S 3.1 #s 13-33 (Do #s 1-12 if needed)

S 3.2 #s 1-17, 21, 29, 30

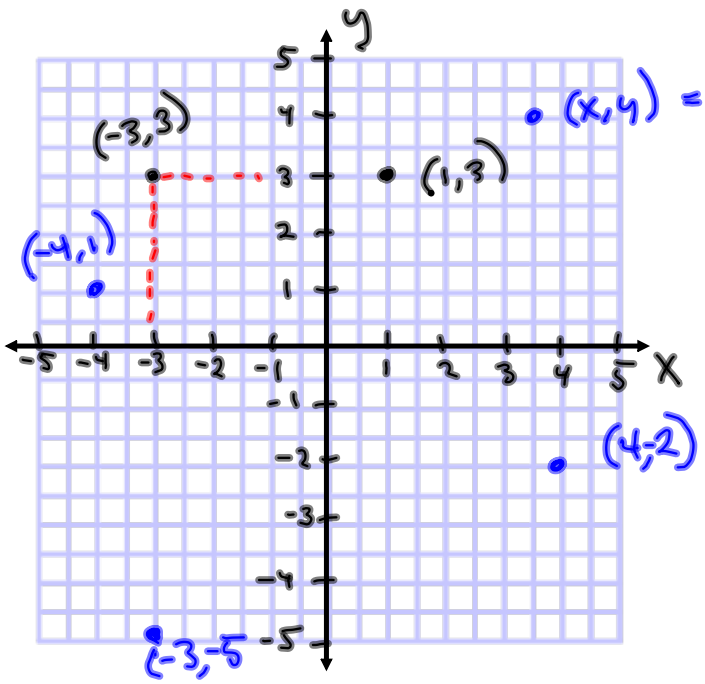
S 3.3 #s 1-11, 13-17, 19-41

↳ ALSO give the x-intercept

Coordinate axes

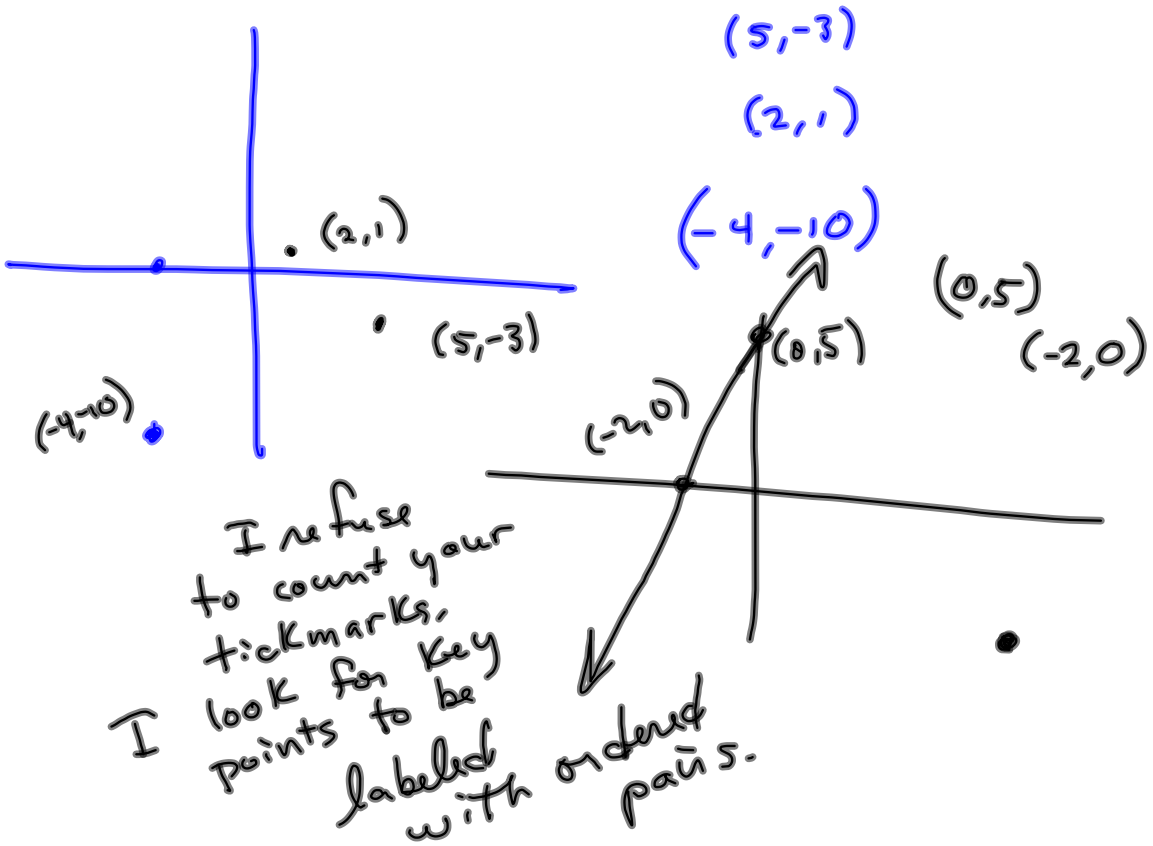
Today:

Lines



(x,y) = coordinates of a point.

* before y

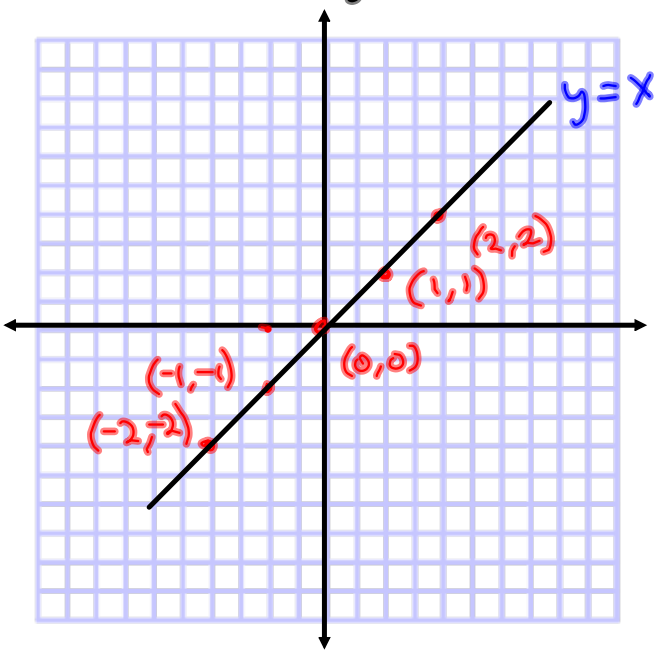

(5,-3)
(2,1)
(-4,-10)
(0,5)
(-2,0)
(2,1)
(5,-3)
(-4,-10)
(0,5)
(-2,0)
I refuse to count your tickmarks. I look for key points to be labeled with ordered pairs.

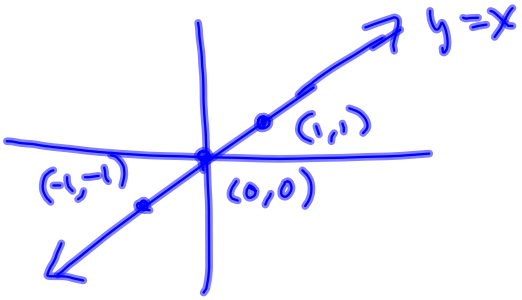
graphs Basic

$y = x$

x	y
-2	-2
-1	-1
0	0
1	1
2	2

$y = x^2$

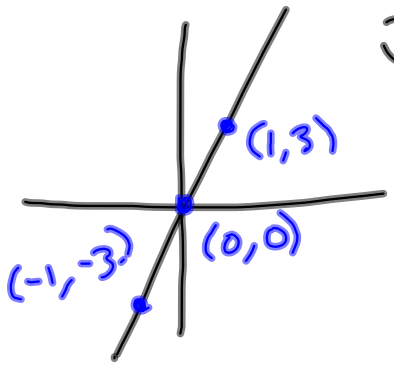




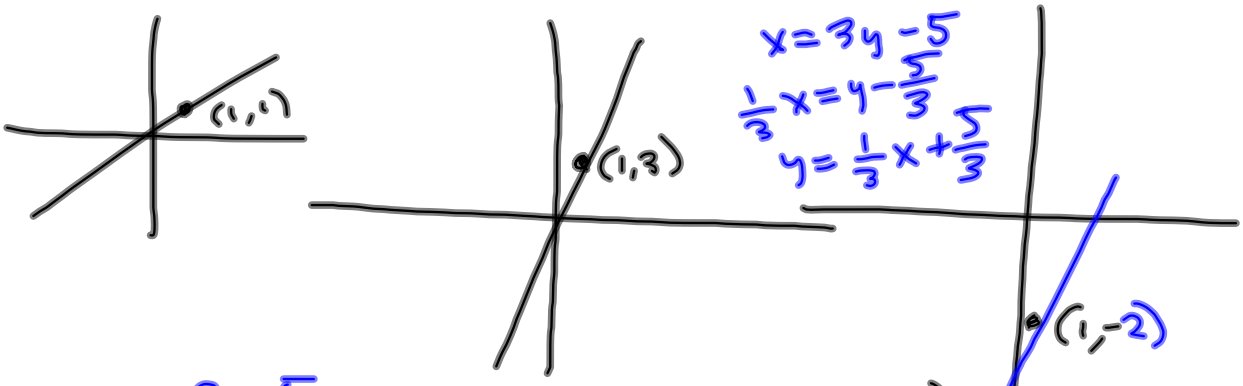
$y = 3x$

these y-values are 3 times the y-values for $y = x$?
Joseph says, it's steeper.

Boot-strap to $y = 3x$ from $y = x$



What about $y = 3x - 5$?



$x = 3y - 5$

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

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

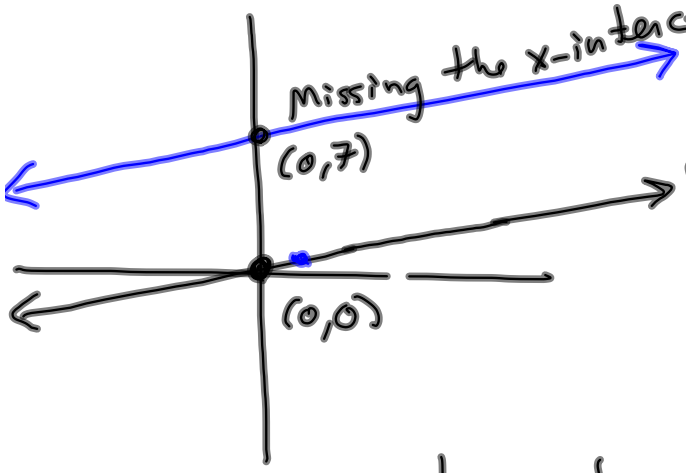
$y = 3x - 5$

$(x,y) \longrightarrow (x,3y) \longrightarrow (x, 3y-5)$

$y = x \qquad y = 3x \qquad y = 3x - 5$

$(1,1) \longrightarrow (1,3) \longrightarrow (x, 3y-5)$

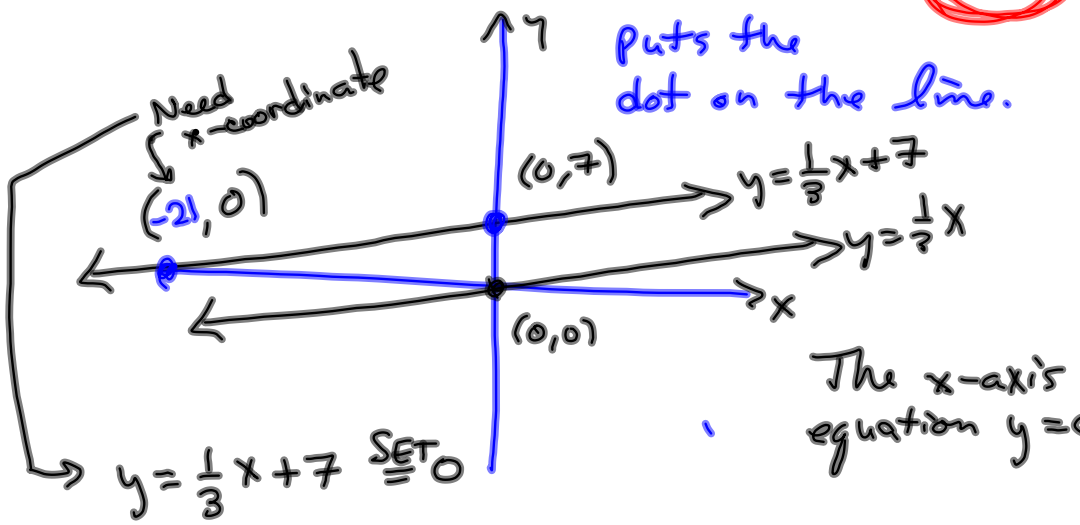
3 times original y-value minus 5 to to get to $y = 3x - 5$ from $y = x$



$m = \text{slope} = \frac{1}{3} = \frac{\text{up } 1}{\text{Right } 3}$

your teacher MAINLY wants x- and y-intercepts.

Put $y=\frac{1}{3}x+7$ on same set of axes.



The x-axis has equation $y=0$.

$y=\frac{1}{3}x+7$ SET 0

$\frac{1}{3}x = -7$

$x = -7 \cdot 3 = -21 \rightsquigarrow (-21, 0)$

$y = 5x - 2$

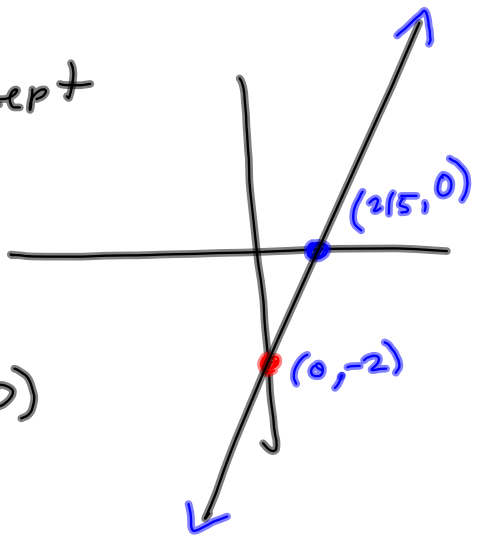
has $(0,-2)$ as y-intercept

x-int:

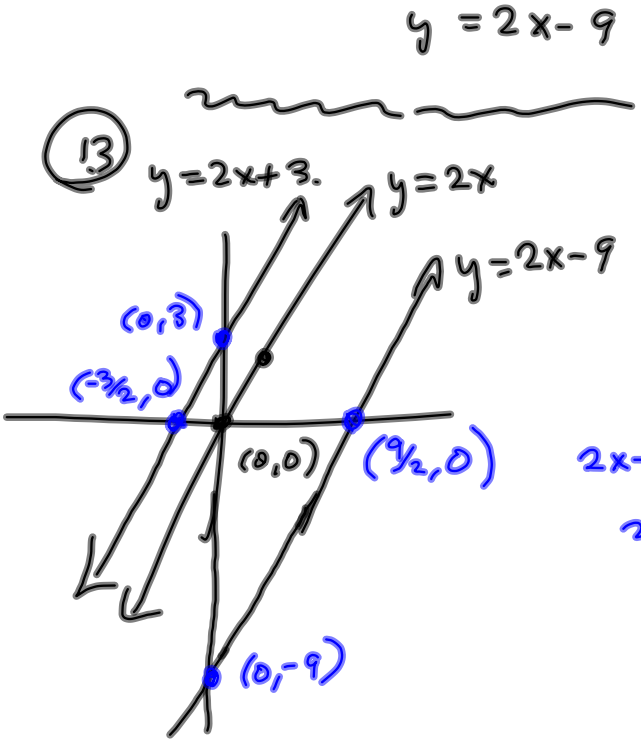
$y = 5x - 2 = 0$

$5x = 2$

$x = \frac{2}{5} \rightsquigarrow (2/5, 0)$



13.



$2x+3=0$

$2x=-3$

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

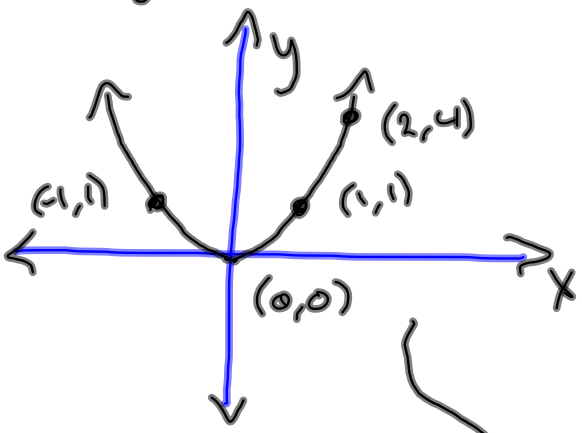
$\rightsquigarrow (-3/2, 0)$

$2x-9=0$

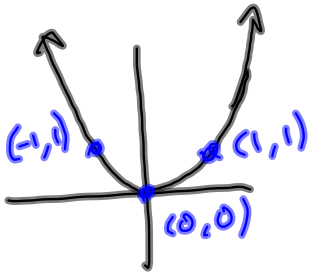
$2x=9$

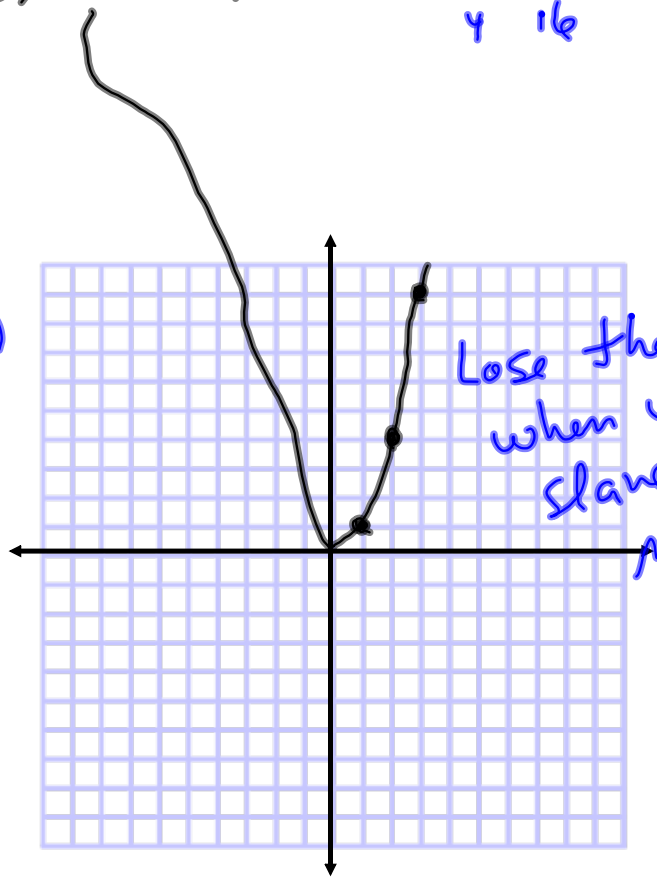
$x=\frac{9}{2}$

$y = x^2$ parabola



x	$y = x^2$
-1	1
0	0
1	1
2	4
3	9
4	16





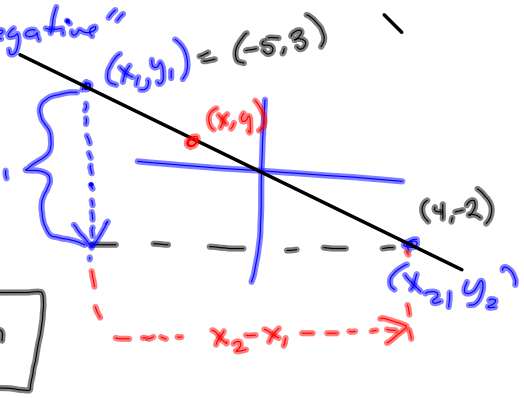
Lose the essence when you're a slave to tick-marks.

Equations of a Line 3.2 / 3.3

via slope.

"Always run right"

"Rise up is positive
Rise down is negative"



m = slope

$$= \frac{\text{Rise}}{\text{Run}} = \boxed{\frac{y_2 - y_1}{x_2 - x_1} = m}$$

$$= \frac{\Delta y}{\Delta x} = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{-2-3}{4-(-5)} = \boxed{\frac{-5}{9} = m}$$

Let (x, y) be another point on the line, then it has same slope to any other point on that line, say, to (x_1, y_1)

Then $\frac{y - y_1}{x - x_1} = m$ Solve for y.

$$\frac{y - y_1}{x - x_1} = \frac{m}{1} \cdot \frac{x - x_1}{x - x_1}$$

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

$y = m(x - x_1) + y_1$ My version of point-slope form

§3.3 # 24 Find an equation of the line thru $(-1, -5)$; $m = 2$
(x_1, y_1)

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

Point-Slope: $\boxed{y = 2(x - (-1)) + (-5)}$ is all I need, unless I specifically ask for a particular form.

Book asks for slope-intercept form

$y = mx + b$

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

$= 2x + 2 - 5$

Slope-Intercept $\boxed{y = 2x - 3}$

... Standard form

$Ax + By = C$ where $A, B, C \in \mathbb{Z}$ (Integers.)

Standard Form $\boxed{-2x + y = -3}$

$2x - y = 3$

(28) $(-\frac{2}{3}, 5)$, $m = -3$

(x_1, y_1)

ALL 3 forms

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

$y = -3(x + \frac{2}{3}) + 5$ P.S.

Last question "an equation" Stop right there

$= -3x - 2 + 5$

$y = mx + b$

$y = -3x + 3$ S.I.

$Ax + By = C$

$3x + y = 3$ Standard

$(-3)(\frac{2}{3}) = -2$

Find Point-Slope, slope-intercept, standard form of the line thru ...

... $(-2,5)$, $(7,7)$

(x_1,y_1) (x_2,y_2)

$m = \frac{y_2-y_1}{x_2-x_1} = \frac{7-5}{7+2} = \frac{2}{9}$

Class hates me.

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

$y = \frac{2}{9}(x+2)+5$ P-S.

$= \frac{2}{9}x + \frac{4}{9} + \frac{45}{9}$

$\left(y = \frac{2}{9}x + \frac{49}{9}\right)(9)$

$9y = 2x + 49$ S-I.

$-2x+9y = 49$ Stdd.

$\frac{5}{1} \cdot \frac{9}{9}$

$\frac{2}{9x}$

$\frac{2}{9} \cdot \frac{2}{1}$

Same for $(2,-7)$ & $(2,5)$

Slope is undefined

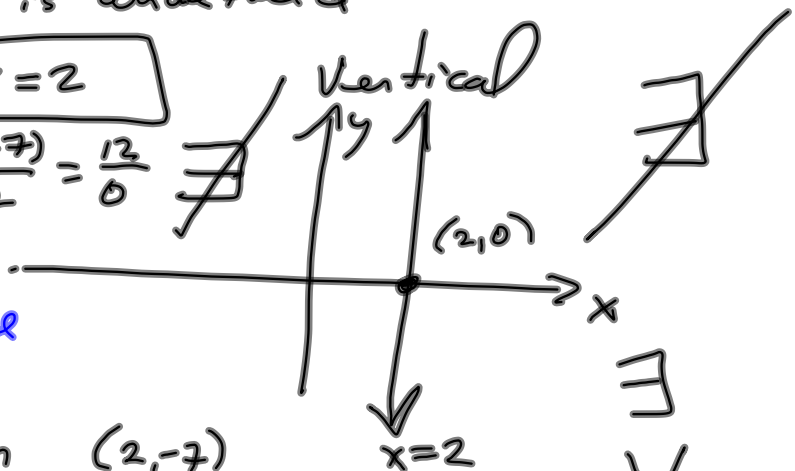
$x = 2$

Vertical

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-(-7)}{2-2} = \frac{12}{0}$

No Slope sucks as a phrase

Undefined



Same for $(2,-7)$ & $(5,-7)$

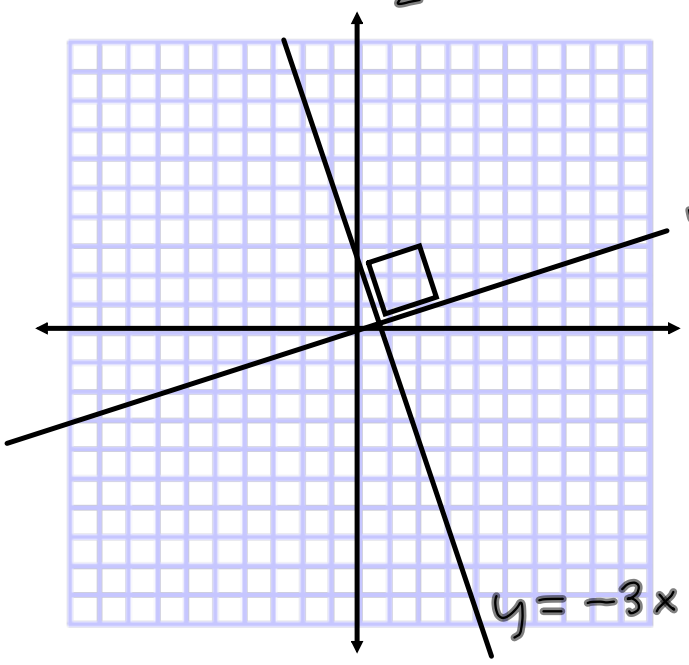
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-(-7)}{5-2}$

$= \frac{0}{3} = 0$

Zero Slope

$m_1 = m_2 \iff$ Lines are parallel

$m_1 = -\frac{1}{m_2} \iff$ Lines are perpendicular.



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

$m_1 = \frac{1}{3} \Rightarrow$

perpendicular line has slope

$m_2 = -\frac{1}{\frac{1}{3}} = -\frac{1}{m_1}$

$= -1 \cdot \frac{3}{1} = -3 = m_2$

Slope of a line parallel to

$3x - 7y = 15$

$y = mx + b$

$-7y = -3x + 15$

$y = \frac{-3x + 15}{-7} = \frac{-3x}{-7} + \frac{15}{-7}$

$y = \frac{3}{7}x - \frac{15}{7}$

$m = \frac{3}{7}$

$Ax + By = C$

$m = -\frac{A}{B}$

If you're crazy & like to memorize junk.

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

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

$$y = mx + b$$

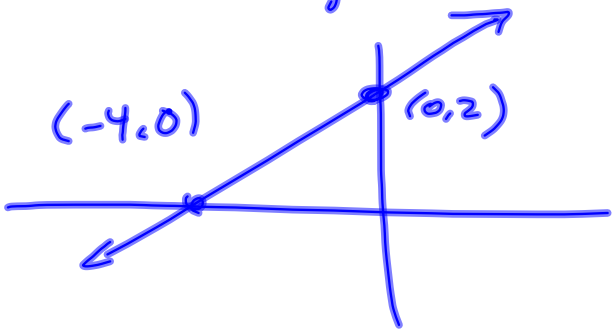
$$Ax + By = C$$

Graphs

Essence over ~~tick marks~~

x-intercepts: $y = 0$

y-intercepts: $x = 0$



$y = 3(x-2)^2 + 11$

$x^2 \longrightarrow 3x^2 \longrightarrow 3(x-2)^2$

$\longrightarrow 3(x-2)^2 + 11$