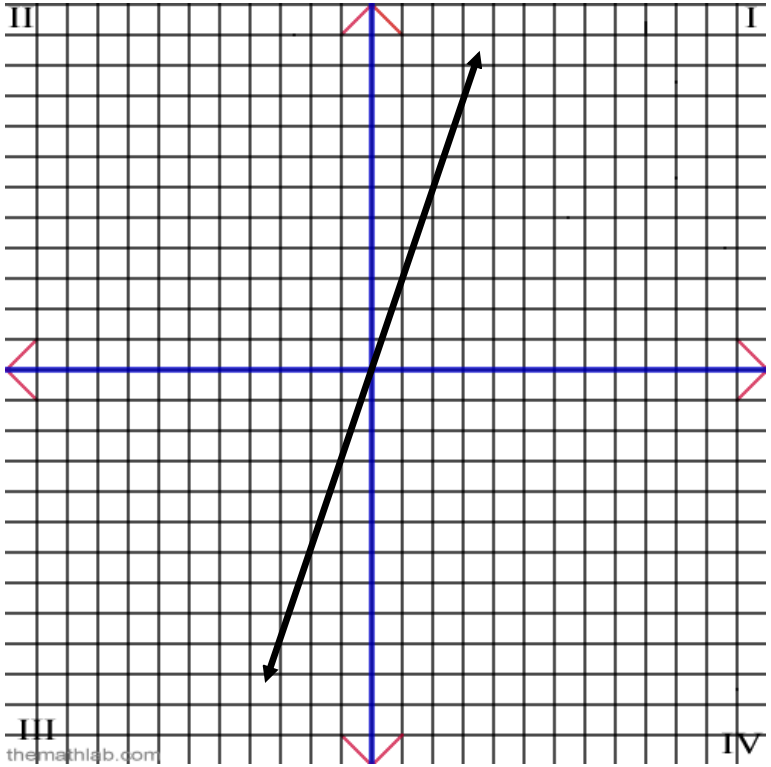
Linear Equations: $y = mx + b$

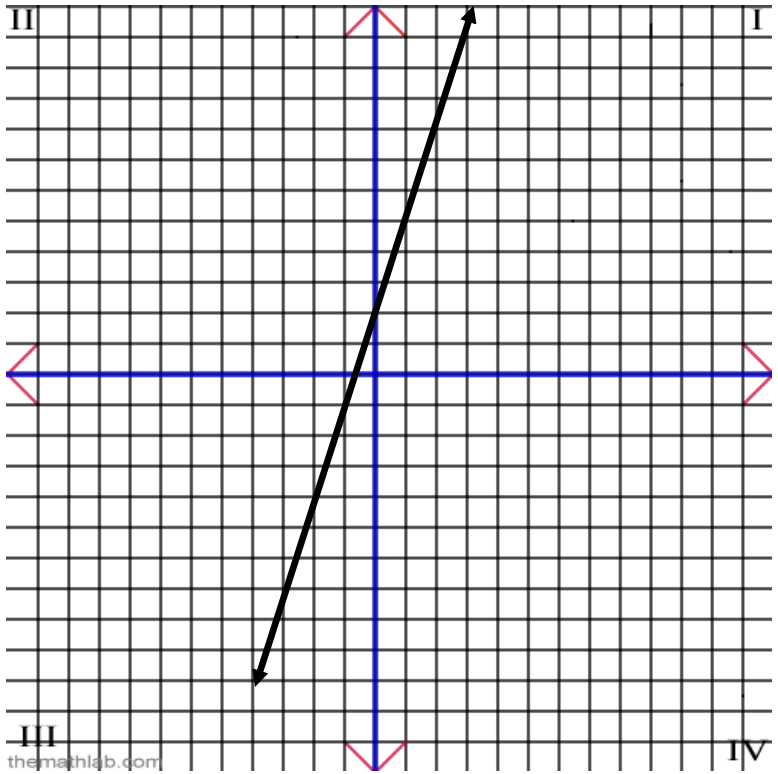
A linear relation can be defined by its slope and any point on the line.

Examine the graphs of the linear relations shown on the next page.



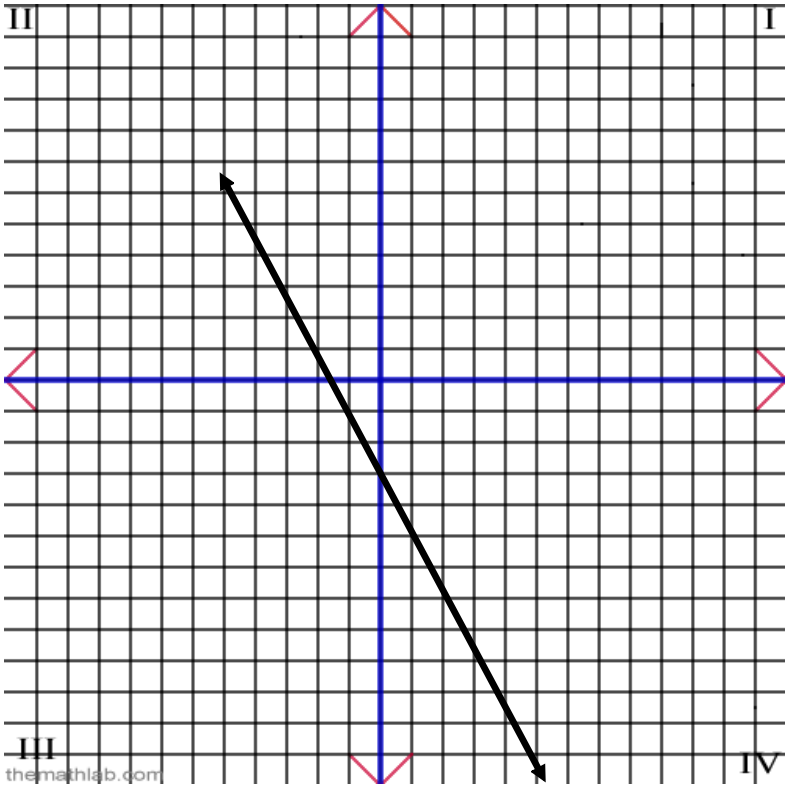
slope of 3 y-intercept of 0

Equation: y = 3x



slope of 3 y-intercept of 2

Equation: 3x + 2



Notice how the slope and the y-intercept relate to the equation.

slope of -2 y-intercept of -3

Equation: y = -2x - 3

Any linear relation can be expressed as $y = mx + b$, where m is the slope of the relation and b is the y-intercept.

This is called the slope y-intercept form of an equation.

Example 1:

Determine the slope and y-intercept of the line given by $3x - 4y = 12$.

Solution:

$$3x - 4y = 12$$

$$-4y = -3x + 12$$

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

Thus, the slope is $\frac{3}{4}$ and the y-intercept is -3.

Example 2:

The lines represented by $y + 2 = 2(x - 3) + kx$ and $3(x + 2) = 3 + y$ have equal slopes. Find the value of "k".

Solution:

Write each equation in the slope y-intercept form and compare the slopes.

$$y + 2 = 2(x-3) + kx$$
$$y + 2 = 2x - 6 + kx$$
$$y = 2x + kx - 8$$
$$= (2 + k)x - 8$$

$$3(x+2) = 3 + y$$
$$3x + 6 = 3 + y$$
$$3x + 3 = y$$
$$y = 3x + 3$$

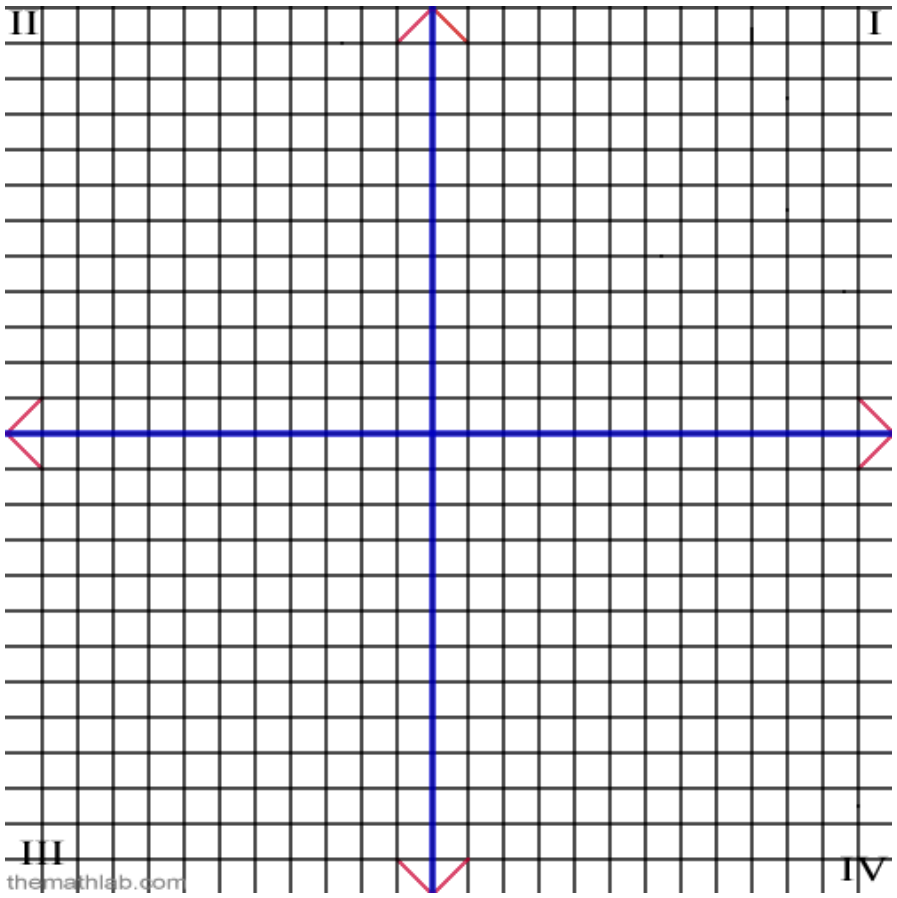
If the slopes are equal then, $2 + k = 3$

$$k = 3 - 2$$

$$k = 1$$

Example 3:

Sketch the line which has: m = 2, b = -3



Example 4:

Sketch the line which has: m = -1/2, b = 6