# 5.5 Write Equations of Parallel and Perpendicular Lines

**KEY CONCEPT** *For Your Notebook*

**Parallel Lines**

- If two nonvertical lines in the same plane have the [redacted]e, then they are [redacted]
- If two nonvertical lines in the same plane a[redacted], then they have the [redacted]

**Skill #19**: Finding an equation of a parallel line given an equation (slope - intercept) and a point.

**EXAMPLE 1** **Write an equation of a parallel line**

**Write an equation of the line that passes through $(-3, -5)$ and is parallel to the line $y = 3x - 1$.**

# Your Turn !

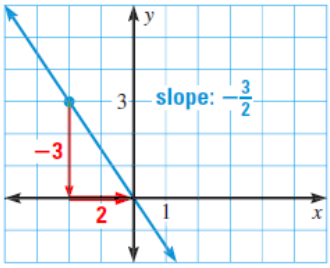
**You Try:** Skill #19

Write an equation of the line that passes through $(-2, 11)$ and is parallel to the line $y = -x + 5$.

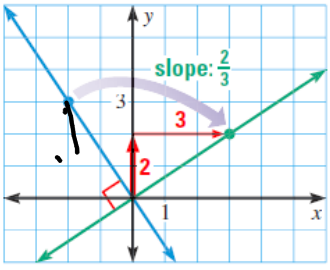
Don't forget to show your work and write down your answer !

**PERPENDICULAR LINES** Two lines in the same plane are **perpendicular** if they intersect to form a right angle. Horizontal and vertical lines are perpendicular to each other.

Compare the slopes of the perpendicular lines shown below.




Rotate the line 90° in a clockwise direction about the origin to find a perpendicular line.



**KEY CONCEPT** *For Your Notebook*

**Perpendicular Lines**

- If two nonvertical lines in the same plane have slopes that ar[redacted] then the lines ar[redacted]
- If two nonvertical lines in the same plane ar[redacted] then their slopes are [redacted]

$m = \frac{2}{3}$ $\quad m_{\perp} =$

$m = -3$ $\quad m_{\perp} =$

$m = -\frac{1}{4}$ $\quad m_{\perp} =$

**Skill #20**: Determine which lines are parallel and perpendicular based on slopes.

**EXAMPLE 2** **Determine whether lines are parallel or perpendicular**

**Determine which lines, if any, are parallel or perpendicular.**

**Line *a*:** $y = 5x - 3$ **Line *b*:** $x + 5y = 2$ **Line *c*:** $-10y - 2x = 0$

# Your Turn !

**You Try:** Skill #20

Determine which lines, if any, are parallel or perpendicular.

**Line *a*:** $2x + 6y = -3$ **Line *b*:** $y = 3x - 8$ **Line *c*:** $-1.5y + 4.5x = 6$

Don't forget to show your work and write down your answer !

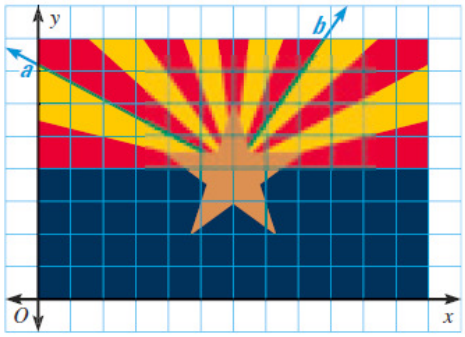
**Skill #20**: Determine which lines are parallel and perpendicular based on slopes.

## EXAMPLE 3 Determine whether lines are perpendicular

**STATE FLAG** The Arizona state flag is shown in a coordinate plane. Lines $a$ and $b$ appear to be perpendicular. Are they?

**Line *a*:** $12y = -7x + 42$

**Line *b*:** $11y = 16x - 52$



# Your Turn !

**You Try:** Skill #20

Is line $a$ perpendicular to line $b$? *Justify* your answer using slopes.

**Line $a$**: $2y + x = -12$ **Line $b$**: $2y = 3x - 8$

Don't forget to show your work and write down your answer !

**Skill #21**: Finding an equation of a perpendicular line given an equation (slope - intercept) and a point.

**EXAMPLE 4** **Write an equation of a perpendicular line**

**Write an equation of the line that passes through $(4, -5)$ and is perpendicular to the line $y = 2x + 3$.**

# Your Turn !

**You Try:** Skill #21

Write an equation of the line that passes through $(4, 3)$ and is perpendicular to the line $y = 4x - 7$.

Don't forget to show your work and write down your answer !