Point Slope Form $y - y_1 = m(x - x_1)$

Slope $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope intercept form $y = mx + b$

(x_1, y_1) (x_2, y_2)

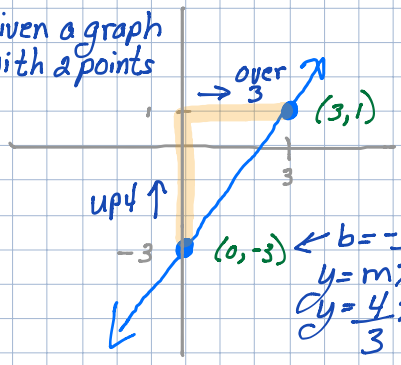
$(-6, -4)$ $(6, -1)$

What you need:

1.) 2 points to find the slope

2.) the slope and one point to find the equation of a line

given a graph with 2 points

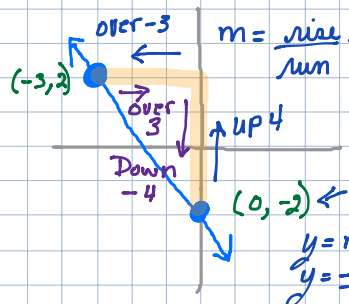


$\frac{\text{rise}}{\text{run}} = \frac{4}{3}$

$b = -3$

$y = mx + b$

$y = \frac{4}{3}x - 3$



$m = \frac{\text{rise}}{\text{run}} = \frac{4}{-3} = \frac{-4}{3} = -\frac{4}{3}$

$b = -2$

$y = mx + b$

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

given 2 points (x_1, y_1), (x_2, y_2)

$(0, -3)$, $(3, 1)$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{1 - (-3)}{3 - 0} = \frac{1 + 3}{3} = \frac{4}{3}$

Then use Point Slope Form to find the equation of the line.

using point $(3, 1)$ and slope $\frac{4}{3}$

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

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

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

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

$+1 \qquad +1$

$y = \frac{4}{3}x - 3$

given Slope $= -2$ and point $(1, 5)$

$y - 5 = -2(x - 1)$

$y - 5 = -2x + 2$

$+5 \qquad +5$

$y = -2x + 7$

Fraction Refresher $\frac{5}{3} + \frac{7}{2} = \frac{5(2) + 7(3)}{3(2)} = \frac{10 + 21}{6} = \frac{31}{6}$

Perpendicular
means where the two lines intersect, makes a 90° angle.

The equation of the line perpendicular to $y = 3x + 5$ through the point $(5, 4)$

m = opposite sign ($\mp$) and the reciprocal $\frac{1}{m}$

so $m = -\frac{1}{3}$

using point slope form

$y - 4 = -\frac{1}{3}(x - 5)$

$y - 4 = -\frac{1}{3}x - 5\left(-\frac{1}{3}\right)$

$y - 4 = -\frac{1}{3}x + \frac{5}{3}$

$+4 \qquad +4$

$y = -\frac{1}{3}x + \frac{17}{3}$

Cross multiply $4(3) = 12$

$\frac{5}{3} + \frac{4}{1} = \frac{5}{3} + \frac{12}{3} = \frac{17}{3}$

Parallel
mean the lines never intersect, so they have the same slope

The equation of the line parallel to $y = 5x + 2$ through the point $(3, 2)$

so $m = 5$

using point slope form

$y - 2 = 5(x - 3)$

$y - 2 = 5x - 15$

$+2 \qquad +2$

$y = 5x - 13$

* If you are given an equation that is not in slope intercept form you must solve for y.

$2x + 3y = 1$

$-2x \qquad -2x$

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

Subtract $2x$ from both sides
Keep the terms in proper order
divide by 3

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