4.6 Model Direct Variation

Goal • Write and graph direct variation equations.

Your Notes

VOCABULARY

Direct variation The relationship of two variables, x and y, provided $y = ax$ and $a \neq 0$

Constant of variation In $y = ax$, a is called the 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.**

$2y =$ $-4x$ **Subtract** $4x$ **from each side.**

$y =$ $-2x$ **Simplify.**

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

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

$y =$ $2x$ $+ 3$ **Add** $2x$ **to each side.**

Because the equation $-2x + y = 3$ cannot be rewritten in the form $y = ax$, it does not represent direct variation.

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Your Notes

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

1. $3x + 4y = 0$ yes; $-\frac{3}{4}$	**2.** $5x + y = 1$ no

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

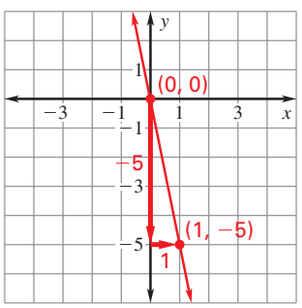
Graph the direct variation equation.

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

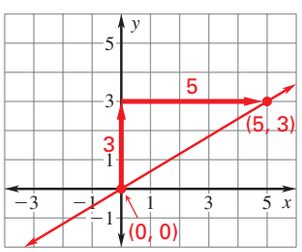
Solution

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 -5. 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 $\frac{3}{5}$. Find and plot a second point, then draw a line through the points.



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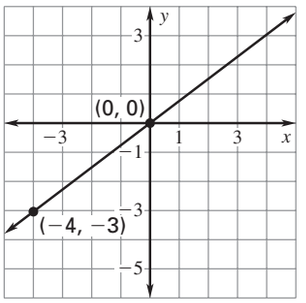
Your Notes

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.**

$\underline{-3} = a(\underline{-4})$ **Substitute.**

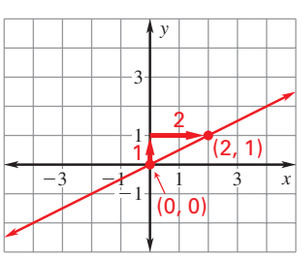
$\frac{3}{4} = a$ **Solve for *a*.**

A direct variation equation that relates x and y is $y = \underline{\frac{3}{4}x}$.

b. When $x = 80$, $y = \underline{\frac{3}{4}(80)} = \underline{60}$.

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 $x = 15$.

$y = -\frac{4}{3}x$; $y = -20$

Homework

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