

Lesson 4-5

Example 1 Identify Linear Equations

Determine whether each equation is a linear equation. If so, write the equation in standard form.

a. $4 - 2y = 6x$

First rewrite the equation so that both variables are on the same side of the equation.

$$4 - 2y = 6x \quad \text{Original equation}$$

$$\frac{4 - 2y}{2} = \frac{6x}{2} \quad \text{Divide each side by the GCF.}$$

$$2 - y = 3x \quad \text{Simplify.}$$

$$2 - y + y = 3x + y \quad \text{Add } y \text{ to each side.}$$

$$2 = 3x + y \quad \text{Simplify.}$$

The equation $2 = 3x + y$ can be written as $3x + y = 2$. The equation is now in standard form where $A = 3$, $B = 1$, and $C = 2$. This is a linear equation.

b. $y + 3 = x^2$

Since the variable x is raised to the second power, this is not a linear equation.

c. $\frac{4}{5}x = -2$

Rewrite the equation with integer coefficients by multiplying both sides by 5.

$$\frac{4}{5}x = -2 \quad \text{Original equation}$$

$$(5)\frac{4}{5}x = 5(-2) \quad \text{Multiply both sides by 5.}$$

$$4x = -10 \quad \text{Simplify.}$$

$$\frac{4x}{2} = \frac{-10}{2} \quad \text{Divide each side by the GCF.}$$

$$2x = -5 \quad \text{Simplify.}$$

The equation $2x = -5$ can be written as $2x + 0y = -5$. Therefore, it is a linear equation in standard form where $A = 2$, $B = 0$, and $C = -5$.

d. $6y + x = 5y - 2$

Combine like terms.

$$6y + x = 5y - 2 \quad \text{Original equation}$$

$$6y + x - 5y = 5y - 2 - 5y \quad \text{Subtract } 5y \text{ from each side.}$$

$$y + x = -2 \quad \text{Simplify}$$

The equation $y + x = -2$ can be written as $x + y = -2$. The equation is now in standard form where $A = 1$, $B = 1$, and $C = -2$.

Example 2 Graph by Making a Table

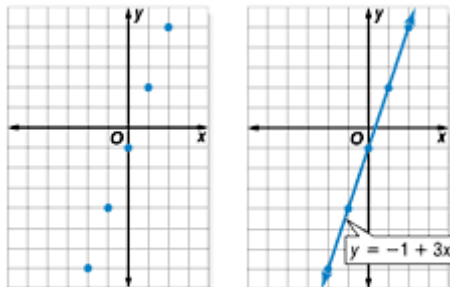
Graph $y - 3x = -1$.

In order to find values for y more easily, solve the equation for y .

$$\begin{array}{ll}
 y - 3x = -1 & \text{Original equation} \\
 y - 3x + 3x = -1 + 3x & \text{Add } 3x \text{ to each side.} \\
 y = -1 + 3x & \text{Simplify.}
 \end{array}$$

Select 5 values for the domain and make a table. Then graph the ordered pairs.

x	$3x - 1$	y	(x, y)
-2	$3(-2) - 1$	-7	$(-2, -7)$
-1	$3(-1) - 1$	-4	$(-1, -4)$
0	$3(0) - 1$	-1	$(0, -1)$
1	$3(1) - 1$	2	$(1, 2)$
2	$3(2) - 1$	5	$(2, 5)$



When you graph the ordered pairs, a pattern begins to form. The domain of $y = -1 + 3x$ is the set of all real numbers, so there are an infinite number of solutions of the equation. Draw a line through the points. This line represents all of the solutions for $y = -1 + 3x$.

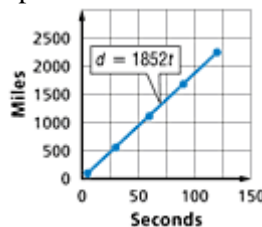
Example 3 Use the Graph of a Linear Equation

The speed of the earth around the sun is 18.52 miles per second. Therefore, the distance d the earth will travel in a time t is $d = 18.52t$.

- a. Graph the equation $d = 18.52t$. Where d is represented in miles and t is represented in seconds.

Select 5 values for t and make a table. Graph the ordered pairs and connect them to draw a line.

t	$18.52t$	d	(t, d)
5	$18.52(5)$	92.6	$(5, 92.6)$
30	$18.52(30)$	555.6	$(30, 555.6)$
60	$18.52(60)$	1111.2	$(60, 1111.2)$
90	$18.52(90)$	1666.8	$(90, 1666.8)$
120	$18.52(120)$	2222.4	$(120, 2222.4)$



- b. How long would it take to travel 200 miles?

Since any point on the line is a solution of the equation, use the graph to estimate the value of the x -coordinate in the ordered pair that contains 200 as the y -coordinate. The ordered pair $(10.8, 200)$ appears to be on the line. So, it takes about 10.8 seconds to travel 200 miles. Check this solution algebraically by substituting $(10.8, 200)$ into the original equation.

Example 4 Graph Using Intercepts

Determine the x -intercept and y -intercept of $5x - y = 8$. Then graph the equation.

To find the x -intercept, let $y = 0$.

$$5x - y = 8 \quad \text{Original equation}$$

$$5x - 0 = 8 \quad \text{Replace } y \text{ with } 0.$$

$$5x = 8 \quad \text{Divide each side by } 5.$$

$$x = \frac{8}{5}$$

To find the y -intercept, let $x = 0$.

$$5x - y = 8 \quad \text{Original equation}$$

$$5(0) - y = 8 \quad \text{Replace } x \text{ with } 0.$$

$$-y = 8 \quad \text{Multiply each side by } -1.$$

$$y = -8$$

The x -intercept is $\frac{8}{5}$, so the graph intersects

the x -axis at $(\frac{8}{5}, 0)$. The y -intercept is -8 , so

the graph intersects the y -axis at $(0, -8)$.

Plot these points. Then draw a line that connects them.

