Writing Equations of Lines

The equation of a line can be found if you know the slope of the line and a point on the line. To find the equation, you will use the *point-slope formula*.

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

where $m = slope of the line and (x_1, y_1) is the point on the line$

Example: Given a point and the slope

1. Find the equation of the line with a slope of 3 that passes through (-1, 5).

| Start with the formula: | $y - y_1 = m(x - x_1)$ |
|-------------------------|------------------------|
| Plug in the values: | y - (5) = 3(x - (-1)) |
| Adjust any signs: | y - 5 = 3(x + 1) |
| Distribute the 3: | y - 5 = 3x + 3 |
| Add 5 to both sides | y = 3x + 8 |
| (to solve for y) | |
| | |

Answer: y = 3x + 8

2. Find the equation of the line with a slope of 4 that passes through (3, -2).

Example: Given a two points

First, calculate the slope of the line by using the slope formula.

The points are (x₁, y₁) and (x₂, y₂) $m = \frac{y_2 - y_1}{x_2 - x_1}$

Then, choose one of the given points and the slope to use the point-slope formula.

3. Find the equation of the line that passes through (-2, 5) and (1, 2)

Calculate the slope using the formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 5}{1 - (-2)} = \frac{-3}{3} = -1$$

Now, use that slope and one of the points in the point-slope formula.

| m = -1, and (-2, 5) | $y - y_1 = m(x - x_1)$ |
|---------------------|------------------------|
| Substitute values | y – 5 = -1 (x – (-2)) |
| Adjust the signs | y - 5 = -1(x + 2) |
| Distribute | y - 5 = -x - 2 |
| Add 5 to both sides | y = -x + 3 |

4. Find the equation of the line that passes through (-1, 4) and (-2, 6)