Math 115

Spring 2019

Lecture 14

$? \; a^2 + b^2 = c^2 \; ?$

$y = mx + b \quad ? \quad d = rt$

Some review:

① Is $(-2, -4)$ a solution of $\begin{cases} 2x - 3y = 8 \\ x - 2y = 6 \end{cases}$?

Checking $2x - 3y = 8$

$2(-2) - 3(-4) = 8$

$-4 + 12 = 8$

$8 = 8$ ✓

Checking $x - 2y = 6$

$-2 - 2(-4) = 6$

$-2 + 8 = 6$

$6 = 6$ ✓

Yes $(-2, -4)$ is a solution.

② Is $(2,4)$ a Solution of $\begin{cases} x+y=6 \\ 3x+2y=21 \end{cases}$? ✓ X

Check $x+y=6$

$2+4=6$

$6=6$ ✓

Check $3x+2y=21$

$3(2)+2(4)=21$

$6+8=21$

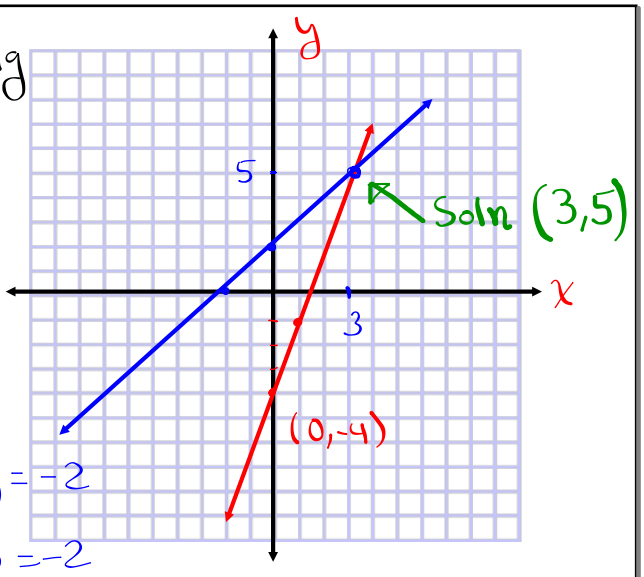
$14=21$ False

So $(2,4)$ is Not the Solution.

Solve by graphing

$\begin{cases} y=3x-4 \\ x-y=-2 \end{cases}$ ✓ ✓

x	y
0	2
-2	0



$y=3x-4$

$5=3(3)-4$

$5=9-4$

$5=5$ ✓

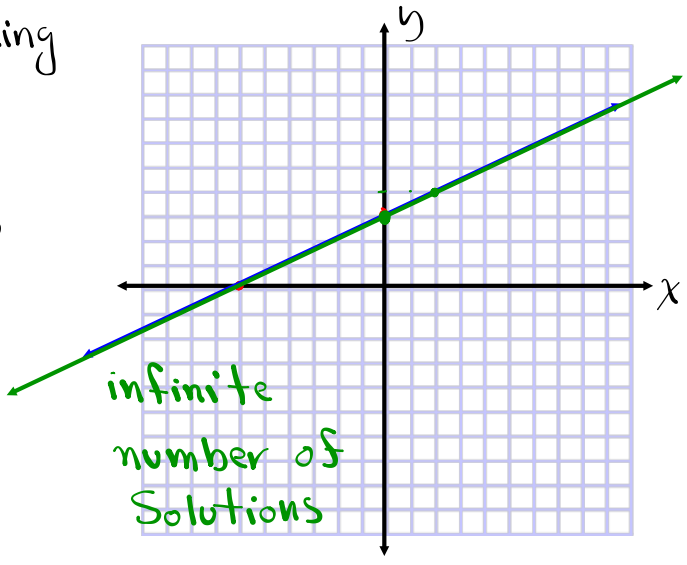
$x-y=-2$

$3-5=-2$

$-2=-2$

Solve by graphing

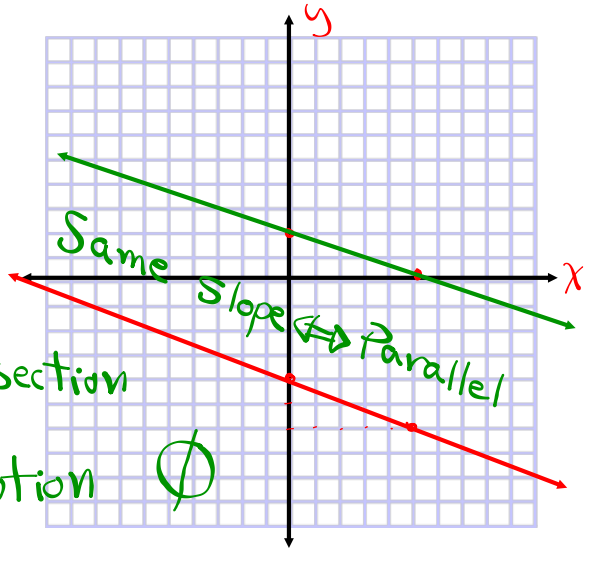
$$\begin{cases} x - 2y = -6 \\ y = \frac{1}{2}x + 3 \end{cases}$$



infinite number of Solutions

Solve by graphing:

$$\begin{cases} 2x + 5y = 10 \\ y = -\frac{2}{5}x - 4 \end{cases}$$



No intersection

No Solution $\emptyset$

Solve by Substitution

$$\begin{cases} x + y = 6 \\ y = -4x \end{cases}$$

$x + -4x = 6$

$-3x = 6$

$\boxed{x = -2}$

$y = -4(-2)$

$\boxed{y = 8}$ ⟹ Final Ans $(-2, 8)$

Solve by Subs.

$$\begin{cases} 4x - 3y = 10 \\ y - x = -5 \end{cases}$$

Hint: Isolate one Variable.

$y = x - 5$

$4x - 3(x - 5) = 10$

$4x - 3x + 15 = 10$

$\boxed{x = -5}$

$y = -5 - 5$

$\boxed{y = -10}$

Final Ans

$(-5, -10)$

Solve by Subs.

$$\begin{cases} x - 2y = -2 \\ 6x - 12y = 10 \end{cases}$$

$x - 2y = -2 \Rightarrow x = 2y - 2$

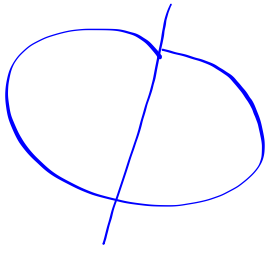
Hint: Isolate one Variable

$6(2y - 2) - 12y = 10$

$12y - 12 - 12y = 10$

$-12 = 10$

False



Solve by Subs.

$$\begin{cases} y - 8x = 4 \\ \frac{1}{4}y - 2x = 1 \end{cases}$$

$y - 8x = 4 \Rightarrow y = 8x + 4$

$\frac{1}{4}(8x + 4) - 2x = 1$

$\frac{1}{4} \cdot 8x + \frac{1}{4} \cdot 4 - 2x = 1$

$2x + 1 - 2x = 1$

$1 = 1$ True

infinite number of solutions

Solve by addition/elimination method:

$$\begin{cases} 3x + y = 5 \\ 6x - y = 13 \end{cases}$$

$$9x = 18$$

$x = 2$

$3x + y = 5$

$3(2) + y = 5$

$6 + y = 5$

$y = -1$

Final Ans: $(2, -1)$

Solve by addition/elimination method:

$$3\begin{cases} 4x + y = -13 \\ 6x - 3y = -15 \end{cases} \Rightarrow \begin{cases} 12x + 3y = -39 \\ 6x - 3y = -15 \end{cases}$$

$$18x = -54$$

$x = -3$

$4x + y = -13$

$4(-3) + y = -13$

$-12 + y = -13$

$y = -1$

Final Ans $(-3, -1)$

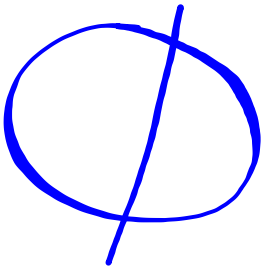
Solve by addition/elimination method:

$$\begin{cases} 3x + y = 4 \\ 9x + 3y = 6 \end{cases} \quad -3$$

$$\Rightarrow \begin{cases} -9x - 3y = -12 \\ 9x + 3y = 6 \end{cases}$$

$$0 = -6$$

False



Solve by addition/elimination method:

$$\begin{cases} 2x + y = 6 \\ 4x + 2y = 12 \end{cases} \quad -2$$

$$\Rightarrow \begin{cases} -4x - 2y = -12 \\ 4x + 2y = 12 \end{cases}$$

$$0 = 0$$

True

infinite
Number of Solutions

Solve by addition/elimination method:

$$\begin{cases} 5x + 6y = -2 \\ 3x - 5y = -27 \end{cases} \quad (\times 5,\ \times 6)$$

$$\Rightarrow \begin{cases} 25x + 30y = -10 \\ 18x - 30y = -162 \end{cases}$$

$43x = -172$

$x = \frac{-172}{43}$

$x = -4$

$5x + 6y = -2$

$5(-4) + 6y = -2$

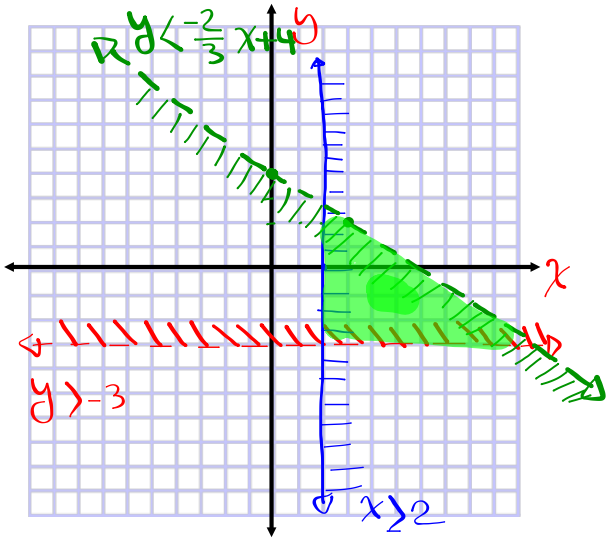
$6y = 18$

$y = 3$

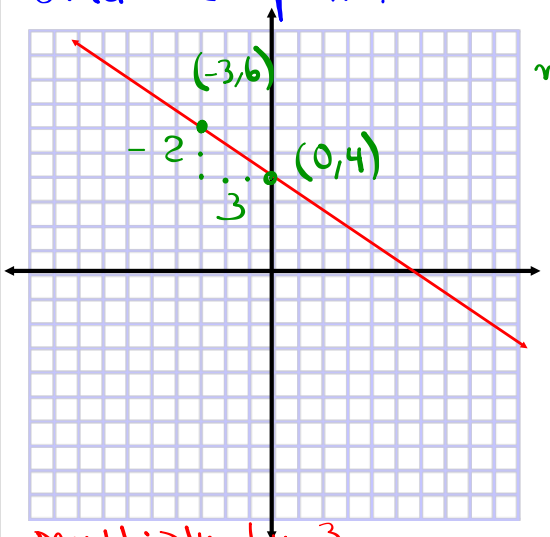
Final Ans $(-4, 3)$

Graph & shade

$$\begin{cases} y > -3 \\ x \geq 2 \\ y < \frac{-2}{3}x + 4 \end{cases}$$



Find the equation of the line given below:



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

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

$y - 4 = \frac{-2}{3}(x - 0)$

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

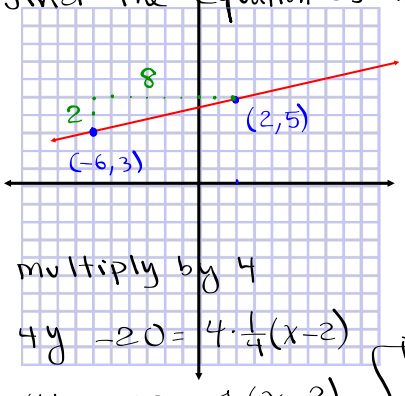
$\boxed{y = \frac{-2}{3}x + 4}$ Slope-Int form $y = mx + b$

Multiply by 3

$3y = -2x + 12$

$\boxed{2x + 3y = 12}$ Standard form $Ax + By = C$ No fraction $A > 0$

Find the equation of the line given below:



$m = \frac{2}{8}$ $m = \frac{1}{4}$

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

$y - 5 = \frac{1}{4}(x - 2)$ Point-Slope

Multiply by 4

$4y - 20 = 4 \cdot \frac{1}{4}(x - 2)$

$4y - 20 = 1(x - 2)$

$4y - 20 = x - 2$

$4y = x - 2 + 20$

$4y = x + 18$

$y = \frac{x}{4} + \frac{18}{4}$

$\boxed{y = \frac{1}{4}x + \frac{9}{2}}$ Slope-Int form

$-x + 4y = 18$

Multiply by -1

$\boxed{x - 4y = -18}$ Standard form.

Find equation of a line that contains $(0,3)$ and $(2,6)$.

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

$$m = \frac{3-6}{0-2} = \frac{-3}{-2} = \frac{3}{2}$$

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

$$y - 3 = \frac{3}{2}(x - 0)$$

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

$$\boxed{y = \frac{3}{2}x + 3}$$

Slope - Int.

$$2y = 3x + 6$$

$$-3x + 2y = 6$$

$$\boxed{3x - 2y = -6}$$ Standard form.

Find eqn of a line that contains $(-3,5)$ and $(3,0)$.

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{5-0}{-3-3}$$

$$\boxed{m = \frac{-5}{6}}$$

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

$$y - 0 = \frac{-5}{6}(x - 3)$$

$$\boxed{y = \frac{-5}{6}x + \frac{5}{2}}$$

Slope - Int

Multiply by 6

$$6y = -5x + 15$$

$$\boxed{5x + 6y = 15}$$ Standard form

Find equation of a line that contains $(-2,5)$ and is Parallel to $y=\frac{1}{2}x-5$.

Graph both lines.

Same slope

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

$y-5=\frac{1}{2}(x-(-2))$

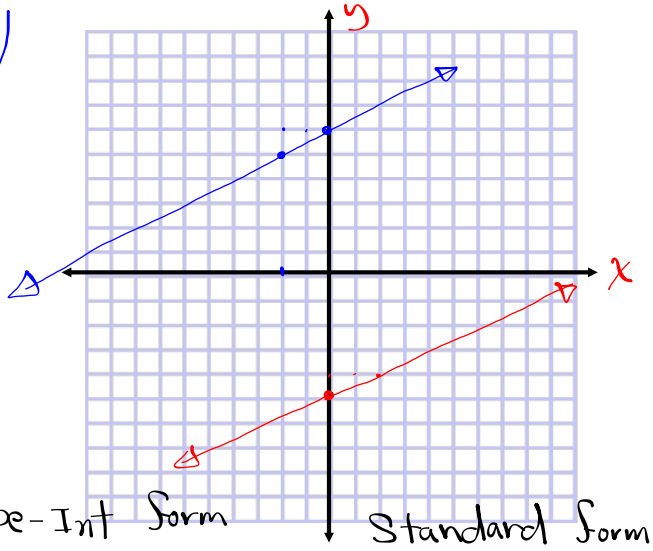
$y-5=\frac{1}{2}x+1$

$\boxed{y=\frac{1}{2}x+6}$ Slope-Int Form

$2y=x+12$

$-x+2y=12$

$\boxed{x-2y=-12}$ Standard Form



Find equation of a line that contains $(6,3)$ and is perpendicular to $y=\frac{-3}{4}x-1$. $m=\frac{-3}{4}$

Graph both lines.

Slope – Reciprocal

$-\left(\frac{-4}{3}\right)=\frac{4}{3}$

Product of slopes is -1.

$\frac{-3}{4}\cdot\frac{4}{3}=\frac{-12}{12}=-1$ ✓

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

$y-3=\frac{4}{3}(x-6)$

$y-3=\frac{4}{3}x-\frac{4}{3}\cdot 6^{2}$

$y-3=\frac{4}{3}x-8$

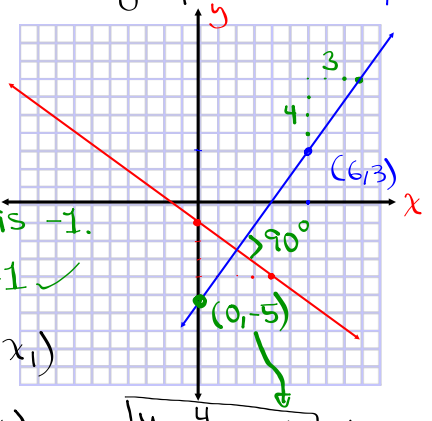
$y=\frac{4}{3}x-8+3$

$\boxed{y=\frac{4}{3}x-5}$ Slope-Int Form

$3y=4x-15$

$-4x+3y=-15$

$\boxed{4x-3y=15}$ Standard Form



Find the equation of a line that Contains $(-7,3)$ with

a) Zero Slope

H.L. $\Rightarrow$ $\boxed{y = 3}$

b) No Slope

V.L. $\Rightarrow$ $\boxed{x = -7}$

c) Slope -3

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

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

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

$y = -3x - 21 + 3$

$\boxed{y = -3x - 18}$ Slope-Int

$\boxed{3x + y = -18}$ Standard

d) Slope $\frac{2}{5}$.

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

$y - 3 = \frac{2}{5}(x + 7)$

Multiply by 5

$5y - 15 = 2(x + 7)$

$5y - 15 = 2x + 14$

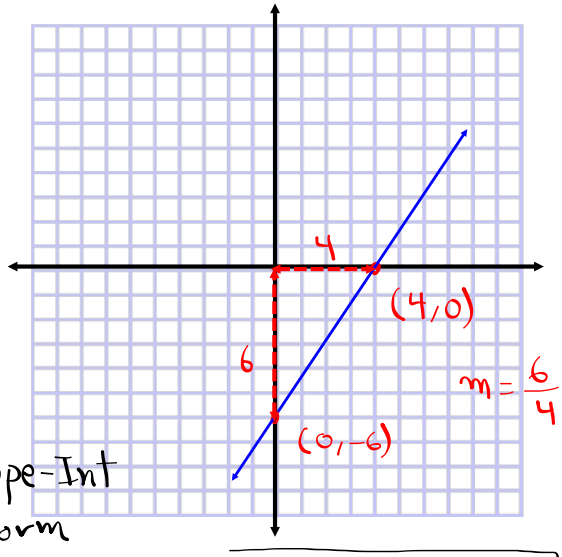
$5y = 2x + 29$

$\boxed{y = \frac{2}{5}x + \frac{29}{5}}$ Slope-Int

$-2x + 5y = 29$

$\boxed{2x - 5y = -29}$ Standard

Find equation of a line with Y-Int $(0,-6)$ and X-Int $(4,0)$. Graph the line.



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

$y - 0 = \frac{3}{2}(x - 4)$

$m = \frac{6}{4} = \frac{3}{2}$

$\boxed{y = \frac{3}{2}x - 6}$ Slope-Int Form

$2y = 3x - 12$

$-3x + 2y = -12$

$\boxed{3x - 2y = 12}$ Standard Form

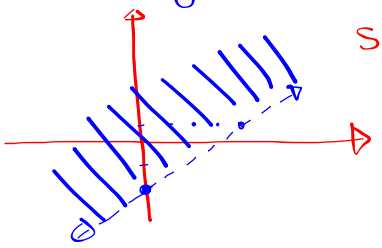
Class Qz

① Graph & shade: $3x - 4y < 8$

Hint: write in slope-int. form

$-4y < -3x + 8$

$y > \frac{3}{4}x - 2$



② write $y + 3 = -2(x - 5)$ in

a) slope-int. form

$y + 3 = -2x + 10$

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

b) Standard form

$\boxed{2x + y = 7}$

Due Thursday SG 9 & 10

Bring SG 11 with you to the class

The sum of two numbers is 7.

Their difference is 3.

Find both numbers.

Let x & y be the numbers

$$\begin{cases} x + y = 7 \\ x - y = 3 \end{cases}$$

using addition method

$2x = 10$ $\boxed{x = 5}$

$x + y = 7$

$5 + y = 7$

$\boxed{y = 2}$

The numbers are 5 & 2.

There were a total of 22 people in a meeting.
The # of Females was 1 more than twice the number of males.
How many of each?

Let M → # Males
F → # Females

$$\begin{cases} M + F = 22 \\ F = 2M + 1 \end{cases}$$

Using Subs. method

$M + (2M+1) = 22$

$3M = 21$

$M = 7$

$F = 2(7) + 1$

$F = 15$

7 males & 15 females

Two angles are Complementary.
One of them is 10° less than four times the other one.
Find both angles.

Let x & y be the measure of these angles.

$$\begin{cases} x + y = 90 \\ x = 4y - 10 \end{cases}$$

Use subs. method

$(4y - 10) + y = 90$

$5y = 100$

$y = 20$

$x = 4(20) - 10$

$x = 70$

70° & 20°

Two angles are supplementary.

3 times one of them plus twice the other one is 410°. Find both angles. Let x & y be measures of these two angles.

$$-2\begin{cases} x + y = 180 \\ 3x + 2y = 410 \end{cases} \Rightarrow \begin{cases} -2x - 2y = -360 \\ 3x + 2y = 410 \end{cases}$$

$$x = 50$$

$x = 50$

$50 + y = 180$

$y = 130$

using addition/elimination

50° & 130°

School paid $86 for 17 tkts.

Adults → $10, Kids → $3

How many of each tkt?

A → Adults, K → Kids

$$-3\begin{cases} A + K = 17 \\ 10A + 3K = 86 \end{cases}$$

$$\begin{cases} -3A - 3K = -51 \\ 10A + 3K = 86 \end{cases}$$

$$7A = 35$$

$A = 5$

$5 + k = 17$

$K = 12$

5 Adults & 12 Kids