

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 same slope, then they are parallel.
- If two nonvertical lines in the same plane are perpendicular, then they have the opposite reciprocals of slopes.

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 !

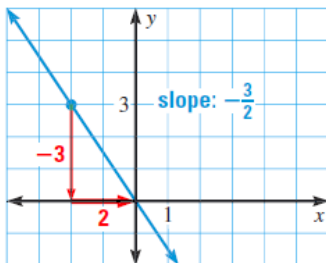
You Try: Skill #19

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

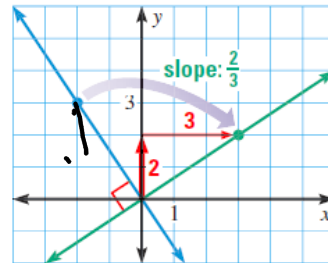
Don't forget to show your work and write down your answer !

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 are m and $-\frac{1}{m}$, then the lines are perpendicular.
- If two nonvertical lines in the same plane are perpendicular, then their slopes are m and $-\frac{1}{m}$.

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

$$m_{\perp} =$$

$$m = -3$$

$$m_{\perp} =$$

$$m = -\frac{1}{4}$$

$$m_{\perp} =$$

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 !

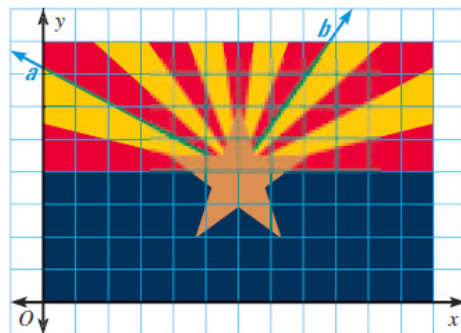
Skill #20: Determine which lines are parallel and perpendicular based on slopes.

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 !