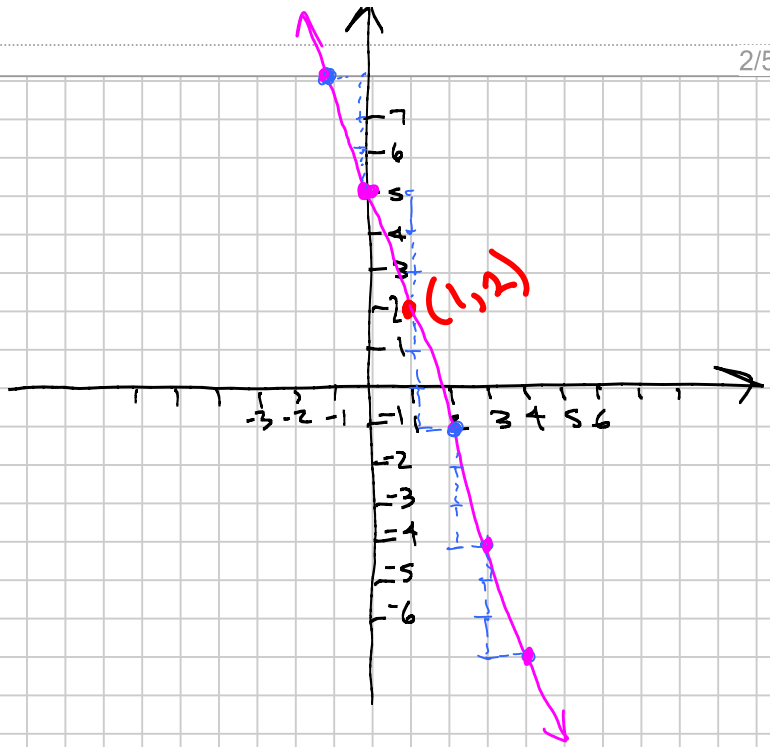
From RR 19

(b) starting point: $(1,2)$

Slope: $m = -3 = -\frac{3}{1}$

rise = vertical change = 3

run = horizontal change = 1



3.4: Slope-Intercept Form of a Linear Equation

Standard Form of a Line: $Ax + By = C$, where A and B are not both zero.

Ex: $2x - 3y = -5$ is in standard form.

Slope-intercept Form of a Line: $y = mx + b$, where m is the slope and $(0, b)$ is the y-intercept.
(some say the y-intercept is just b)

Note: To find the y-intercept, we set $x = 0$:

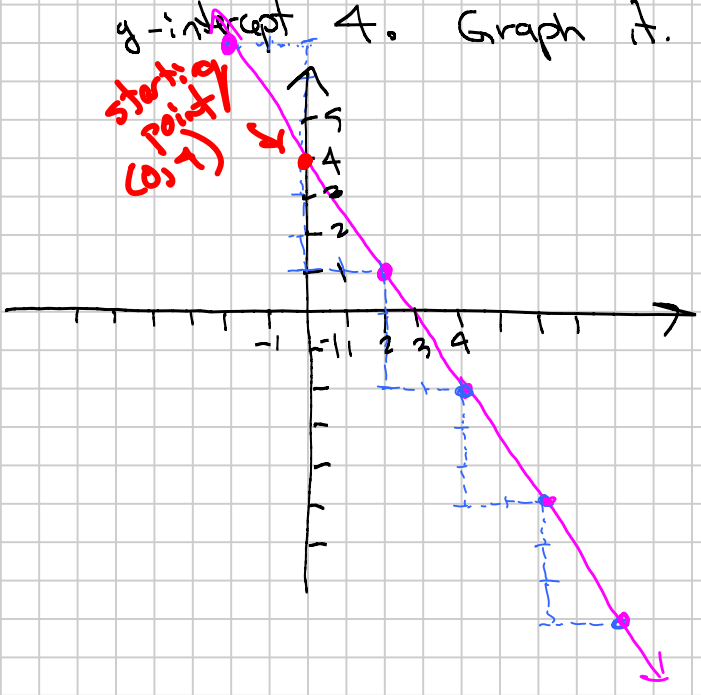
$y = mx + b$

$x = 0$ $\quad y = m(0) + b$

$y = 0 + b$

$y = b$ $\Rightarrow$ ordered pair $(0, b)$

Ex: Write the equation of the line with slope $-\frac{3}{2}$ and y-intercept 4. Graph it.



Slope: $m = -\frac{3}{2}$

rise: 3
run: 2

write the eqn:

$y = mx + b$ with $m = -\frac{3}{2}$, $b = 4$

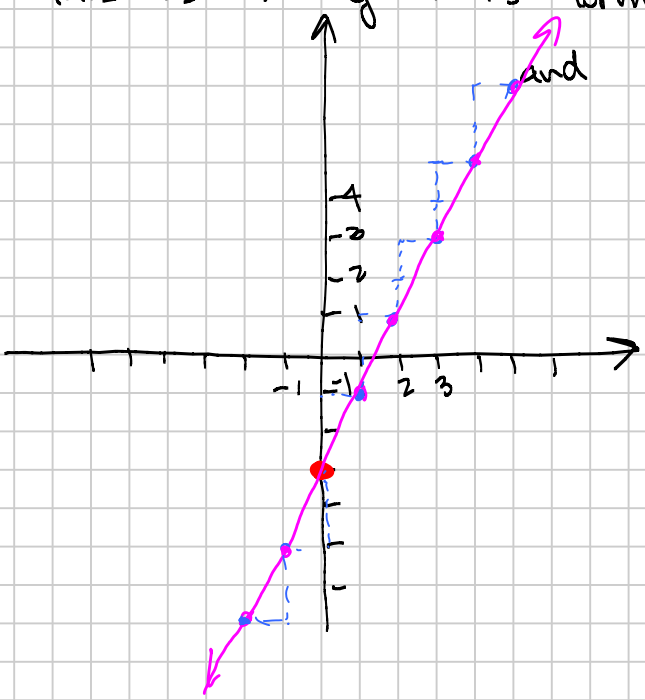
So y-intercept is $(0, 4)$

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

Ex: Graph the line $y = 2x - 3$.

This is in $y = mx + b$ form, so $m = 2 = +\frac{2}{1}$ and $b = -3$

so y-intercept $(0, -3)$



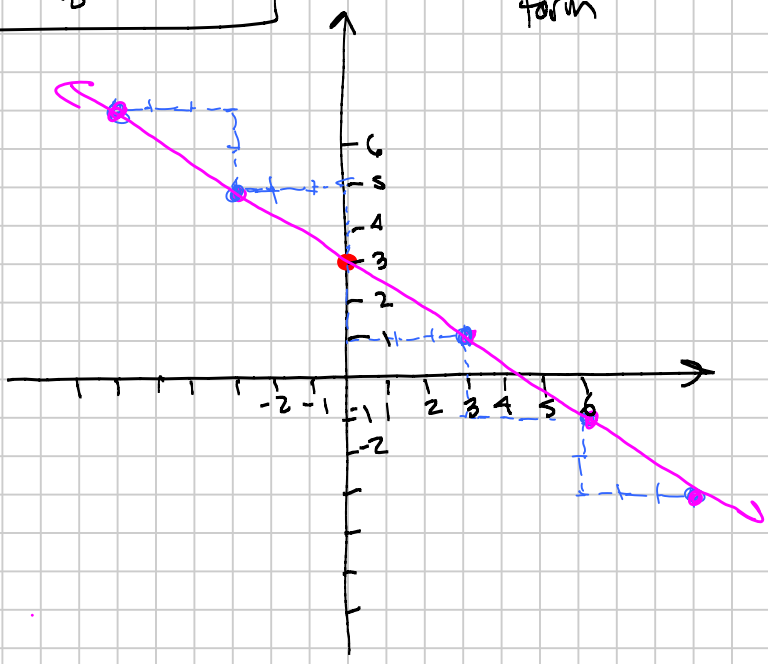
Ex: Graph the line $2x + 3y = 9$ by writing in slope-intercept form.

Aiming for $y = mx + b$.

$$2x + 3y = 9$$
$$-2x \quad -2x$$
$$3y = -2x + 9$$
$$\frac{3y}{3} = \frac{-2x}{3} + \frac{9}{3}$$
$$\boxed{y = -\frac{2}{3}x + 3}$$ ← slope-intercept form

Slope: $m = -\frac{2}{3}$ (rise: 2, run: 3)

y-intercept: $b = 3$, so $(0, 3)$



3.4.3

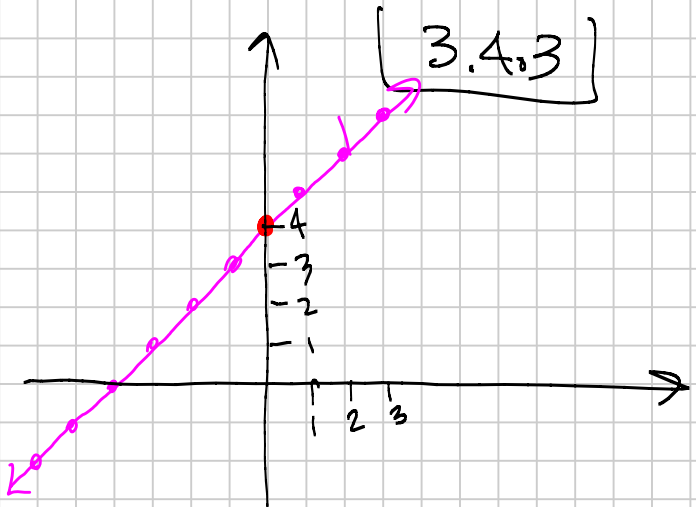
Ex: Graph the line.

$$x - y = -4$$
$$-y = -x - 4$$
$$\frac{-y}{-1} = \frac{-x}{-1} - \frac{4}{-1}$$
$$\boxed{y = x + 4}$$

$y = 1x + 4$

$m = 1 = +\frac{1}{1}$ ↗

$b = 4 \Rightarrow$ y-intercept is $(0, 4)$

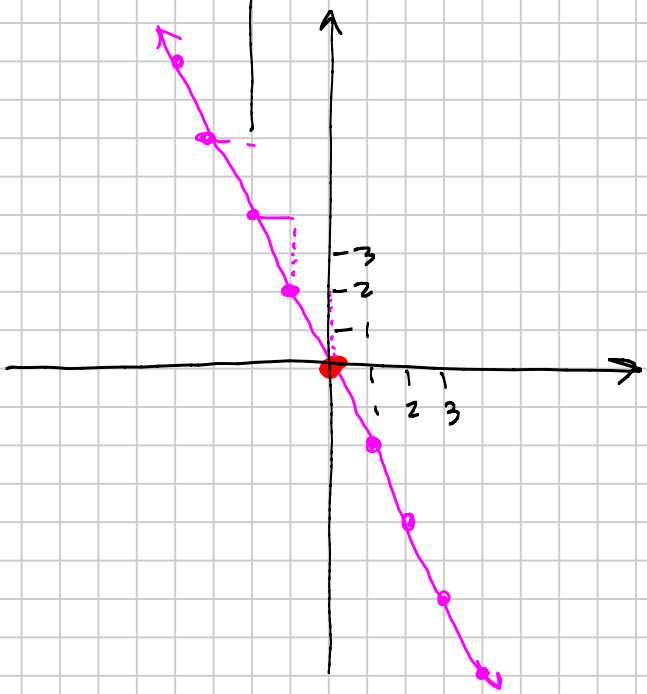


Ex: Graph the line

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

slope: $m = -2 = -\frac{2}{1}$ ↘

y-intercept: $b = 0$, so $(0, 0)$



Ex: Are the following pairs of lines parallel, perpendicular, or neither?

a) $y = 2x + 5$, $y = 2x - 7$

b) $y = -\frac{3}{4}x + 4$, $y = \frac{3}{4}x$

c) $y = -3x + \frac{1}{7}$, $y = \frac{1}{3}x - \frac{2}{7}$

Recall: * If 2 lines are parallel, their slopes are equal.

* If 2 lines are perpendicular, their slopes are opposite reciprocals.

a) They are **parallel** $(m_1 = 2, m_2 = 2)$ (slopes are equal)

b) They are **neither** parallel nor perpendicular $(m_1 = -\frac{3}{4}, m_2 = \frac{3}{4}$ these are opposites, not reciprocal).

c) They are **perpendicular** $(m_1 = -3 = -\frac{3}{1}, m_2 = +\frac{1}{3}$, so opposite reciprocal)

4.1: Solving Linear Systems of Equations using graphing (4.1.1)

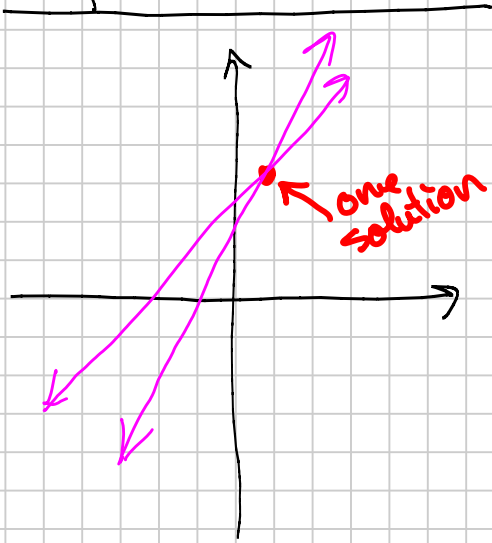
System of equations: group of equations

Solution to a system (of equations): A set of values for the variables that makes all the equations true.

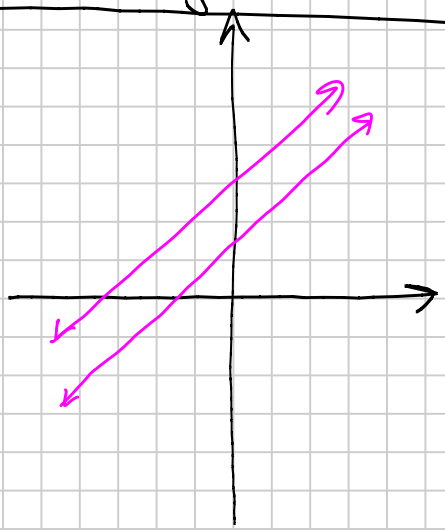
For us: we will work with systems of 2 linear equations in 2 variables (typically x and y)

Ex: $\begin{cases} 2x-5y=4 \\ x+6y=8 \end{cases}$ ← graphs of these are lines

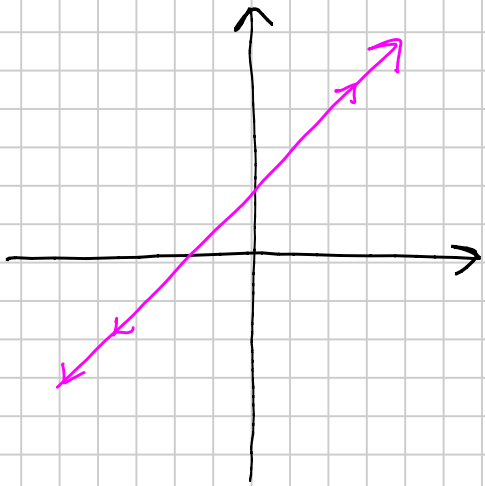
3 possible situations for a system of 2 linear eqns in 2 variables



Independent System
one solution
(lines intersect at a single point)



Inconsistent System
no solution
(lines are parallel)



Dependent System
Infinitely many solutions
(both equations represent the same line)

To solve a system by graphing, graph both lines & estimate the solution from the graph.

Ex: Is the ordered pair $(9, -2)$ a solution of the system?

$$\begin{cases} 2x + 5y = 8 \\ 3x - 2y = 23 \end{cases}$$

Put $x = 9$, $y = -2$ into $2x + 5y = 8$

$2(9) + 5(-2) = 8$

$18 - 10 = 8$

$8 = 8$ ✓ True!

Put $x = 9$, $y = -2$ into $3x - 2y = 23$

$3(9) - 2(-2) = 23$

$27 + 4 = 23$

$31 = 23$ False!

No, $(9, -2)$ is not a solution to the system.

Question on Test #4

For an inconsistent system, or an independent system, or a dependent system:

1) State the number of solutions
2) Describe the graph in words (lines are parallel, lines intersect at 1 point, lines are the same)
3) Illustrate with an example graph