

# WRITING PARALLEL & PERPENDICULAR EQUATIONS

**What is this?** Given an equation, you must create ANOTHER equation that is either parallel or perpendicular to this line, passing through a certain point.

Keep in mind the following points:

- Parallel equations have Same slopes!
- Perpendicular equations have Negative Reciprocal slopes!

## Writing PARALLEL Equations

### EXAMPLE 1:

Write the equation of the line that passes through the point  $(-2, 7)$  and is **PARALLEL** to the line  $y = -4x + 1$

$$\parallel m = -4$$

$$y - 7 = -4(x + 2)$$

$$y - 7 = -4x - 8$$

$$\begin{array}{r} +7 \qquad \qquad +7 \\ \hline y = -4x - 1 \end{array}$$

### EXAMPLE 2:

Write the equation of the line that passes through the point  $(3, -1)$  and is **PARALLEL** to the line  $x - 3y = 9$

$$\parallel m = \frac{1}{3}$$

$$y + 1 = \frac{1}{3}(x - 3)$$

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

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

$$\begin{array}{r} -x \qquad -x \\ \hline -3y = -x + 9 \\ -3 \qquad -3 \\ \hline y = \frac{1}{3}x - 3 \end{array}$$

## Writing PERPENDICULAR Equations

### EXAMPLE 3:

Write the equation of the line that passes through the point  $(4, 3)$  and is **PERPENDICULAR** to the line  $y = 2x - 4$

$$\perp m = -\frac{1}{2}$$

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

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

$$\begin{array}{r} +3 \qquad \qquad +3 \\ \hline y = -\frac{1}{2}x + 5 \end{array}$$

### EXAMPLE 4:

Write the equation of the line that passes through the point  $(-5, 1)$  and is **PERPENDICULAR** to the line  $5x + 3y = -21$

$$\perp m = \frac{3}{5}$$

$$y - 1 = \frac{3}{5}(x + 5)$$

$$y - 1 = \frac{3}{5}x + 3$$

$$\begin{array}{r} +1 \qquad \qquad +1 \\ \hline y = \frac{3}{5}x + 4 \end{array}$$

$$\begin{array}{r} -5x \qquad -5x \\ \hline 3y = -5x - 21 \\ 3 \qquad 3 \\ \hline y = -\frac{5}{3}x - 7 \end{array}$$

# YOU TRY!

Write equations that are either parallel or perpendicular to the given lines, and passing through the point.

Write an equation passing through the point that is PARALLEL to the given equation.	
<p>1. <math>(-4, -1); y = 2x + 4</math></p> <p><math>11m = 2</math></p> $y + 1 = 2(x + 4)$ $y + 1 = 2x + 8$ $\begin{array}{r} -1 \qquad -1 \\ \hline y = 2x + 7 \end{array}$	<p>2. <math>(8, 3); y = -\frac{1}{4}x + 7</math></p> <p><math>11m = -\frac{1}{4}</math></p> $y - 3 = -\frac{1}{4}(x - 8)$ $y - 3 = -\frac{1}{4}x + 2$ $\begin{array}{r} +3 \qquad +3 \\ \hline y = -\frac{1}{4}x + 5 \end{array}$
<p>3. <math>(4, 5); x - 2y = 14</math></p> $\begin{array}{r} -x \qquad -x \\ \hline -2y = -x + 14 \\ -2 \qquad -2 \\ \hline y = \frac{1}{2}x - 7 \end{array}$ <p><math>11m = \frac{1}{2}</math></p> $y - 5 = \frac{1}{2}(x - 4)$ $y - 5 = \frac{1}{2}x - 2$ $\begin{array}{r} +5 \qquad +5 \\ \hline y = \frac{1}{2}x + 3 \end{array}$	<p>4. <math>(-6, 7); 5x + 2y = 10</math></p> $\begin{array}{r} -5x \qquad -5x \\ \hline 2y = -5x + 10 \\ 2 \qquad 2 \\ \hline y = -\frac{5}{2}x + 5 \end{array}$ <p><math>11m = -\frac{5}{2}</math></p> $y - 7 = -\frac{5}{2}(x + 6)$ $y - 7 = -\frac{5}{2}x - 15$ $\begin{array}{r} +7 \qquad +7 \\ \hline y = -\frac{5}{2}x - 8 \end{array}$

Write an equation passing through the point that is PERPENDICULAR to the given equation.	
<p>5. <math>(3, -3); y = \frac{3}{4}x + 5</math></p> <p><math>11m = -\frac{4}{3}</math></p> $y + 3 = -\frac{4}{3}(x - 3)$ $y + 3 = -\frac{4}{3}x + 4$ $\begin{array}{r} -3 \qquad -3 \\ \hline y = -\frac{4}{3}x + 1 \end{array}$	<p>6. <math>(-3, -2); y = x - 2</math></p> <p><math>11m = -1</math></p> $y + 2 = -1(x + 3)$ $y + 2 = -x - 3$ $\begin{array}{r} -2 \qquad -2 \\ \hline y = -x - 5 \end{array}$
<p>7. <math>(2, 3); 2x + 10y = 20</math></p> $\begin{array}{r} -2x \qquad -2x \\ \hline 10y = -2x + 20 \\ 10 \qquad 10 \\ \hline y = -\frac{1}{5}x + 2 \end{array}$ <p><math>11m = 5</math></p> $y - 3 = 5(x - 2)$ $y - 3 = 5x - 10$ $\begin{array}{r} +3 \qquad +3 \\ \hline y = 5x - 7 \end{array}$	<p>8. <math>(-1, -6); x + 3y = 6</math></p> $\begin{array}{r} -x \qquad -x \\ \hline 3y = -x + 6 \\ 3 \qquad 3 \\ \hline y = -\frac{1}{3}x + 2 \end{array}$ <p><math>11m = 3</math></p> $y + 6 = 3(x + 1)$ $y + 6 = 3x + 3$ $\begin{array}{r} -6 \qquad -6 \\ \hline y = 3x - 3 \end{array}$