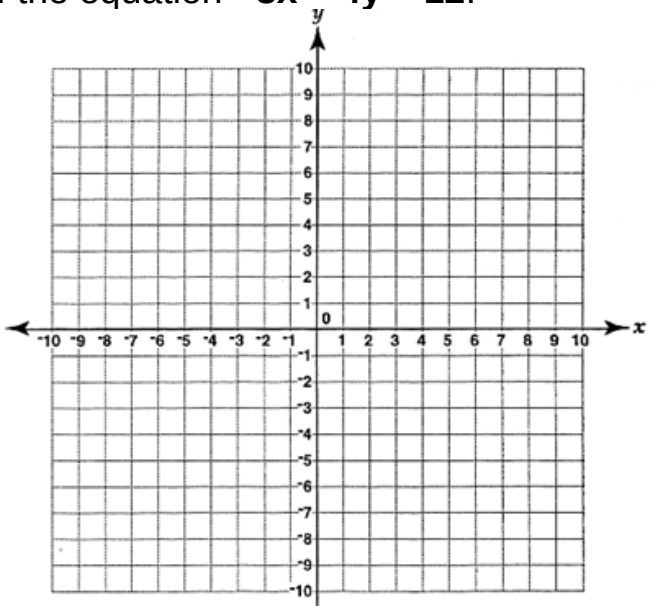
y-intercept:

Example 1: Finding Intercepts

Find the x-intercept and the y-intercept of the graph of the equation **-3x + 4y = 12**.

1. To find the x-intercept let y = ___.

2. To find the y-intercept let x = ___.



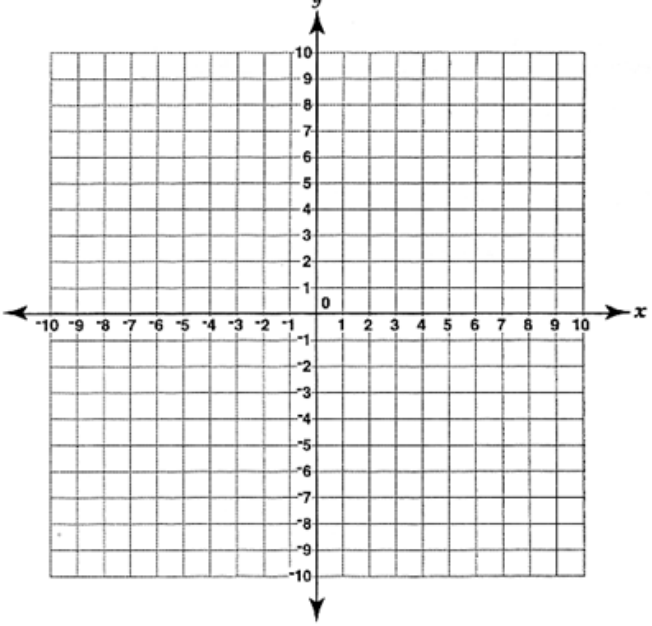
Now plot the two points and connect them to make the graph.

Example 2: Making a Quick Graph

Graph the equation **3x + 2.5y = 7.5**.

1. To find the x-intercept let y = ___.

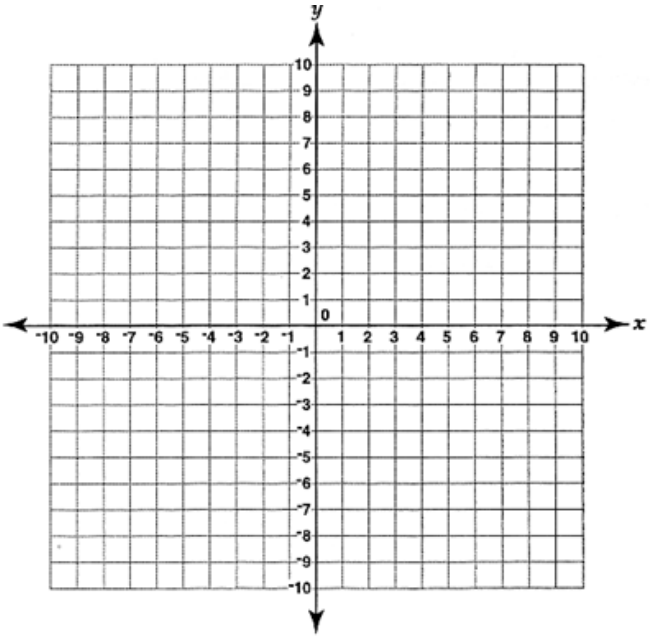
2. To find the y-intercept let x = ___.



Try it!

Graph the equation **-4x + 5y = 20**.

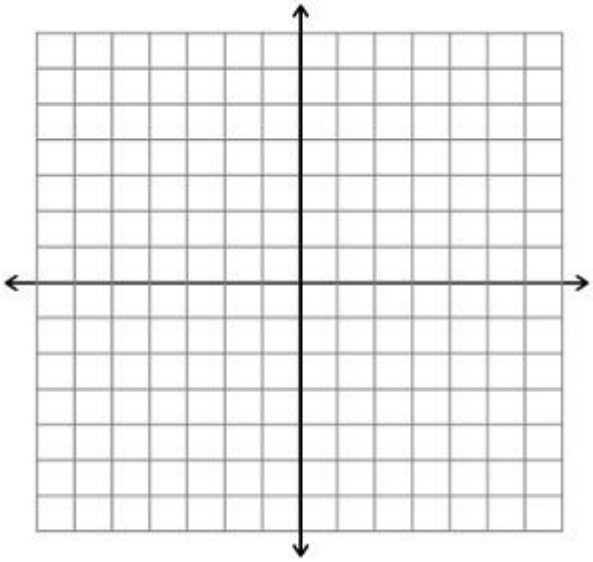
1. To find the x-intercept let y = ___.



2. To find the y-intercept let x = ___.

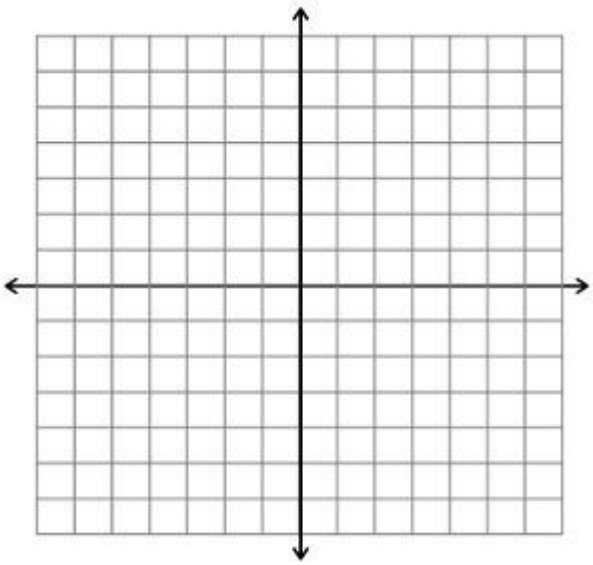
Example 3: Drawing Appropriate Scales

Graph the equation **y = 5x + 35**.



Try it!

Graph the equation **y = -5x + 50**.



4.4 The Slope of a Line

Goals:
- Find the slope of a line using two of its points.
- Interpret slope as a rate of change in real-life situations.

EQ:

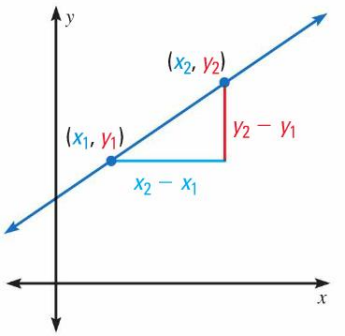
Vocabulary

Slope:

Rate of change:

Finding the slope of a line.

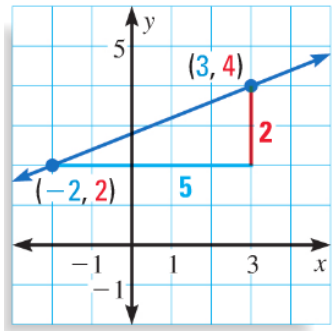
The slope, *m,* of the nonvertical line passing through the point (x_1, y_1) and (x_2, y_2) is



$$m = \text{\_\_\_\_} = \frac{change\ in}{change\ in} = \text{\_\_\_\_\_}$$

Example

Find the slope of a line passing through (-2, 2) and (3, 4).

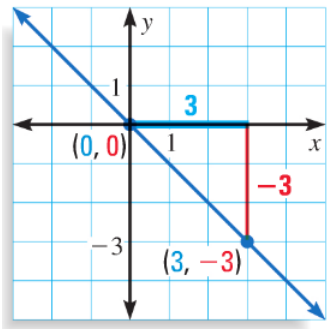


$$m = \frac{rise}{run} =$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} =$$

Try it!

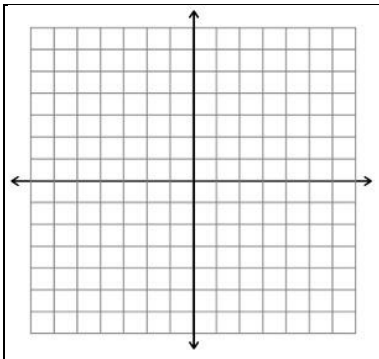
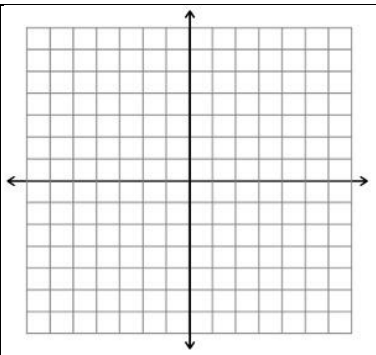
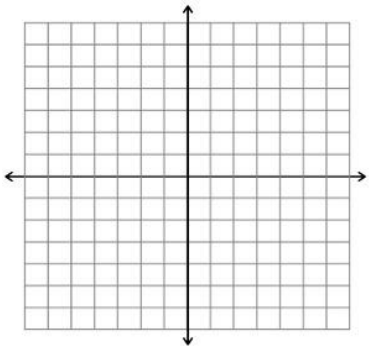
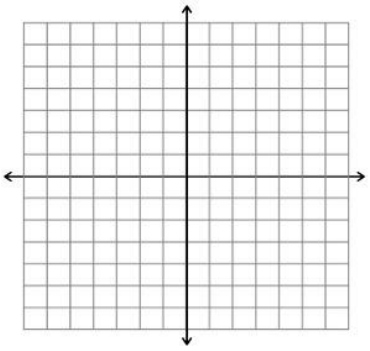
Find the slope of the line passing through (0, 0) and (3, -3).



$$m = \frac{rise}{run} =$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} =$$

Classification of lines by slope

 A line with a _____ slope _____ from left to right.	 A line with a _____ slope _____ from left to right.
 A line with a _____ slope is _____.	 A line with an _____ slope is _____.

Example: Finding the Slope of a Line

Find the slope of the line passing through the points. Then classify the line by its slope.

a. (-2, -3), (1, 2) b. (-2, -3), (4, -3) c. (-1, -4), (-1, -2)

Try it!

1) (-5, 2), (4, -1)

2) (6, 2), (9, 2)

3) (-7, 0), (-7, 8)

4) (2, -4), (8, 6)

4.4 The Slope of a Line Continued

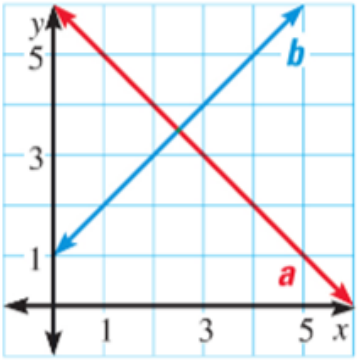
Goals:
- Find the slope of a line using two of its points.
- Interpret slope as a rate of change in real-life situations.

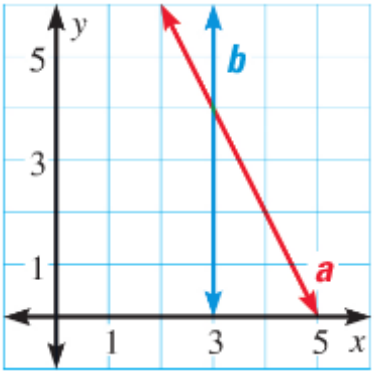
EQ:

Formula for slope?

(2, 1), (-3, 5)

Find the slope of the lines.

1. 

2. 

Find the value of y so that the line passing through the two points has the given slope.

a. (0, -2), (2, y), m = 3

b. (3, y), (1, 4), m = $-\frac{1}{2}$

c. (-2, 1), (4, y), m = $\frac{2}{3}$

4.5 Direct Variation

Goals:
- Write linear equations that represent direct variation.
- Use a ratio to write an equation for direct variation.

EQ:

Vocabulary

Constant of variation:

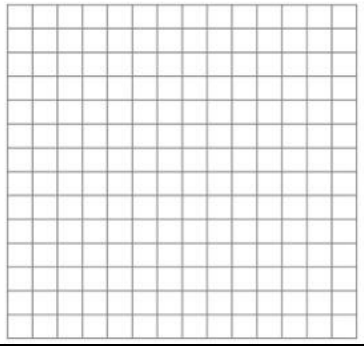
Direct variation:

Properties of graphs of direct variation models

The graph of y = kx is a line through the _____.

The slope of the graph of y = kx is _____.

$$k = \frac{y}{x}$$

k is negative	k is positive
	

Example Writing a direct variation equation

The variables x and y vary directly. When x=7 then y = 21.

1. Write an equation that relates x and y.

2. Find the value of y when x = 4.

   y = kx

Try it!

The variables x and y vary directly. Use the given values to write an equation that relates x and y. **Then find the value of y when x = -2.**

a) x = 6, y = 30

b) x = 8, y = 20

c) x = 3.6, y = 1.8

Solve the proportion.

$\frac{10}{8} = \frac{n}{10}$ $\frac{7}{n} = \frac{8}{7}$ $\frac{4}{9} = \frac{r-3}{6}$ $\frac{4}{m-8} = \frac{8}{2}$

Try it!

$\frac{7}{5} = \frac{x}{3}$ $\frac{4}{3} = \frac{8}{x}$ $\frac{5}{6} = \frac{7n+9}{9}$ $\frac{6}{b-1} = \frac{9}{7}$

4.6 Quick Graphs Using Slope-Intercept Form

Goals:
- Graph a linear equation in slope-intercept form.
- Graph and interpret equations in slope intercept form that model real-life situations.

EQ:

Vocabulary

Slope-intercept form:

Parallel:

SLOPE-INTERCEPT FORM OF THE EQUATION OF A LINE

The linear equation $y = mx + b$ is written in _____ form. The slope of the line is ___. The *y*-intercept of the line is ___ .

Example: The linear equation $y = 2x + 3$ has a slope of ___ and a *y*-intercept of ___ .

Example 1: Writing Equations in Slope-Intercept Form

Equation	Slope-intercept Form	Slope	y-intercept
y = 5 – 2x	y =	m =	b =
$y = \frac{x-2}{3}$	y =	m =	b =
y = 13	y =	m =	b =
2.2x – 4.4y = 0	y =	m =	b =

Try it!

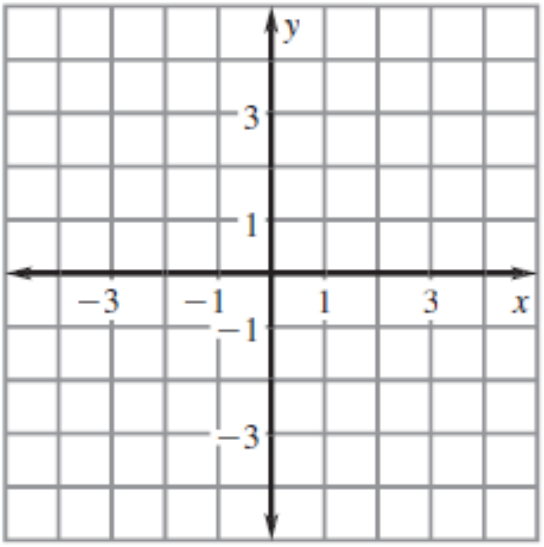
Find the slope and the y-intercept of the graph of the equation.

a) y = 4 – 3x b) 2x + y = -3 c) $y = \frac{3x-8}{4}$

Example 2: Graphing Using Slope and y-Intercept

Graph the equation -2x + y = -3.

1. Write in slope-intercept form.



2. Find the slope and y-intercept.

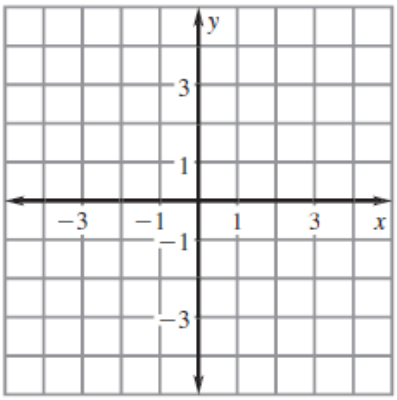
   m = ____ b = _____

3. Plot the y-intercept and use the slope to find a second point.

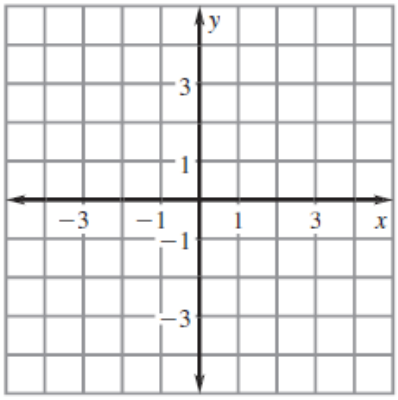
Try it!

Graph the equation.

a) x – y – 2 = 0



b) 2x + 3y = 9



Example 3: Identifying a Family of Parallel Lines

When are lines parallel?

Which of the following lines are parallel? Begin by rewriting in slope-intercept form.

a: -2x + y = 4 *b*: x + 2y = 6 *c*: 8x – 4y = 5

m = ___ b = ___ m = ___ b = ___ m = ___ b = ___

Which lines are parallel?

Try it!

Decide whether the lines are parallel.

a) y = 5 – 2x and y + 2x = 0 b) $y = \frac{x-2}{3}$ and 2x + 6y = 12

4.8 Functions and Relations

Goals:
- Identify when a relation is a function.
- Use function notation to represent real-life situation.

EQ:

Vocabulary

Relation:

Function:

Function notation:

Graph of a function:

Representing Relations

Ordered Pairs: (-2, 2), (-2, -2), (0, 1), (3, 1)

Mapping Diagram:

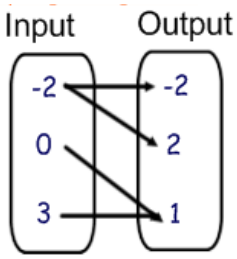
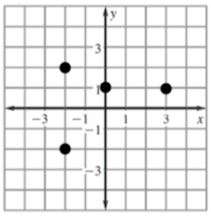


Table:

x	y
-2	2
-2	-2
0	1
3	1

Graph:

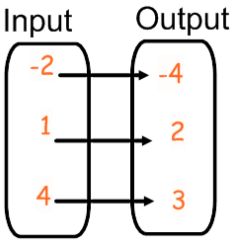


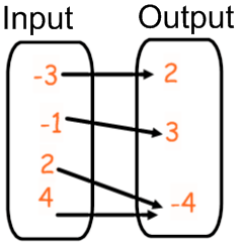
What is the domain?

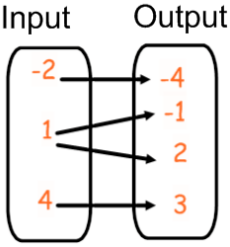
What is the range?

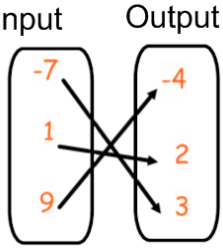
Identifying Functions

Identify if the relation is a function. If it is, give the domain and range.

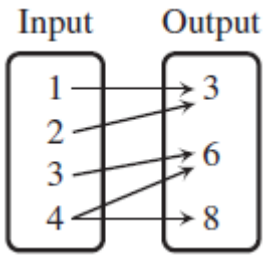


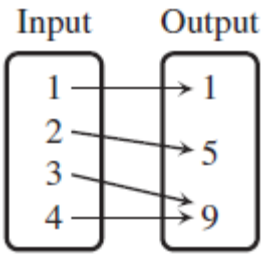


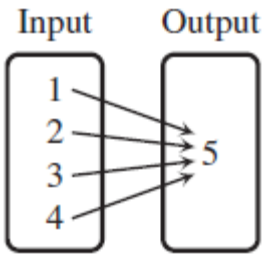


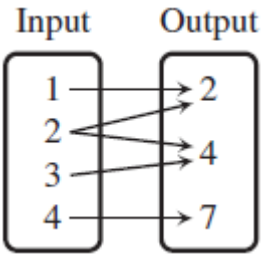


Try It Identify if the relation is a function. If it is, give the domain and range.





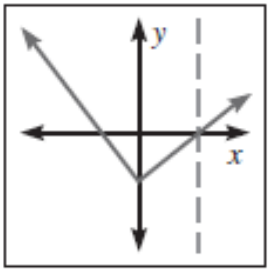


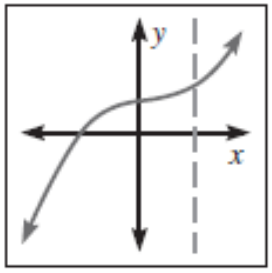


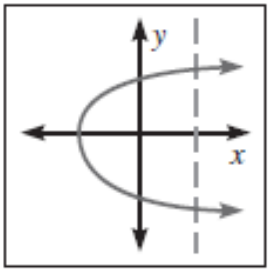
Vertical Line Test

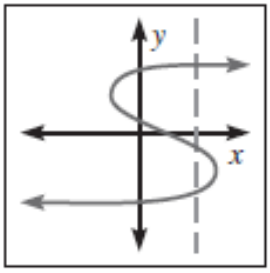
A relation is a function of the horizontal-axis variable if and only if **no vertical line passes through two or more points on the graph**.

Determine if the graph is a function.









Evaluating a function

Evaluate the function for the given value of the variable.

a) $f(x) = -3x$ when $x = 2$

b) $g(x) = 4x + 20$ when $x = -3$

Try it!

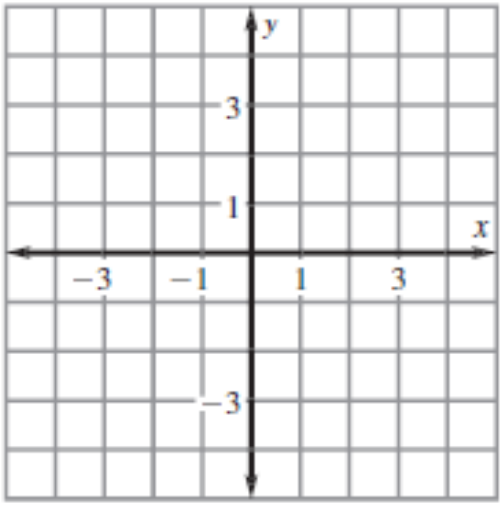
Evaluate the function for the given value of the variable.

a) $f(x) = 11x + 3$ when $x = -3$

b) $g(x) = 6 – 1.75x$ when $x = 10$

Graphing a Linear Function

Graph f(x) = $\frac{3}{4}$x – 2



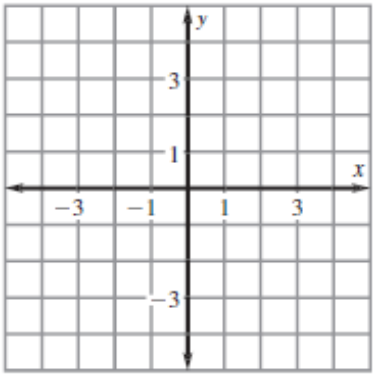
1. Put in slope-intercept form.

2. Identify the slope and y-intercept.
m = ____ b = ____

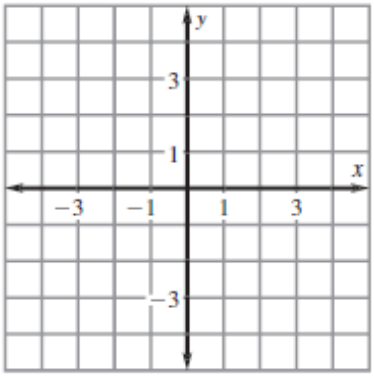
3. Plot the y-intercept and use the slope to find a second point. Connect.

Try it! Graph the following functions.

a) f(x) = -2x + 1



b) f(x) = 4x - 3



Finding the slope of the graph of a linear function.

$$f(9) = -1, \quad f(-1) = 2$$

1. Identify x_1, x_2, y_1, y_2
2. Use the formula for slope and substitute in the values.

$$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1} = \underline{\qquad\qquad}$$

Try it!

$f(-3) = -9, f(3) = 9$

$f(2) = -3, f(-2) = 5$