2.3 Lines

- Slope-Intercept

$$y = mx + b$$

m: slope, b: y-intercept

- Point-slope Form

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

m: slope, (x_1, y_1) point on the line

- General (Standard) Form

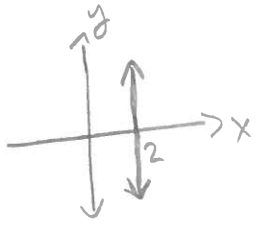
$$Ax + By + C = 0$$

A, B can not both be zero

Vertical Lines

$x = a$

$x = 2$

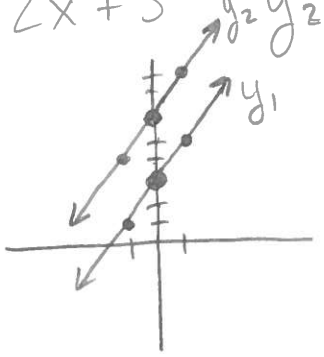


$$m = \frac{\text{rise}}{\text{run}}$$

undefined! (no run)

2.4 Varying the Coefficients, Direct Proportionality

$y_1 = 2x + 3$ y_2 $y_2 = 2x + 6$



$m = 2$

If two lines have the same slope and different y-intercepts (or different x-intercepts for vertical lines) we say the lines are parallel.

Ex: Find the equation of the line parallel to $y - 4x = 7$ containing the point $(-1, 5)$.

Sol: $y = 4x + 7$

$m = 4$

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

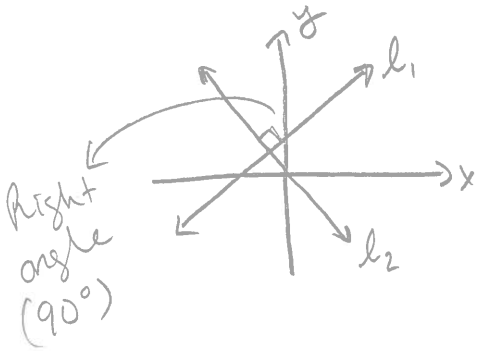
$y - 5 = 4(x - -1)$

$y - 5 = 4(x + 1)$

$y - 5 = 4x + 4$

$y = 4x + 9$

Perpendicular Lines



If l_1 has slope

$m = m_1$

then l_2 has slope

$m = -\frac{1}{m_1}$

opposite reciprocal (negative)

Ex: Given $y = 2x - 6$, find the equation of the line perpendicular containing the point $(2, 0)$.

Sol: Slope of original: $m = 2$

Slope of perpendicular: $m = -1/2$

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

$$y - 0 = -1/2\,(x - 2)$$

$$\boxed{y = -1/2\,x + 1}$$

Direct Proportionality

We say the variable y is <u>directly proportional to</u> the variable x if x and y are related by an equation of the form

$$y = kx.$$

The constant k is called the <u>constant of proportionality</u>.

Ex: A solar electric company installs solar panels on the roofs of houses. A customer is informed that when 12 solar panels are installed, they produce 2.4 kilowatts of electricity.

a) Find the eq. of proportionality relating the number of solar panels to the kilowatts of electricity produced.

$y = kx$, x = # of solar panels
y = amount of electricity.

$$2.4 = k(12)$$

$$\frac{2.4}{12} = k, \quad k = 0.2$$

$$y = 0.2x$$

$$y = 0.2x$$

b) How many kilowatts of electricity are produced by 16 solar panels?

$$y = 0.2(16) = 3.2 \text{ kilowatts}$$

c) How many solar panels are needed to produce 5 kilowatts of electricity?

$$5 = 0.2x$$

$$\frac{5}{0.2} = x$$

$$x = 5 \cdot \frac{10}{2} = 25 \text{ solar panels}$$