

1-3 ; Lines

Formulas

Slope-intercept form

$$y = mx + b$$

$m = \text{slope}$

$b = y\text{-int.}$

Slope

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

Point slope form

$$y - y_2 = m(x - x_2)$$

where, $m = \text{slope}$
and (x_2, y_2) are
a point.

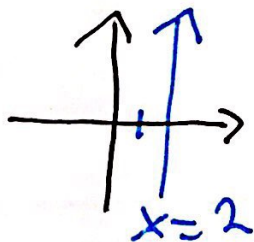
General form

$$Ax + By + C = 0$$

where $A, B,$ and C
are #'s

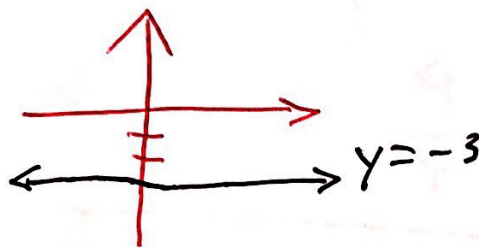
vert. lines

$$x = \#$$



Horiz. lines

$$y = \#$$



1-3

ex. 1

Find the Slope between the given points.

$$\begin{array}{l} \text{slope} \\ \downarrow \\ m \end{array} = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{-6 - 7}{5 - (-8)} = \frac{-13}{13} = \boxed{-1}$$

ex. 2

Find Slope.

$$\begin{array}{l} (-\frac{1}{3}, -2) \\ + \\ (3, +\frac{1}{4}) \end{array}$$
$$m = \frac{\frac{1}{4} - (-2)}{3 - (-\frac{1}{3})} = \frac{2\frac{1}{4}}{3\frac{1}{3}} = \frac{\frac{9}{4}}{\frac{10}{3}} = \frac{9}{4} \div \frac{10}{3}$$
$$\frac{9}{4} \cdot \frac{3}{10} = \boxed{\frac{27}{40}}$$

ex. Find the Slope and y-int. of the line

$$2x - 7y + 13 = 0$$

$$\begin{array}{r} 2x - 7y = -13 \\ -2x \quad -2x \end{array}$$

$$\frac{-7y}{-7} = \frac{-2x - 13}{-7} \Rightarrow y = \boxed{\frac{2}{7}}x + \frac{13}{7}$$

Try to write in
 $y = mx + b$ form.
(Slope/int.)

Slope \downarrow $\frac{2}{7}$ \uparrow y-int $\frac{13}{7}$

ex 1

(m)
Find the Slope Between the two Points.

$$(2, 2), (-8, 1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{1 - 2}{-8 - 2} = \frac{-1}{-10} = \boxed{\frac{1}{10}}$$

ex. Find the slope.

$$(1, -\frac{1}{2}), (-3, 4)$$

$$\frac{4 - (-\frac{1}{2})}{-3 - 1} = \frac{4 + \frac{1}{2}}{-4}$$

$$\rightarrow \frac{9}{-4} = \frac{9}{2} \div -4 = \left(\frac{9}{2}\right) \left(\frac{1}{4}\right) = \boxed{-\frac{9}{8}}$$

Find the slope and y-int of the following eq. $3x - 4y - 12 = 0$

① Solve for y so that it has form $y = mx + b$

$$\begin{aligned} 3x - 4y &= 12 & m &= \frac{3}{4} \\ -3x & \quad -3x & \text{y-int} &= -3 \\ \hline -4y &= -3x + 12 \\ \frac{-4y}{-4} &= \frac{-3x}{-4} + \frac{12}{-4} \\ \hline y &= \frac{3}{4}x - 3 \end{aligned}$$

ex. 4

A line has the equation $y = 3x + 7$

- Find Slope = 3
- Parallel Slope. (Same as eq.) = 3 = $\frac{3}{1}$
- Perpendicular Slope. $-\frac{1}{3}$
 - opp. sign and
 - flipped fraction

Q.9 ex. 5

Find eq. of a line with given conditions.

through $(-2, 5)$; slope -1

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

$$\begin{array}{r} y - 5 = -(x + 2) \\ +5 \quad +5 \\ \hline y = -(x + 2) + 5 \end{array}$$

$$y = -x - 2 + 5$$

$$\boxed{y = -x + 3}$$

find first part

b) Find \perp eq. through $(-2, 5)$

$\perp m = 1$

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

$$y - 5 = x + 2$$

$$\boxed{y = x + 7} \perp \text{eq.}$$

ex. 6

Find eq. that passes through $(1, -7)$ and is \perp to $y = -\frac{1}{2}x + 8$.

$$\perp m = 2$$

$$y - (-7) = 2(x - 1)$$

$$y + 7 = 2x - 2$$

$$\boxed{y = 2x - 9} \perp \text{eq.}$$

Find eq. of line that passes through $(-2, -6)$ $(2, -9)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - (-9)}{-2 - (2)} = \frac{-6 + 9}{-4} = \frac{3}{-4} = -\frac{3}{4}$$

$$y - (-9) = -\frac{3}{4}(x - (2))$$

$$y + 9 = -\frac{3}{4}x + \frac{6}{4} \quad (-9) \rightarrow -\frac{36}{4}$$

$$y = -\frac{3}{4}x - \frac{30}{4}$$

$$\boxed{y = -\frac{3}{4}x - \frac{15}{2}}$$

Find equation of \perp line to $y = 3x - 7$
and pass through $(-2, -3)$.

① Find $\perp m = -\frac{1}{3}$

② use Point-Slope form $(y - y_1 = m(x - x_1))$

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

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

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

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

$$y = -\frac{1}{3}x - \frac{11}{3}$$

$$-\frac{2}{3} - 3 = -\frac{2}{3} - \frac{9}{3} = -\frac{11}{3}$$

ex. 4

Things to know: Parallel lines have same slope.

(⊥) Perpendicular lines: • opp. sign

ex. $m = -7 = -\frac{7}{1}$ • flip the fraction
 $\perp m = \frac{1}{7}$

Find ⊥ slope for the eq.

$$7x + 2y + 1 = 0$$

-1 -1

$$7x + 2y = -1$$

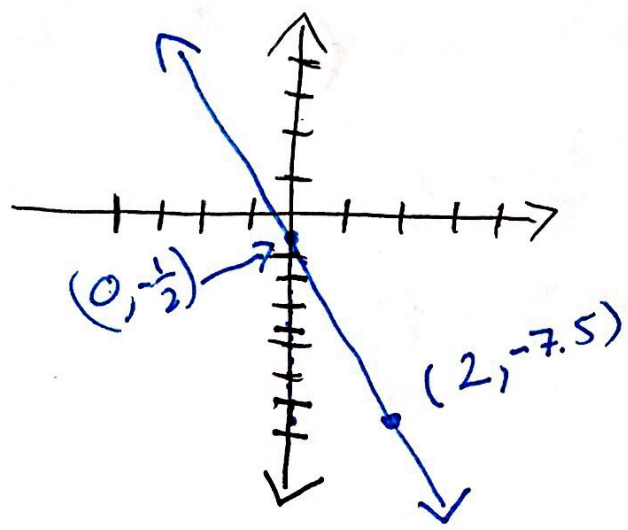
-7x -7x

$$\frac{2y}{2} = \frac{-7x}{2} - \frac{1}{2}$$

$$y = -\frac{7}{2}x - \frac{1}{2}$$

so, $\perp m = \frac{2}{7}$

Graph y-int



ex. 5

Find eq. of line that passes through

$$\begin{matrix} (2, 6) & (-3, -1) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

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

$$\frac{-1 - 6}{-3 - 2}$$

Point-Slope

$$y - 6 = \frac{7}{5}(x - 2)$$

$$\frac{-7}{-5} = \frac{7}{5}$$

$$\begin{array}{r} y - 6 = \frac{7}{5}x - \frac{14}{5} + 6 \\ +6 \end{array}$$

$$y = \frac{7}{5}x - \frac{14}{5} + \frac{30}{5}$$

$$y = \frac{7}{5}x + \frac{16}{5}$$

ex. ~~6~~

Find eq. with x -int = 7 and y -int = -2

$$m = \frac{0 - (-2)}{7 - 0} = \frac{2}{7}$$

$$y - 0 = \frac{2}{7}(x - 7)$$

$$y = \frac{2}{7}x - \frac{14}{7}$$

$$y = \frac{2}{7}x - 2$$