

Section 5.3 Writing Linear Equations Given Two Points

Writing an equation given two points has only extra step compared to writing an equation given the slope and a point. That step is to find the slope. The steps for this method are as follows:

1. Find the slope between the two points using $slope = \frac{rise}{run}$ or $slope = \frac{y_2 - y_1}{x_2 - x_1}$
2. Plug one of the (x,y) pairs and the slope into $y = mx + b$. Either point will work, but you might want to choose the one with the simpler numbers.
3. Solve for b, the y-intercept.
4. Plug the slope and y-intercept back into $y = mx + b$

Example: Write an equation of the line that passes through (3,1) and (2,-1)

1. $slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-1-1)}{(2-3)} = \frac{-2}{-1} = 2$ $m = 2$
2. $y = mx + b$, $1 = 2(3) + b$
3. Solve for b
 $1 = 2(3) + b$ $1 = 6 + b$ $-5 = b$ $b = -5$
4. Write the equation: $y = 2x - 5$

Writing Equation of Perpendicular Lines

You may recall that parallel lines have the same slope. Perpendicular lines have opposite reciprocal slopes from each other. Thus, to find the slope of a line perpendicular to $y = 3x + 7$, you would take the slope of 3, take its reciprocal then reverse the sign:

$$3 \rightarrow -\frac{1}{3}$$

Example: Write an equation of the line that passes through (4,2) and is perpendicular to $y = 2x - 5$.

Slope of the given line = 2

So the perpendicular line would have a slope of $-\frac{1}{2}$

Plug the slope and out point into $y = mx + b$ and solve for b:

$$2 = -\frac{1}{2}(4) + b$$

$$2 = -2 + b$$

$$b = 4$$

Write the equation: $y = -\frac{1}{2}x + 4$