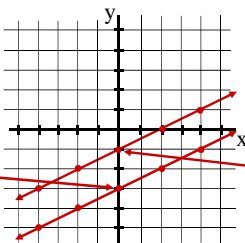


# Lesson 5-7

Objective - To write equations of parallel and perpendicular lines.  
Graph the following on the coordinate plane.

$y = \frac{1}{2}x - 3$    $y = \frac{1}{2}x - 1$

$m = \frac{1}{2}$   $m = \frac{1}{2}$   
 $b = -3$   $b = -1$

Parallel lines have the same slope.

Write the equation of the line in slope-intercept form that is parallel to  $y = -2x - 9$  and contains  $(4, -3)$ .

$m = -2$   $(x_1, y_1)$

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = -2(x - 4)$$

$$y + 3 = -2(x - 4)$$

$$y + 3 = -2x + 8$$

$$\begin{array}{r} -3 \qquad -3 \\ \hline y = -2x + 5 \end{array}$$

Find the equation of a line in standard form that is parallel to  $3x - 5y = 10$  and contains  $(-2, 6)$ .

$$\begin{array}{r} 3x - 5y = 10 \\ -3x \qquad -3x \\ \hline -5y = -3x + 10 \\ -5 \qquad -5 \\ \hline y = \frac{-3x}{-5} + \frac{10}{-5} \\ y = \frac{3}{5}x - 2 \end{array}$$

$m = \frac{3}{5}$   $(-2, 6)$   $y = \frac{3}{5}x + \frac{36}{5}$

$$y = \frac{3}{5}x + b$$

$$5\left(y = \frac{3}{5}x + \frac{36}{5}\right)$$

$$5y = 3x + 36$$

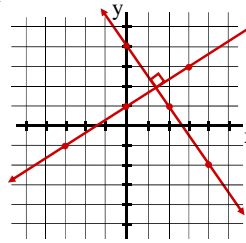
$$6 = \frac{3}{5}(-2) + b$$

$$6 = \frac{-6}{5} + b$$

$$\frac{30}{5} + \frac{6}{5} = b = \frac{36}{5}$$

$-3x + 5y = 36$   
or  
 $3x - 5y = -36$

Graph the following on the coordinate plane.

$y = \frac{2}{3}x + 1$    $y = -\frac{3}{2}x + 4$

$m = \frac{2}{3}$   $m = -\frac{3}{2}$   
 $b = 1$   $b = 4$

Lines appear perpendicular

Perpendicular lines have slopes that are opposite reciprocals

Find the following:

Number	Opposite	Reciprocal	Opposite Reciprocal
$\frac{2}{3}$	$-\frac{2}{3}$	$\frac{3}{2}$	$-\frac{3}{2}$
$-\frac{4}{5}$	$\frac{4}{5}$	$-\frac{5}{4}$	$\frac{5}{4}$
$3 = \frac{3}{1}$	$-3$	$\frac{1}{3}$	$-\frac{1}{3}$
$0.2 = \frac{1}{5}$	$-0.2$	$\frac{5}{1} = 5$	$-5$
$-8$	$8$	$-\frac{1}{8}$	$\frac{1}{8}$

Find the equation of a line in standard form that is perpendicular to  $4y - x = 6$  and contains  $(2, 5)$ .

$$\begin{array}{r} 4y - x = 6 \\ +x \quad +x \\ \hline 4y = x + 6 \\ 4 \qquad 4 \\ \hline y = \frac{x}{4} + \frac{6}{4} \\ y = \frac{1}{4}x + \frac{3}{2} \end{array}$$

$\perp m = -4$   $(2, 5)$   $y = -4x + 13$

$$y = -4x + b$$

$$5 = -4(2) + b$$

$$5 = -8 + b$$

$$13 = b$$

$4x + y = 13$

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

## Lesson 5-7 (cont.)

Determine whether the slopes are perpendicular.

1)  $m = \frac{2}{3}$     $m = \frac{-3}{2}$     $\frac{2}{3} \cdot \frac{-3}{2} = \frac{-6}{6} = -1$   
Yes, perpendicular.

2)  $m = -\frac{3}{5}$     $m = \frac{-5}{3}$     $-\frac{3}{5} \cdot \frac{-5}{3} = \frac{15}{15} = 1$   
No, not perpendicular.

3)  $m = -4$     $m = \frac{1}{4}$     $-4 \cdot \frac{1}{4} = -1$   
Yes, perpendicular.

Find the equation of a line in standard form that is perpendicular to  $3x + 5y = 7$  and contains  $(-4, -8)$ .

$$\begin{array}{l} 3x + 5y = 7 \\ -3x \quad -3x \\ \hline 5y = -3x + 7 \\ \frac{5y}{5} = \frac{-3x + 7}{5} \\ y = \frac{-3x}{5} + \frac{7}{5} \end{array}$$

$\perp m = \frac{5}{3}$     $(-4, -8)$     $y = \frac{5}{3}x - \frac{4}{3}$

$$\begin{array}{l} y = \frac{5}{3}x + b \\ -8 = \frac{5}{3}(-4) + b \\ -8 = \frac{-20}{3} + b \end{array}$$

$3(y = \frac{5}{3}x - \frac{4}{3})$   
 $3y = 5x - 4$   
 $-5x + 3y = -4$   
 or  
 $5x - 3y = 4$

$$m = \left(\frac{-3}{5}\right) \quad \frac{-24}{3} + \frac{20}{3} = b = \left(\frac{-4}{3}\right)$$