Algebra 1A

Chapter 4: Graphing Linear Equations and Functions

Name: _____

Period: _____

Miss. Duckworth

Algebra 1A Chapter 4: Graphing Linear Equations and Functions

Date	Homework	Objective
M Jan 3	p209 #1,3-13 odd, 14-17,24,36	SwBat identify and plot points in a coordinate plane
T Jan 4	p219 #1-10,11-21 odd, 23-25	SwBat graph linear equations on a coordinate plane
W Jan 5	p219 #26-29,35-37,48-55	SwBat graph linear equations on a coordinate plane
R Jan 6	p229 #4-10, 16-21,28-33	SwBat graph a linear equation using intercepts
F Jan 7	p229 #37,45,46,51-56	SwBat graph a linear equation using intercepts
M Jan 10	p232 #1-13 (in class)	SwBat graph equations and points
T Jan 11	Quiz 4A (50 points) Sections 4.1,4.2,4.3	SwBat graph equations and points
W Jan 12	p239 #1-18,42-56	SwBat find the slope of a line and interpret slope as a rate of change
R Jan 13	p240 #19-23,31-33,36-40,57-62	SwBat find the slope of a line and interpret slope as a rate of change
F Jan 14	p247 #1-13,17-24,30-33,40-43,46-56 even	SwBat graph linear equations using slope intercept form
M Jan 17	NO SCHOOL	
T Jan 18	p257# 3-9odd,11-22even,23-27,40-43,48-62even	SwBat write and graph direct variation equations
W Jan 19	p941 #27-52 all (in class)	SwBat graph lines using slope intercept form and direct variation.
R Jan 20	Quiz 4B (50 points) Sectiosn 4.4,4.5,4.6	SwBat graph lines using slope intercept form and direct variation.
F Jan 21	p275 #1-18,21-23 (in class)	SwBat graph equations and points using a variety of methods.
M Jan 24	Chapter 4 Test (100 Points)	SwBat graph equations and points using a variety of methods.

4.1 Plot Points in a Coordinate Plane

Goal • Identify and plot points in a coordinate plane.

Your Notes

VOCABULARY

Quadrant

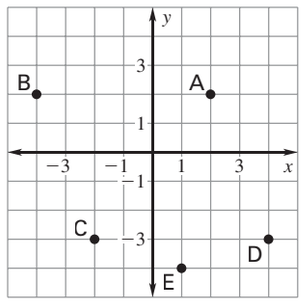
Example 1 ***Name points in a coordinate plane***

Give the coordinates of the point.

a. *A* **b.** *B*

Solution

a. Point *A* is ___ units to the _____ of the origin and ___ units _____.
The *x*-coordinate is ___.
The *y*-coordinate is ___.
The coordinates are _____.



Points in Quadrant I have two positive coordinates. Points in the other three quadrants have at least one negative coordinate.

b. Point *B* is ___ units to the _____ of the origin and ___ units _____.
The *x*-coordinate is _____.
The *y*-coordinate is ___.
The coordinates are _____.

✔ ***Checkpoint*** **Complete the following exercise.**

1. Use the coordinate plane in Example 1 to give the coordinates of points *C, D,* and *E*.

Your Notes

Example 2 ***Plot points in a coordinate plane***

Plot the point in a coordinate plane. Describe the location of the point.

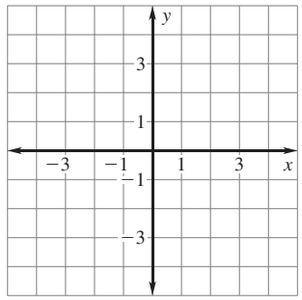
a. $A(0, 3)$ **b.** $B(1, -2)$ **c.** $C(-3, -4)$

Solution

a. Begin at the _____.
Move ___ units _____.
Point *A* is on the _____.

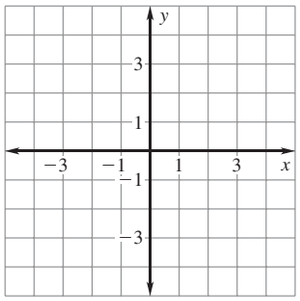
b. Begin at the _____.
Move ___ unit to the _____.
Move ___ units _____.
Point *B* is in Quadrant ____.

c. Begin at the _____
Move ___ units to the _____.
Move ___ units _____.
Point *C* is in Quadrant ____.

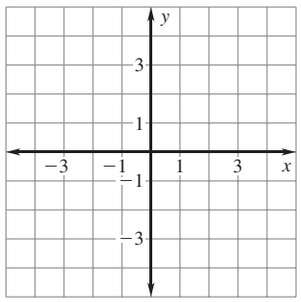


✔ ***Checkpoint*** **Plot the point in a coordinate plane. Describe the location of the point.**

2. $A(-4, -4)$



3. $B(2, 0)$



Your Notes

Example 3 ***Graph a function***

Graph the function $y = x + 1$ with domain $-2, -1, 0, 1, 2$. Then identify the range of the function.

Solution

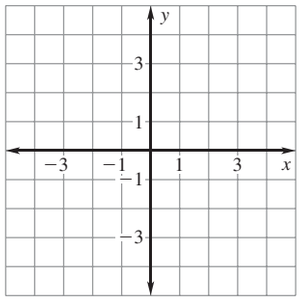
Step 1 Make a table.

x	$y = x + 1$
-2	$y = -2 + 1 =$ _____
-1	$y = -1 + 1 =$ _____
0	$y = 0 + 1 =$ _____
1	$y = 1 + 1 =$ _____
2	$y = 2 + 1 =$ _____

Step 2 List the ordered pairs:

(−2, _____), (−1, ___), (0, ___), (1, ___), (2, ___).

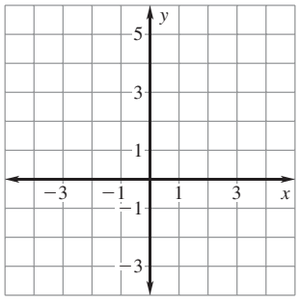
Then graph the function.



Step 3 Identify the range: _____.

✔ ***Checkpoint*** **Complete the following exercise.**

4. Graph the function $y = -\frac{1}{2}x + 3$ with domain $-4, -2, 0, 2$, and 4. Then identify the range.



Homework

Name _____ Date _____

LESSON 4.1

Interdisciplinary Application

For use with pages 206–212

Mammals

Biology Cows, dogs, humans, and lions are all mammals. Mammals are different from most other types of animals in five ways.

- Mammals have hair at some time in their lives.
- Mammals are warm-blooded. This means that the body temperatures of mammals are about the same all of the time, even though the temperature of their environment changes.
- Mammals have brains that are larger and better developed than other animals.
- Mammals train and protect their young more than other animals.
- Mammals nurse their babies.

Before a mammal can nurse its baby, the mother carries its unborn young while it develops from conception to birth. This is called the gestation period. The length of the gestation period differs with the species, and may even vary with individual births of the same animal. The following table shows a mammal, its average gestation period (in days), and the average birth weight (in pounds).

Mammal	Cow	Dog	Elephant	Giraffe	Horse	Human	Lion	Mouse	Rabbit
Average gestation period (days)	284	61	641	410	337	267	108	19	31
Average birth weight (pounds)	50	0.5	243	132	50	7.5	3.5	0.0025	0.125

1. Graph the function represented by the table for the average gestation periods and the average birth weights for the nine mammals. Use the horizontal axis to represent the gestation period.
2. What is the heaviest average birth weight shown in the graph? What is the lightest?
3. Describe the relationship between the average gestation period and the average birth weight.

4.2 Graph Linear Equations

Goal • Graph linear equations in a coordinate plane.

Your Notes

VOCABULARY

Solution of an equation in two variables

Graph of an equation in two variables

Linear equation

Standard form of a linear equation

Linear function

Example 1 ***Graph an equation***

Graph the equation $x + y = 4$.

Solution

Step 1 Solve the equation for y.

$x + y = 4$

$y =$ _____

Step 2 Make a table.

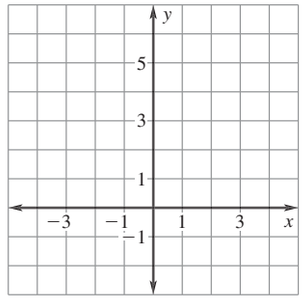
Choose a few values for x and find the values for y.

x	-2	-1	0	1	2
y					

Use convenient values for x when making a table. These should include a combination of negative values, zero, and positive values.

Your Notes

Step 3 **Plot** the points.



Step 4 **Connect** the points by drawing a line through them. Use arrows to indicate that the graph goes on without end.

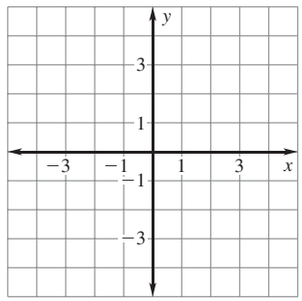
Example 2 ***Graph y = b and x = a***

Graph (a) $y = -3$ and (b) $x = 2$.

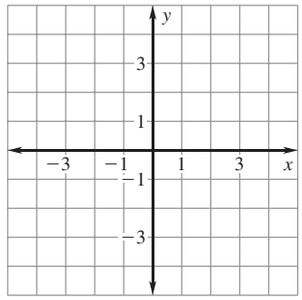
Solution

The equations $y = -3$ and $0x + 1y = -3$ are equivalent. For any value of x, the ordered pair $(x, -3)$ is a solution of $y = -3$.

a. Regardless of the value of x, the value of y is always _____. The graph of $y = -3$ is a _____ line 3 units _____ the x-axis.



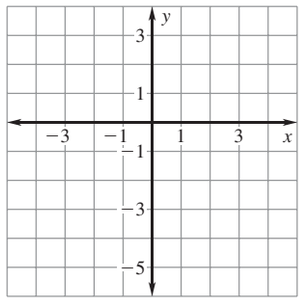
b. Regardless of the value of y, the value of x is always _____. The graph of $x = 2$ is a _____ line 2 units to the _____ of the y-axis.



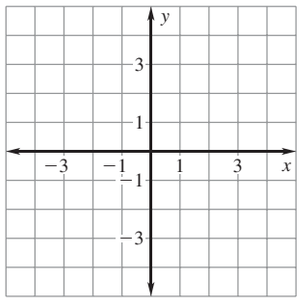
Your Notes

✔ ***Checkpoint*** **Graph the equation.**

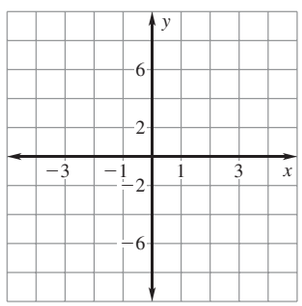
1. $y = 2x - 1$



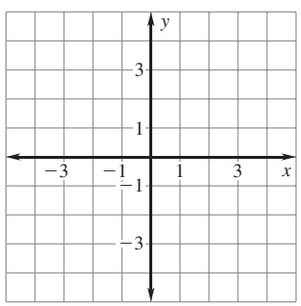
2. $x = 0.5$



3. $y = -4x + 1$



4. $y = -1.5$



EQUATIONS OF HORIZONTAL AND VERTICAL LINES

1. The graph of $y = b$ is a _____ line.
2. The line of graph $y = b$ passes through the point _____.
3. The graph of $x = a$ is a _____ line.
4. The line of graph $x = a$ passes through the point _____.

Your Notes

Example 3 ***Graph a linear function***

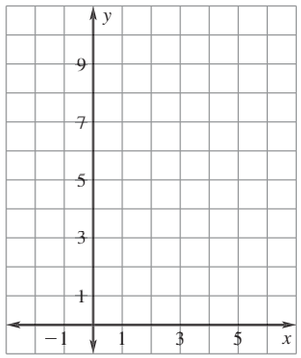
Graph the function $y = 2x + 2$ with domain $x \geq 0$. Then identify the range of the function.

Solution

Step 1 Make a _____.

x	0	1	2	3	4
y					

Step 2 Plot the _____.

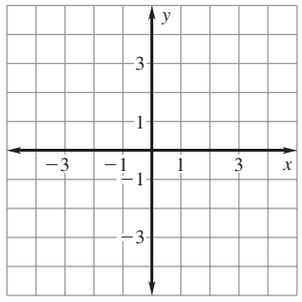


Step 3 Connect the points with a _____ because the domain is _____.

Step 4 Identify the range. From the graph, you can see that all points have a y-coordinate of _____, so the range of the function is _____.

✔ ***Checkpoint*** **Complete the following exercise.**

5. Graph the function $y = -x + 4$ with domain $x \geq 0$. Then identify the range of the function.



Homework

Name _____ Date _____

LESSON 4.2

Investigating Algebra Activity: Linear Equations

For use before Lesson 4.2

Materials: ruler, graph paper, pencil

QUESTION **What can you observe about the graph of the ordered pairs that are solutions to a linear equation?**

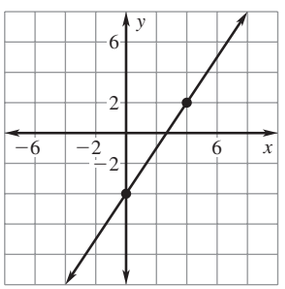
An example of a *linear equation* in x and y is $3x - 2y = 8$. A *solution* of a linear equation is an ordered pair (x, y) that makes the equation true. For example, $(4, 2)$ is a solution of the equation $3x - 2y = 8$ because $3(4) - 2(2) = 12 - 4 = 8$.

EXPLORE **Determine solutions of a linear equation**

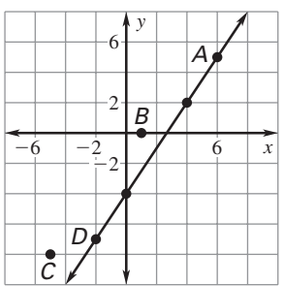
Given that $(4, 2)$ and $(0, -4)$ are solutions of the equation $3x - 2y = 8$, determine whether each point is also a solution.

a. $A(6, 5)$ **b.** $B(1, 0)$ **c.** $C(-5, -8)$ **d.** $D(-2, -7)$

STEP 1 Plot solutions
Plot the given solution $(4, 2)$ and $(0, -4)$ on a coordinate grid. Draw a line through them. This is the graph of the linear equation $3x - 2y = 8$.



STEP 2 Plot points *A*, *B*, *C*, and *D*
Plot points A, B, C, and D on the same coordinate grid.



STEP 3 Determine solutions
Look at the graph in Step 2. The points that lie on the same line as the given solutions, points A and D, are also solutions of the equation $3x - 2y = 8$. Points B and C do not lie on the line, so they are not solutions of the equation.

DRAW CONCLUSIONS **Plot the solution points *A* and *B* and draw the line that connects them. Then plot the given points *C*, *D*, and *E* and use the graph to determine which points are also solutions to the equation. Verify your answers by substituting in the equation.**

1. Equation: $2x + y = 5$
Solutions: $A(2, 1)$, $B(-1, 7)$
Points: $C(5, -5)$, $D(3, -4)$, $E(0, 5)$

2. Equation: $-x + 2y = -6$
Solutions: $A(0, -3)$, $B(6, 0)$
Points: $C(2, -2)$, $D(-4, -4)$, $E(-8, -8)$

4.3 Graph Using Intercepts

Goal • Graph a linear equation using intercepts.

Your Notes

VOCABULARY

x-intercept

y-intercept

Example 1 ***Find the intercepts of the graph of an equation***

Find the *x*-intercept and the *y*-intercept of the graph of $8x - 2y = 32$.

Solution

1. Substitute ___ for y and solve for x.

$8x - 2y = 32$ — **Write original equation.**

$8x - 2(\_\_\_) = 32$ — **Substitute ___ for *y*.**

$x = \frac{\square}{\square} = \_\_\_$ — **Solve for ___.**

2. Substitute ___ for x and solve for y.

$8x - 2y = 32$ — **Write original equation.**

$8(\_\_\_) - 2y = 32$ — **Substitute ___ for *x*.**

$y = \frac{\square}{\square} = \_\_\_\_\_$ — **Solve for ___.**

The *x*-intercept is ___. The *y*-intercept is _____.

Your Notes

✔ ***Checkpoint*** **Find the *x*-intercept and *y*-intercept of the graph of the equation.**

1. $2x + 3y = 18$	**2.** $-12x - 4y = 36$

Example 2 ***Use intercepts to graph an equation***

Graph $3.5x + 2y = 14$. Label the points where the line crosses the axis.

Solution

Step 1 Find the _____.

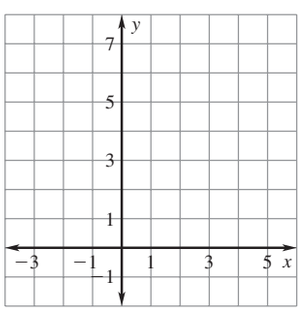
$3.5x + 2y = 14$	$3.5x + 2y = 14$
$3.5x + 2(\_\_\_) = 14$	$3.5(\_\_\_) + 2y = 14$
$x = \frac{\square}{\square} = \_\_\_$	$y = \frac{\square}{\square} = \_\_\_$

Step 2 Plot the points that correspond to the intercepts.

The *x*-intercept is ___, so plot the point _____.

The *y*-intercept is ___, so plot the point _____.

Step 3 _____ the points by drawing a line through them.



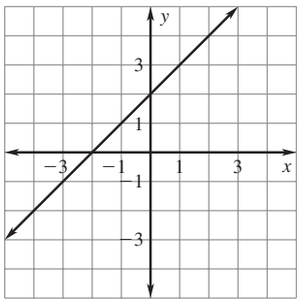
CHECK

You can check the graph of the equation by using a third point. When $x = 2$, $y =$ _____, so the ordered pair _____ is a third solution of the equation. You can see that _____ lies on the graph, so the graph is correct.

Your Notes

Example 3 ***Use a graph to find the intercepts***

Identify the *x*-intercept and *y*-intercept of the graph.

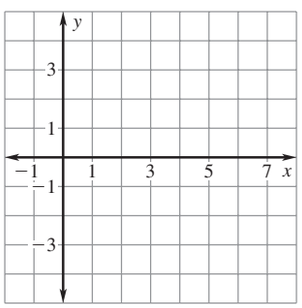


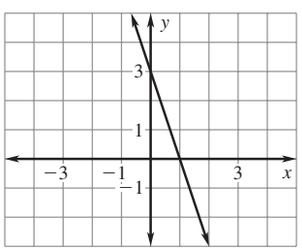
Solution

To find the *x*-intercept, look to see where the graph crosses the _____. The *x*-intercept is _____. To find the *y*-intercept, look to see where the graph crosses the _____. The *y*-intercept is ___.

✔ ***Checkpoint*** **Complete the following exercises.**

3. Graph $2x - 7y = 14$. Label the points where the line crosses the axes.





Homework

4.4 Find Slope and Rate of Change

Goal • Find the slope of a line and interpret slope as a rate of change.

Your Notes

VOCABULARY

Slope

Rate of change

FINDING THE SLOPE OF A LINE

Words

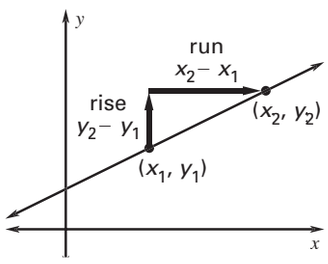
The slope of the nonvertical line passing through the two points (x_1, y_1) and (x_2, y_2) is the ratio of the _____ (change in y) to the _____ (change in x).

Symbols

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

$$\text{slope} = \frac{\square}{\square} = \frac{\text{change in } y}{\text{change in } x}$$

Graph

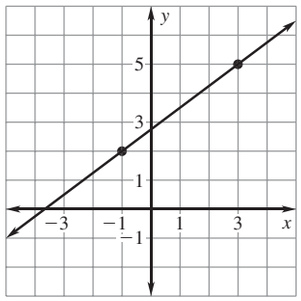


Your Notes

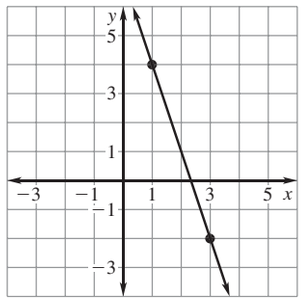
Example 1 ***Find a slope***

Find the slope of the line shown.

a. Let $(x_1, y_1) = (-1, 2)$ and $(x_2, y_2) = (3, 5)$.



b. Let $(x_1, y_1) = (1, 4)$ and $(x_2, y_2) = (3, -2)$.



Solution

Keep the *x*- and *y*-coordinates in the same order in the numerator and denominator when calculating slope. This will help avoid error.

a. $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ **Write formula for slope.**

$= \dfrac{\square - 2}{\square - (-1)}$ **Substitute.**

$=$ ____ **Simplify.**

The line _____ from left to right. The slope is _____.

b. $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ **Write formula for slope.**

$= \dfrac{\square - 4}{\square - 1}$ **Substitute.**

$=$ ____ $=$ ____ **Simplify.**

The line _____ from left to right. The slope is _____.

✔ ***Checkpoint*** **Find the slope of the line passing through the points.**

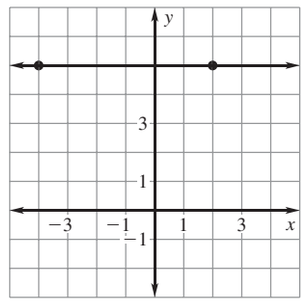
1. $(-3, -1)$ and $(-2, 1)$	**2.** $(-6, 3)$ and $(5, -2)$

Your Notes

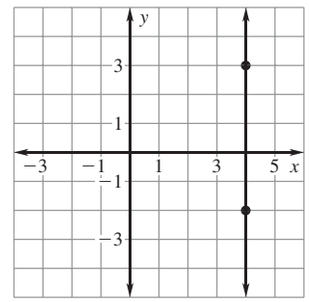
Example 2 ***Find the slope of a line***

Find the slope of the line shown.

a. Let $(x_1, y_1) = (2, 5)$ and $(x_2, y_2) = (-4, 5)$.



b. Let $(x_1, y_1) = (4, -2)$ and $(x_2, y_2) = (4, 3)$.



Solution

a. $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ **Write formula for slope.**

$= \dfrac{5 - \square}{4 - \square}$ **Substitute.**

$=$ _____ **Simplify.**

The line is _____. The slope is _____.

b. $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ **Write formula for slope.**

$= \dfrac{3 - \square}{4 - \square}$ **Substitute.**

$=$ _____ **Simplify.**

The line is _____. The slope is _____.

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

3. (1, −2) and (1, 3)	**4.** (−3, 7) and (4, 7)

Your Notes

Example 3 ***Find a rate of change***

Gas Prices The table shows the cost of a gallon of gas for a number of days. Find the rate of change with respect to time.

Time (days)	Day 1	Day 3	Day 5
Price/gal ($)	1.99	2.09	2.19

$$\text{Rate of change} = \frac{\text{change in cost}}{\text{change in time}}$$ **Write formula.**

$$= \frac{2.09 - \square}{3 - \square}$$ **Substitute.**

$$= \frac{\square}{\square} = \_\_\_\_$$ **Simplify.**

The rate of change in price is _____ per day.

Checkpoint

5. The table shows the change in temperature over time. Find the rate of change in degrees Fahrenheit with respect to time.

Temperature (°F)	**Time (hours)**
38	0
43	2
48	4
53	6

Homework

Name _____ Date _____

LESSON 4.4

LESSON 4.4

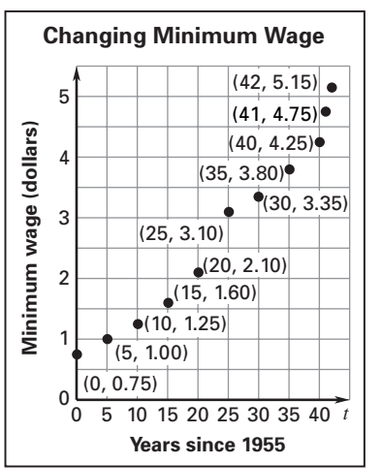
Interdisciplinary Application

For use with pages 234–242

Minimum Wage

History The smallest amount of money an employer may legally pay a worker per hour is called a minimum wage. In 1938, President Franklin D. Roosevelt signed the Fair Labor Standards Act. At the time, the act was limited to a few industries and only affected about one-fifth of the labor force. The act established in these industries a minimum wage of 25 cents per hour, banned child labor, and set other standards. Through the years, the act has been amended several times to cover more workers and raise the minimum wage. The minimum wage has increased over the years. For example, the per hour minimum wage was \$1.00 in 1956, \$2.00 in 1974, \$3.10 in 1980, \$4.25 in 1991, and \$5.15 in 1997. It should be noted that when a state requires a higher minimum wage than the federal standard, the worker is paid the state minimum wage.

In Exercises 1–4, use the graph at the right.



1. Estimate the average rate of change in the minimum wage from 1955 to 1995 in dollars per year.
2. Estimate the average rate of change in the minimum wage from 1990 to 1997 in dollars per year.
3. Which five-year period had the biggest wage increase?
4. Use the graph to estimate the minimum wage in 2000. Compare your estimate with the actual minimum wage in 2000. Why might your estimate be different from the actual wage?
5. The table below shows the value of the minimum wage from 1955 to 2004 in 1996 dollars. Graph the function represented by the table.

Minimum wage (in 1996 Dollars)

Year	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Value	\$4.39	\$5.77	\$5.58	\$5.43	\$5.39	\$5.30	\$6.03	\$5.97	\$6.41	\$6.33
Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Value	\$6.23	\$6.05	\$6.58	\$7.21	\$6.84	\$6.47	\$6.20	\$6.01	\$5.65	\$6.37
Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Value	\$6.12	\$6.34	\$5.95	\$6.38	\$6.27	\$5.90	\$5.78	\$5.45	\$5.28	\$5.06
Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Value	\$4.88	\$4.80	\$4.63	\$4.44	\$4.24	\$4.56	\$4.90	\$4.75	\$4.61	\$4.50
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Value	\$4.38	\$4.75	\$5.03	\$4.96	\$4.85	\$4.69	\$4.56	\$4.49	\$4.39	\$4.28

4.5 Graph Using Slope-Intercept Form

Goal • Graph linear equations using slope-intercept form.

Your Notes

VOCABULARY

Slope-intercept form

Parallel

FINDING THE SLOPE AND *Y*-INTERCEPT OF A LINE

Words

A linear equation of the form $y = mx + b$ is written in

_____

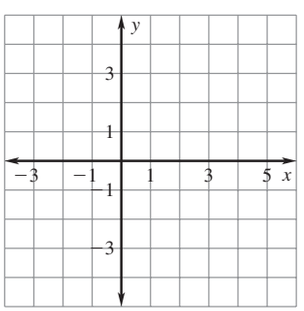
where ____ is the slope and ____ is the *y*-intercept of the equation's graph.

Symbols

$y = mx + b$

$y = 2x + 1$

Graph



Your Notes

Example 1 ***Identify slope and y-intercept***

Identify the slope and *y*-intercept of the line with the given equation.

a. $y = x + 3$ **b.** $-2x + y = 5$

Solution

a. The equation is in the form _____. So, the slope of the line is ___, and the *y*-intercept is ___.

b. Rewrite the equation in slope-intercept form by solving for ___.

$-2x + y = 5$ **Write original equation.**

$y =$ _____ **Subtract _____ from each side.**

The line has a slope of ___ and a *y*-intercept of ___.

✔ ***Checkpoint*** **Identify the slope and *y*-intercept of the line with the given equation.**

1. $y = 4x - 1$	**2.** $4x - 2y = 8$
3. $4y = 3x + 16$	**4.** $6x + 3y = -21$

Your Notes

Example 2 ***Graph an equation using slope-intercept form***

Graph the equation $4x + y = 2$.

Solution

Step 1 **Rewrite** the equation in slope-intercept form.

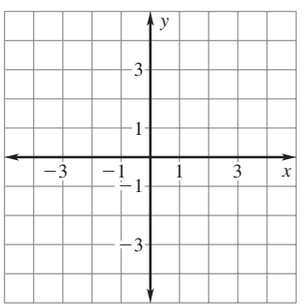
_____

Step 2 _____ the slope and the y-intercept.

$m =$ ____ $b =$ ____

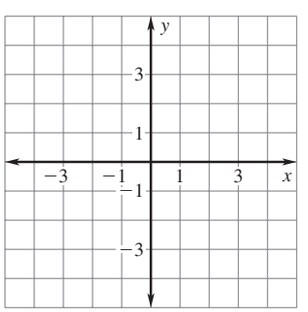
Step 3 _____ the point that corresponds to the y-intercept, (_____).

Step 4 **Use** the slope to locate a second point on the line. Draw a line through the two points.



✔ ***Checkpoint*** **Complete the following exercise.**

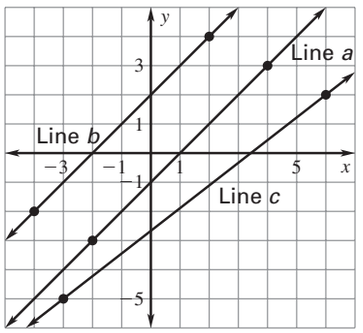
5. Graph the equation $-\frac{1}{2}x + y = 1$.



Your Notes

Example 3 ***Identify parallel lines***

Determine which of the lines are parallel.



Solution

Find the slope of each line.

Line *a*: $m = \dfrac{\square - 3}{\square - 4} = \dfrac{\square}{\square} =$ ___

Line *b*: $m = \dfrac{\square - 4}{\square - 2} = \dfrac{\square}{\square} =$ ___

Line *c*: $m = \dfrac{\square - 2}{\square - 6} = \dfrac{\square}{\square} =$ ___

Lines ___ and ___ have the same slope. They are parallel.

✔ ***Checkpoint*** **Complete the following exercise.**

6. Determine which lines are parallel.

Line *a*: through (2, 5) and (−2, 2)

Line *b*: through (4, 1) and (−3, −4)

Line *c*: through (2, 3) and (−2, 0)

Homework

Name _____ Date _____

LESSON 4.5

Graphing Calculator Activity: Identifying Parallel Lines

For use before Lesson 4.5

QUESTION **How can you use a graphing calculator to identify parallel lines?**

Two different lines in the same plane are *parallel* if they do not intersect.

EXAMPLE **Identify parallel lines**

Use a graphing calculator to determine which of the following lines are parallel.

Line a: $-3x + 2y = -4$ Line b: $-4x + 2y = 6$ Line c: $-2x + y = -1$

STEP 1 Rewrite equations

Write each equation in slope-intercept form.

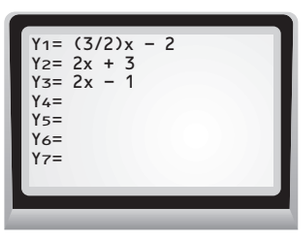
Line a: $-3x + 2y = -4$ Line b: $-4x + 2y = 6$ Line c: $-2x + y = -1$

$2y = 3x - 4$ $2y = 4x + 6$ $y = 2x - 1$

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

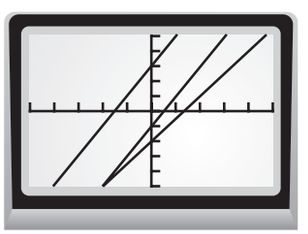
STEP 2 Enter equations

Enter the equations into the Y= screen.



STEP 3 Graph equations

Graph the equations in the standard viewing window.



STEP 4 Analyze graphs

You can see from the graph that lines a and c intersect. Use the *intersect* feature in the calc menu to determine whether lines a and b intersect and whether lines b and c intersect. The calculator will give you an error if the lines do not intersect. Using this method, you will find that lines b and c do not intersect. So, lines b and c are parallel.

PRACTICE **Use a graphing calculator to determine whether the graphs of the two equations are parallel lines.**

1. $y = -x + 5$
$y + x = -2$

2. $y = 10 + 3x$
$3x - 4 = y$

3. $y + 6x + 7 = 0$
$2y = 12x + 4$

4. $6y - 2x = 6$
$8y = 2x - 24$

5. $-15 = 2x - 3y$
$9y + 9 = 6x$

6. $5y = -10 - 4x$
$10y - 8x = 30$

7. In Exercises 1–6, what do you notice about the equations of the lines that are parallel?

4.6 Model Direct Variation

Goal • Write and graph direct variation equations.

Your Notes

VOCABULARY

Direct variation

Constant of variation

Example 1 ***Identify direct variation equations***

Tell whether the equation represents direct variation. If so, identify the constant of variation.

a. $4x + 2y = 0$ **b.** $-2x + y = 3$

Solution

To tell whether an equation represents direct variation, try to rewrite the equation in the form $y = ax$.

a. $4x + 2y = 0$ **Write original equation.**

$2y =$ _____ **Subtract** _____ **from each side.**

$y =$ _____ **Simplify.**

Because the equation $4x + 2y = 0$ _____ be rewritten in the form $y = ax$, it _____ direct variation. The constant of variation is _____.

b. $-2x + y = 3$ **Write original equation.**

$y =$ _____ $+ 3$ **Add** _____ **to each side.**

Because the equation $-2x + y = 3$ _____ be rewritten in the form $y = ax$, it _____ direct variation.

Your Notes

✔ ***Checkpoint*** **Tell whether the equation represents direct variation. If so, identify the constant of variation.**

1. $3x + 4y = 0$	**2.** $5x + y = 1$

Example 2 ***Graph direct variation equations***

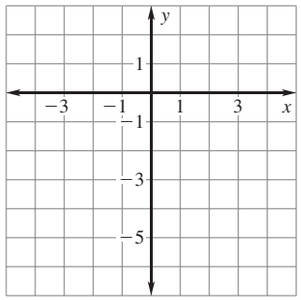
Graph the direct variation equation.

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

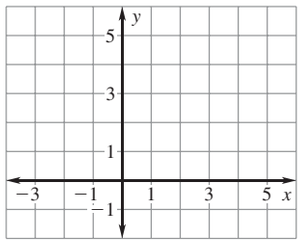
Solution

The graph of a direct variation equation is a line with a slope of *a* and a *y*-intercept of 0. This line passes through the origin.

a. Plot a point at the origin. The slope is equal to the constant of variation, or _____. Find and plot a second point, then draw a line through the points.



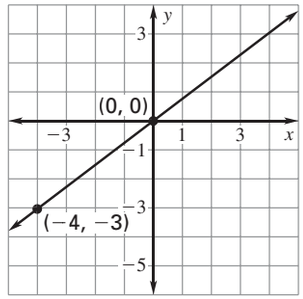
b. Plot a point at the origin. The slope is equal to the constant of variation, or ____. Find and plot a second point, then draw a line through the points.



Your Notes

Example 3 ***Write and use a direct variation equation***

The graph of a direct variation equation is shown.



a. Write the direct variation equation.

b. Find the value of y when $x = 80$.

Solution

a. Because y varies directly with x, the equation has the form $y = ax$. Use the fact that $y = -3$ when $x = -4$ to find a.

$y = ax$ **Write direct variation equation.**

$\_\_\_\_ = a(\_\_\_\_)$ **Substitute.**

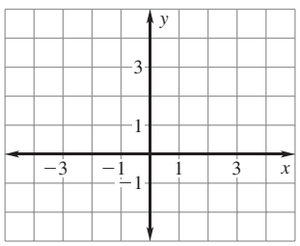
$\frac{\_\_\_\_}{\_\_\_} = a$ **Solve for a.**

A direct variation equation that relates x and y is $y =$ ____.

b. When $x = 80$, $y =$ ____ $=$ ____.

✔ ***Checkpoint*** **Complete the following exercises.**

3. Graph the direct variation equation $y = \frac{1}{2}x$.



4. The graph of a direct variation equation passes through the point $(3, -4)$. Write the direct variation equation and find the value of y when $x = 15$.

Homework

Name _____ Date _____

LESSON 4.6

Real-Life Application: When Will I Ever Use This?

For use with pages 253–259

Gasoline Prices

In Sacramento, California, gasoline prices fluctuated dramatically during the first half of 1999. After recording near record lows of $1.05 per gallon in February, fires and mechanical failures that shut down four California refineries drove up prices to around $1.67 per gallon in April. Because of California's strict clean-air specifications set by the California Air Resources Board (CARB), obtaining gas from other refineries was not an option. Wholesale distributors, fearing they would run out of gasoline that met CARB specifications, bid up gasoline prices. After the refineries re-opened, prices once again began falling and dropped to around $1.42 per gallon by May. Increases in worldwide crude oil prices, the main factor in driving gasoline prices up (or down), kept the price of gasoline from returning to the pre-crisis levels.

In Exercises 1–3, use the following information.

The cost of gasoline (in dollars) at a gas station varies directly with the number of gallons of gasoline that you pump. It costs $27.95 to fill your 13-gallon tank at a station in Sacramento.

1. Write a direct variation model that relates the number of gallons g to the total cost c (in dollars) to fill the tank.
2. Use your model from Exercise 1 to determine how much it will cost to fill up a car with a 19-gallon tank.
3. If you decide to buy a higher grade of gasoline, what will change in your model?

In Exercises 4 and 5, use the following information.

In many collegiate towns, gasoline stations raise their prices when students return to campus in August. The cost of gasoline (in dollars) and the number of gallons pumped by selected customers in eight university towns in Indiana are shown in the table below.

University	Town	Total Cost	Number of Gallons
Ball State	Muncie	$19.71	9
DePauw	Greencastle	$48.18	22
Indiana State	Terre Haute	$41.61	19
Indiana	Bloomington	$70.08	32
Purdue	West Lafayette	$28.47	13
Taylor	Fort Wayne	$35.04	16
Notre Dame	South Bend	$54.75	25

4. Write a ratio model that relates the total cost for gasoline to the number of gallons pumped.
5. Estimate the total cost for a car that needs 18 gallons of gasoline to fill the tank.