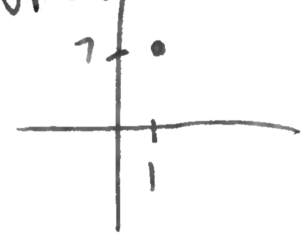
point-slope ~ given $P=(x_0,y_0)$ $\longrightarrow$ $\boxed{y-y_0=m(x-x_0)}$
slope m

slope-intercept ~ given y-int $(0,b)$ $\longrightarrow$ $y=mx+b$
slope m

Ex: Eqt of line w/ slope 3 going thru $(1,7)$ can be written in form $y=mx+b$, where



1906

$m=$ 3

$b=$ 4

Soln: Here, we are given $P=(1,7)$ and $m=3$.
$x_0=1$, $y_0=7$
We must use point-slope form!

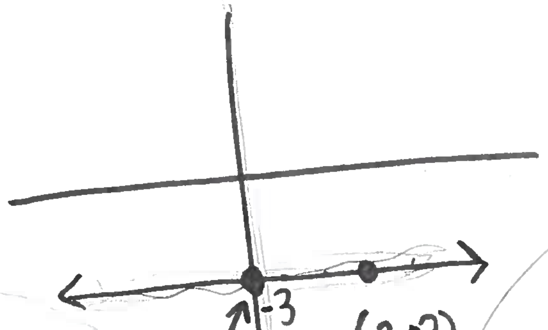
$$y-7=3(x-1)$$

dep variable — indep var

$$y-7=3x-3 \xrightarrow{\text{add } 7} y=3x-3+7$$
$$=3x+4$$

violating the form we want

Ex: Find eqt for the line



Know

line is horizontal

know horizontal lines have ZERO slope

$y = 0x - 3$

$\boxed{y = -3}$

x22

x_0 y_0

Line between points $(0,-3)$ and $(2,-3)$

$$m = \frac{-3-(-3)}{2-0} = \frac{-3+3}{2} = \frac{0}{2} = 0$$

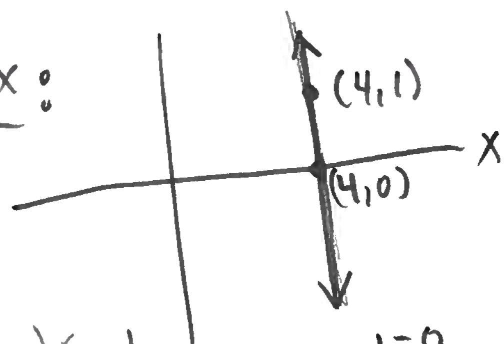
Use point-slope form to get

$y - (-3) = 0(x - 0)$

$y + 3 = 0$

$y = -3$

Ex:



$y = \cancel{m}x + b$

$$\text{slope} = \frac{1-0}{4-4} = \cancel{\frac{1}{0}}$$

UH OH!

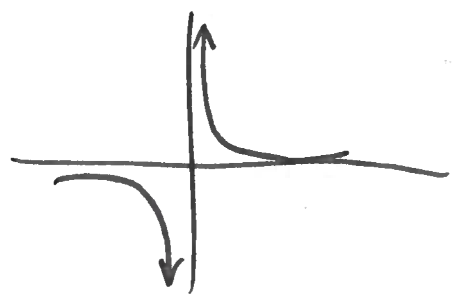
$\boxed{x = 4}$ ← this eqt does not "care" about y

y=6

Equations are restrictions!

Ex: $f(x) = \frac{1}{x}$

$f(0) = \frac{1}{0}$ ← bad



Ex: Find eqt of line that fits the data in the table

inputs x-values	outputs y-values
-2	-10
-1	-7
0	-4
1	-1
2	2

→ (-2, -10)

→ (-1, -7)

etc

Find eqt of line containing $(-2, -10)$ and $(-1, -7)$. $y_0 = -10$, $x_0 = -2$

Slope: $m = \frac{-10-(-7)}{-2-(-1)}$

$= \frac{-10+7}{-2+1} = \frac{-3}{-1} = 3$

$y-(-10) = 3(x-(-2))$

$y+10 = 3x+6$

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

Solve linear equation

A solution to an equation is a choice of (a value(s)) all variables in the equation. with property that using these values makes the eqt TRUE.

$$2x+3=1$$

Take $x=5$

$2(5)+3=1$

false

$\Downarrow$

$x=5$ NOT a solution

Take $x=-1$

$\underbrace{2(-1)+3}_{-2+3}=1$

TRUE

$$2x+3=1$$

$\downarrow$ subtr 3

$$2x=-2$$

$\downarrow$ div by 2

$$\boxed{x=-1}$$

5

Ex: $\dfrac{2x+1}{3} + \dfrac{x-1}{5} = \dfrac{x}{2}$

$\boxed{3 \cdot 5 \cdot 2 = 30}$ common denominator

$\dfrac{10}{10} = 1$

multiply out the denoms $3\left(\dfrac{x-1}{5}\right)$

$\dfrac{2x+1}{3} = \left(\dfrac{2x+1}{3}\right)(1)$

$= \left(\dfrac{2x+1}{3}\right)\left(\dfrac{10}{10}\right) = \dfrac{20x+10}{30}$

$3x = 30$

$\boxed{x = 10}$

$\dfrac{20x+10}{30} + \dfrac{6x-6}{30} = \dfrac{15x}{30}$

B/c common denom + subtr 15x

$\dfrac{20x+10+6x-6-15x}{30} = 0$

$\dfrac{11x+4}{30} = 0$

$\downarrow$ mult by 30

$11x + 4 = 0 \xrightarrow{\text{sub } 4} 11x = -4$

$\downarrow$ div by 11

$x = -\dfrac{4}{11}$

mult by 3

$3\left(\dfrac{2x+1}{3} + \dfrac{x-1}{5}\right) = 3\left(\dfrac{x}{2}\right)$

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

$\downarrow$ mult by 5

$10x + 5 + 3x - 3 = \dfrac{15x}{2}$

$\downarrow$ mult by 2

$20x + 10 + 6x - 6 = 15x$

$\downarrow$ subtr 15x, simp.

$11x + 4 = 0$

Ex: $2W = \frac{5}{6}\Delta t - 10z$

Solve for t.

Soln: Add $10z$

$$2W + 10z = \frac{5}{6}\Delta t$$

Mult by 6

$$12W + 60z = 5\Delta t$$

Div by 5Δ

$$\frac{12W + 60z}{5\Delta} = t$$

Now: Can solve linear eqt in 1 variable

Next wk: systems of linear eqt in 2 & 3 vars

$$\begin{cases} a + b = 4 \\ 2a - b = 7 \end{cases}$$