

3.18

Writing the Equation of the Line through a Given Point and Perpendicular to a Given Line

• Example 1

Write the equation of the line perpendicular to the line given by $3x - 4y = -10$ that passes through the point $(-1, 4)$.

We first find the slope of the given line by solving for y .

$$\begin{aligned} 3x - 4y &= -10 \\ -4y &= -3x - 10 \\ y &= \frac{3}{4}x + \frac{5}{2} \end{aligned}$$

So the slope of this line is $\frac{3}{4}$.

The slope of any line perpendicular to this line is the negative reciprocal of $\frac{3}{4}$ which is $-\frac{4}{3}$.

Using this slope and the point $(-1, 4)$, we can find the equation of the line using the slope-intercept form of a line.

$$\begin{aligned} y &= mx + b \\ 4 &= \left(-\frac{4}{3}\right)(-1) + b \\ 4 - \frac{4}{3} &= b \\ \frac{8}{3} &= b \end{aligned}$$

The equation of the line in slope-intercept form is $y = -\frac{4}{3}x + \frac{8}{3}$.

• • • CHECK YOURSELF 1

Write the equation of the line perpendicular to the line given by $x - 2y = 4$ that passes through the point $(1, 5)$.

• • • CHECK YOURSELF ANSWER

1. $y = -2x + 7$ or $2x + y = 7$.

3.18 Exercises

Name _____

Section _____

Date _____

A N S W E R S

1. _____

2. _____

3. _____

4. _____

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7. _____

8. _____

Find the equation of the line perpendicular to the given line that passes through the given point.

1. $y = -\frac{1}{2}x + \frac{5}{2}; (1, 1)$

2. $y = 2x + 7; (3, 10)$

3. $6x - 2y = -5; (5, 6)$

4. $x + y = 7; (5, -4)$

5. $2x - y = 4; (3, 5)$

6. $-3x + 4y = 1; (1, -2)$

7. $6x - 2y = -5; (0, 7)$

8. $-8x - y = -7; (-4, -5)$