Name _____

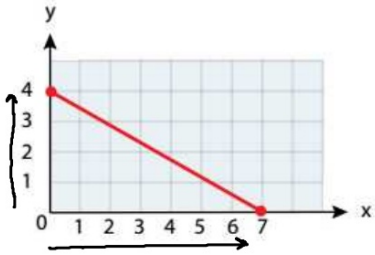
5-5 Standard Form

OBJECTIVE: I can graph linear equations using intercepts to write linear equations in standard form

Warm-Up

An athlete wants to make a snack mix of peanuts and cashews that will contain a certain amount of protein. Cashews have 4 g of protein per ounce, and peanuts have 7 g of protein per ounce. How many grams of protein will the athlete's mix contain?

What do the points (7, 0) and (0, 4) represent? Explain.



The athlete will pack 28 g of protein

The point (7,0) represent 7 g of peanuts and no cashews

The point (0,4) represents 4g of cashews and no peanuts

Essential Understanding

Essential Understanding One form of a linear equation, called standard form, allows you to find intercepts quickly. You can use the intercepts to draw the graph.

Key Concept:

The **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.

Example #1 Finding x- and y-Intercepts

What are the x- and y-intercepts of the graph of $3x + 4y = 24$?

To find the x-intercept
Let y=0

$3x + 4y = 24$

$3x + 4(0) = 24$

$3x + 0 = 24$

$\frac{3x}{3} = \frac{24}{3}$

$x = 8$

The x-intercept is 8

To find the y-intercept
Let x=0

$3x + 4y = 24$

$3(0) + 4y = 24$

$0 + 4y = 24$

$\frac{4y}{4} = \frac{24}{4}$

$y = 6$

The y-intercept is 6

Your Turn to Work it Out

1. What are the x- and y-intercepts of the graph of each equation?

a. $3x + 8y = 12$

To find the x-intercept
Let y=0

$3x + 8y = 12$

$3x + 8(0) = 12$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$

the x-intercept is 4

To find the y-intercept
Let x=0

$3x + 8y = 12$

$3(0) + 8y = 12$

$0 + 8y = 12$

$\frac{8y}{8} = \frac{12}{8}$ ÷ 4 ÷ 4

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

The y-intercept is $\frac{3}{2}$

Example #2 Graphing a Line Using Intercepts

What is the graph of $x - 2y = -2$?

To find the x-intercept
Let y=0

$x - 2y = -2$

$x - 2(0) = -2$

$x = -2$

$(-2, 0)$

To find the y-intercept
Let x=0

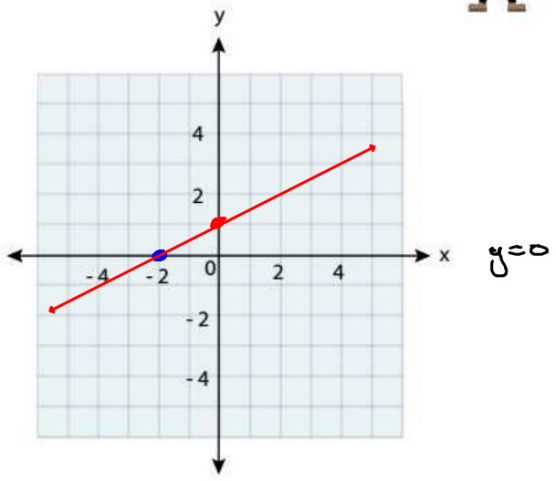
$x - 2y = -2$

$0 - 2y = -2$

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

$y = 1$

$(0, 1)$



Your Turn to Work it Out

2. What is the graph of $2x + 5y = 20$?

To find the x-intercept
Let y=0

$2x+5y=20$

$2x+5(0)=20$

$\frac{2x}{2}=\frac{20}{2}$

$x=10$

$(10, 0)$

To find the y-intercept
Let x=0

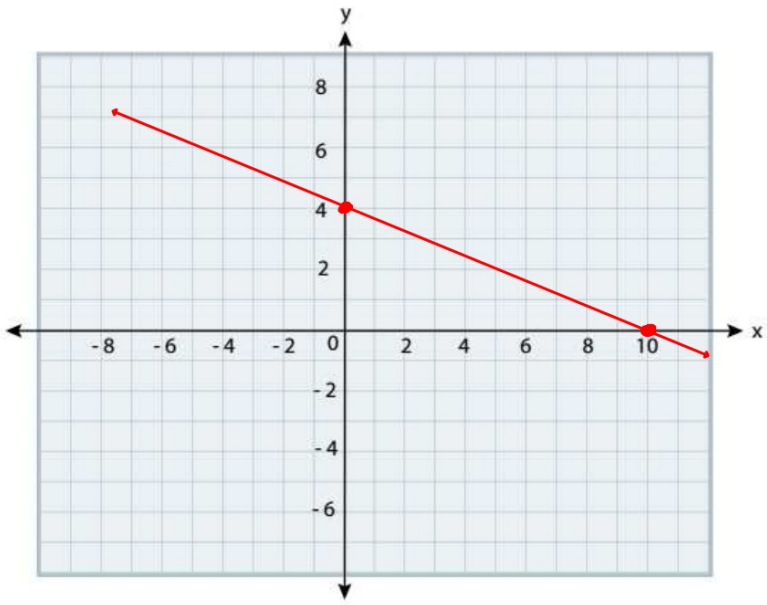
$2x+5y=20$

$2(0)+5y=20$

$\frac{5y}{5}=\frac{20}{5}$

$y=4$

$(0, -4)$



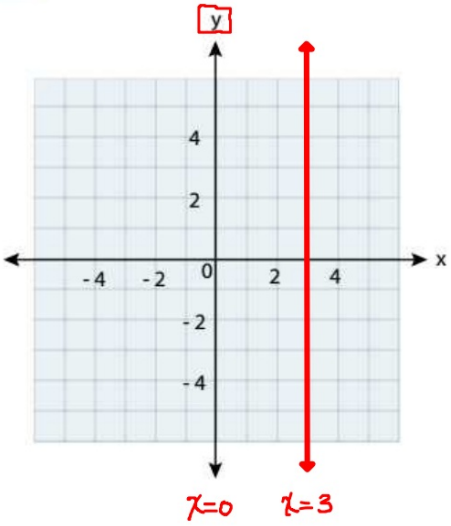
Example #3 Graphing Horizontal and Vertical Lines

If A = 0 in the standard form Ax + By = C, then you can write the equation in the form y = b, where b is a constant. If B = 0, you can write the equation in the form x = a, where a is a constant. The graph of y = b is a horizontal line, and the graph of x = a is a vertical line.

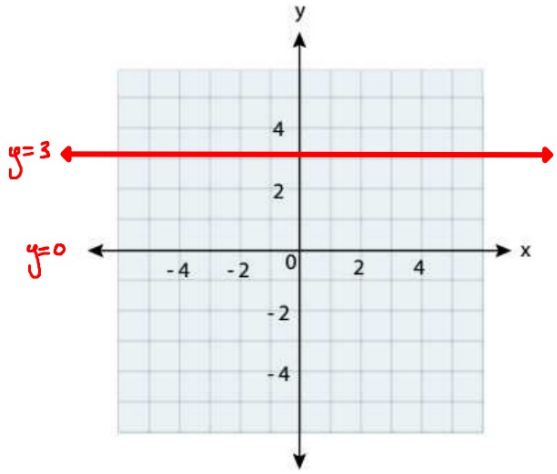
What is the graph of each equation?

The x-axis is $y=0$
The y-axis is $x=0$

A x = 3



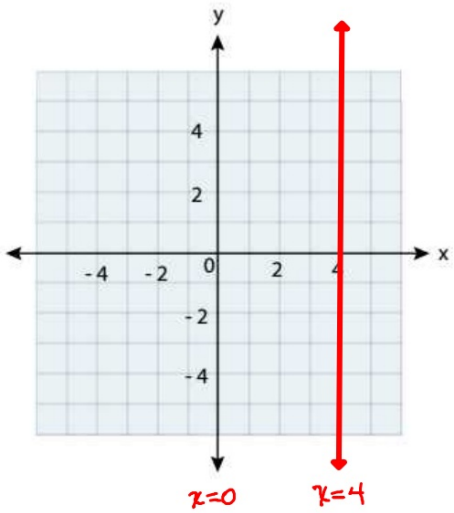
B y = 3



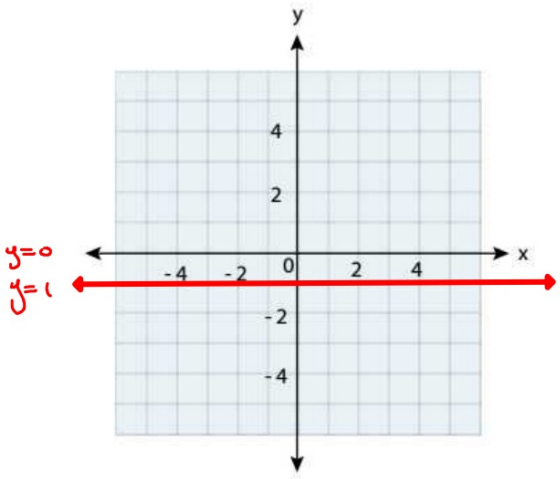
Your Turn to Work it Out

3. What is the graph of each equation?

a. $x = 4$



b. $y = -1$



Example #4 Transforming to Standard Form

What is $y = -\frac{3}{7}x + 5$ written in standard form using integers?

$y = -\frac{3}{7}x + 5$ ← this is slope intercept form

$7(y) = 7\left(-\frac{3}{7}x + 5\right)$ ← Multiply both sides by the 7

$7y = \frac{-21}{7}x + 35$ ← Simplify the fraction $\frac{-21}{7}$

$7y = -3x + 35$ ← Both x and y must be on same side of the equal sign

$+3x \quad +3x$

$3x + 7y = 35$ ← this is standard form

Your Turn to Work it Out

4. Write $y - 2 = -\frac{1}{3}(x + 6)$ in standard form using integers.

$3\left[y - 2\right] = \left[-\frac{1}{3}(x + 6)\right]3$ ← Multiply both side by 3

$3y - 6 = -\frac{3}{3}(x + 6)$ ← Simplify $-\frac{3}{3}$ as -1

$3y - 6 = -1(x + 6)$ ← the negative 1 must be distributed

$3y - 6 = -x - 6$ ← Place x and y on the same side of the equal sign
$+x \qquad +x$

$x + 3y - 6 = -6$ ← Place the constant on othe side of x and y
$+6 \qquad +6$

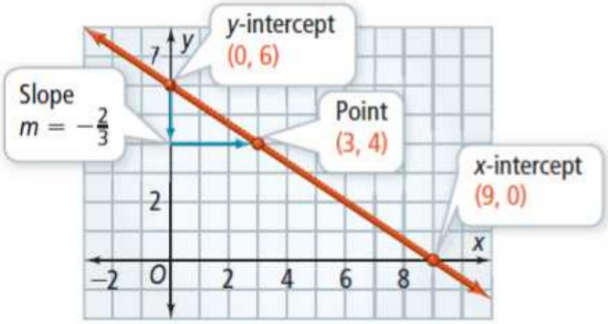
$x + 3y = 0$

Concept Understanding

Concept Summary: Linear Equations

You can describe any line using one or more of these forms of a linear equation. Any two equations for the same line are equivalent.

Graph



Forms

Slope-Intercept Form

$y = mx + b$

$y = -\frac{2}{3}x + 6$

Point-Slope Form

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

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

Standard Form

$Ax + By = C$

$2x + 3y = 18$