

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 each other's 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 !

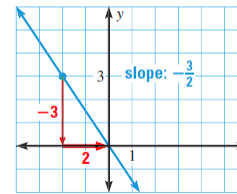
You Try: Skill #19

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

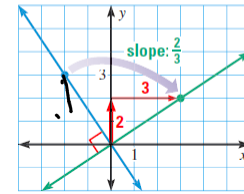
Don't forget to show your work and write down your answer !

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 **opposites reciprocals** then the lines are **perpendicular**.
- If two nonvertical lines in the same plane are **perpendicular** then their slopes are **opposites reciprocals**.

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

$$m_{\perp} = -\frac{3}{2}$$

$$m = -3$$

$$m_{\perp} = \frac{1}{3}$$

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

$$m_{\perp} = 4$$

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 2 Determine whether lines are parallel or perpendicular**

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

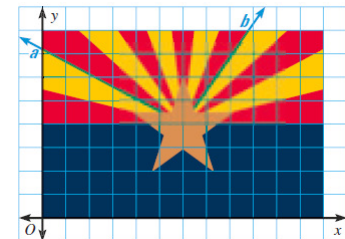
Line a : $y = 5x - 3$ Line b : $x + 5y = 2$ Line c : $-10y - 2x = 0$

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 !

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 !

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 $y = 2x + 3$.