**Data Science Math Skills**
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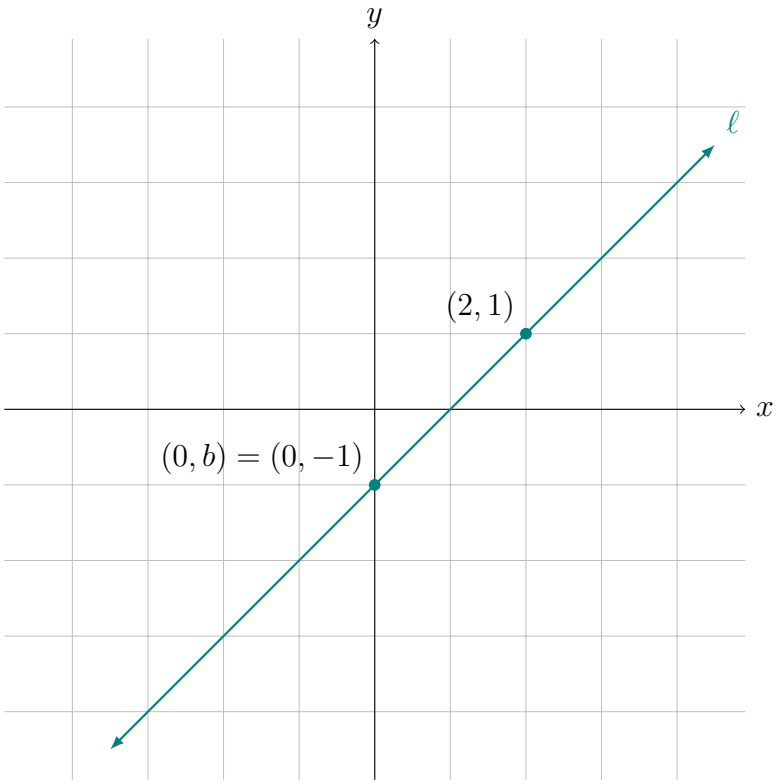
# Cartesian Plane: Slope-Intercept Formula for Lines

Video companion

## 1 Derivation using point-slope form




From last video, the equation of a line in point-slope form that passes through $(2, 1)$ and has slope $m = 1$ is

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

The $y$-intercept is at point $(0, b)$. To find $b$, we substitute that point into the definition of the line:

$$\begin{aligned}(0, b) &\in \ell, \text{ so} \\ b - 1 &= 1(0 - 2) \\ b &= -1\end{aligned}$$

Using the $y$-intercept in the equation for the line in point-slope form:

$$\begin{aligned} y-(-1) &= 1(x-0) \\ y+1 &= x \\ y &= 1x-1 \end{aligned}$$

## 2 Slope-intercept form

If $\ell$ has slope $m$, and $\ell$ hits the $y$-axis at $(0, b)$, then

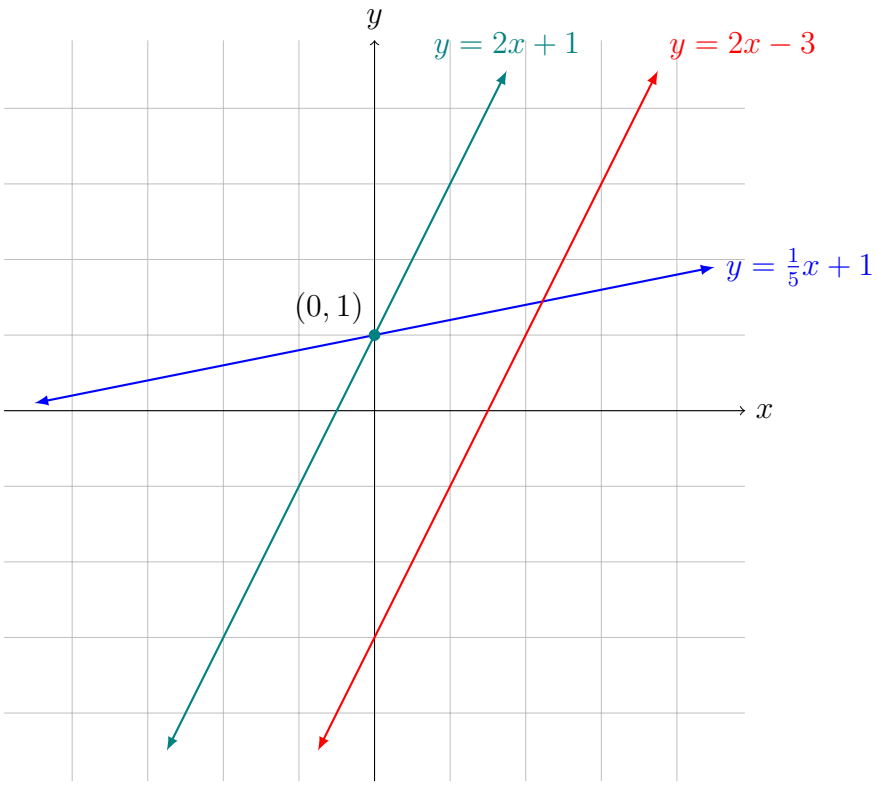
$$\boxed{y = mx + b}$$

is an equation for $\ell$, where $m$ is the slope and $b$ is the $y$-intercept.

# 3 Drawing lines

Draw line with equation

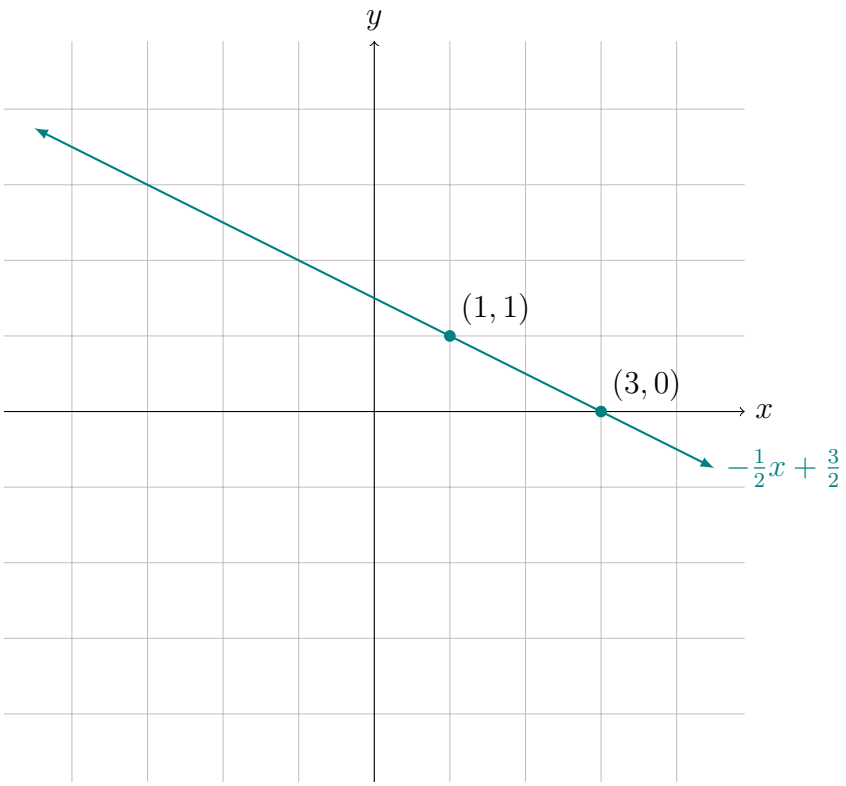
$$y = 2x + 1$$
$$y = \frac{1}{5}x + 1$$
$$y = 2x - 3$$




The slope tells you how to angle the line, and the $y$-intercept tells you where to anchor it on the $y$-axis.

# 4 Example

**Problem:** Line $\ell$ has points $(1, 1)$ and $(3, 0)$ on it. Find an equation for $\ell$.




Find the slope:

$$m = \frac{0-1}{3-1} = -\frac{1}{2}$$

Some possible equations for the line in point-slope form:

$$y - 1 = -\frac{1}{2}(x - 1)$$
$$y - 0 = -\frac{1}{2}(x - 3)$$

An equation for the line in slope-intercept form:

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