5.4 Write Linear Equations in Standard Form

Goal • Write equations in standard form.

Your Notes

Example 1 ***Write equivalent equations in standard form***

Write two equations in standard form that are equivalent to $4x + 2y = 12$.

Solution

To write one equivalent equation, multiply each side by 0.5.

$2x + y = 6$

To write one equivalent equation, multiply each side by 2.

$8x + 4y = 24$

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

1. Write two equations in standard form that are equivalent to $6x - 4y = 6$.

$3x - 2y = 3$; $12x - 8y = 12$

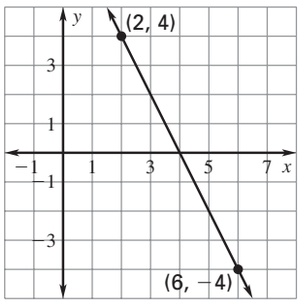
2. Write two equations in standard form that are equivalent to $-12x + 6y = -9$.

$-4x + 2y = -3$; $-24x + 12y = -18$

Your Notes

Example 2 *Write an equation from a graph*

Write an equation in standard form of the line shown.



Solution

All linear equations can be written in standard form, $Ax + By = C$.

Step 1 Calculate the slope.

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

$$= \frac{\boxed{-4} - \boxed{4}}{\boxed{6} - \boxed{2}}$$

$$= \frac{\boxed{-8}}{\boxed{4}}$$

$$= \underline{-2}$$

Step 2 Write an equation in point-slope form. Use (2, 4).

$y - y_1 = m(x - x_1)$ — **Write point-slope form.**

$y - \underline{4} = \underline{-2}(x - \underline{2})$ — **Substitute** $\underline{4}$ **for** y_1, $\underline{-2}$ **for** m, **and** $\underline{2}$ **for** x_1.

Step 3 Rewrite the equation in standard form.

$y - \underline{4} = \underline{-2}x + \underline{4}$ — **Distributive property**

$y + \underline{2}x = \underline{8}$ — **Collect variable terms on one side, constants on the other.**

Your Notes

Checkpoint **Complete the following exercise.**

3. Write an equation in standard form of the line through (3, −1) and (2, −4).

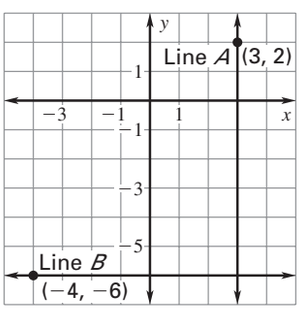
$y - 3x = -10$

Example 3 ***Write an equation of a line***

Write an equation of the specified line.

a. Line *A*

b. Line *B*



Solution

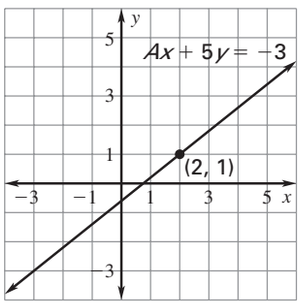
a. The *x*-coordinate of the given point on Line *A* is 3. This means that all points on the line have an *x*-coordinate of 3. An equation of the line is $x = 3$.

b. The *y*-coordinate of the given point on Line *B* is −6. This means that all points on the line have a *y*-coordinate of −6. An equation of the line is $y = -6$.

Your Notes

Example 4 ***Complete an equation in standard form***

Find the missing coefficient in the equation of the line shown. Write the completed equation.



Solution

Step 1 **Find** the value of A. Substitute the coordinates of the given point for x and y in the equation.

$Ax + 5y = -3$ **Write equation.**

$A(\underline{2}) + 5(\underline{1}) = -3$ **Substitute** 2 **for** x **and** 1 **for** y.

$\underline{2}A + \underline{5} = -3$ **Simplify.**

$\underline{2}A = \underline{-8}$ **Subtract** 5 **from each side.**

$A = \underline{-4}$ **Divide by** 2.

Step 2 **Complete** the equation.

$\underline{-4}x + 5y = -3$ **Substitute** -4 **for** A.

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

4. Write equations of the horizontal and vertical lines that pass through $(-10, 5)$.

Horizontal: $y = 5$; Vertical: $x = -10$

5. Find the missing coefficient in the equation of the line that passes through $(-2, 2)$. Write the completed equation.

$6x + By = 4$

$B = 8$; $6x + 8y = 4$

Homework