Math 115

Spring 2019

Lecture 13

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

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

Feb 19-8:47 AM

1) Draw the line $4x - 3y = -12$

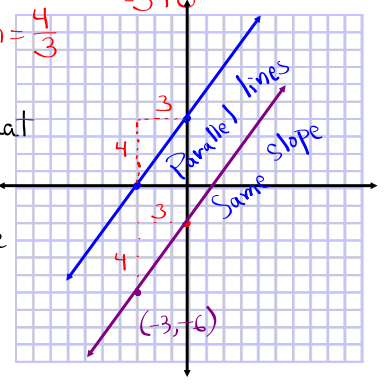
x	y
0	4
-3	0

2) Identify its slope $m = \frac{4}{3}$

3) Draw a Second line that contains $(-3, -6)$ and Parallel to the top line

Same Slope

4) Find equation of the Second line.



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

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

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

$y + 6 = \frac{4}{3}x + \frac{4}{3} \cdot 3$

$y + 6 = \frac{4}{3}x + 4$

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

$y = \frac{4}{3}x - 2$ Slope-Int. form

Multiply by 3

$3y = 4x - 6$

$-4x + 3y = -6$

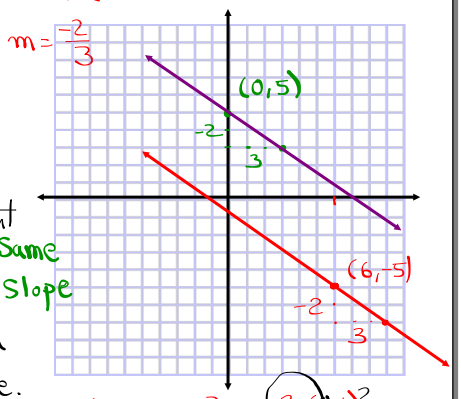
Multiply by -1

$4x - 3y = 6$ Standard form

1) Draw $y = -\frac{2}{3}x + 5$ Y-Int $(0,5)$

2) Identify its slope and Y-Int.

3) Draw a second line Parallel to this line that contains $(6,-5)$. → Same Slope



4) Find the equation of the second line.

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

$y - -5 = \frac{-2}{3}(x - 6)$

$y + 5 = \frac{-2}{3}x - \frac{2}{3}(-6)$

$y + 5 = \frac{-2}{3}x + 4$ Slope-Int

$y = \frac{-2}{3}x + 4 - 5$ $\boxed{y = \frac{-2}{3}x - 1}$

Multiply by 3

$3y = -2x - 3$

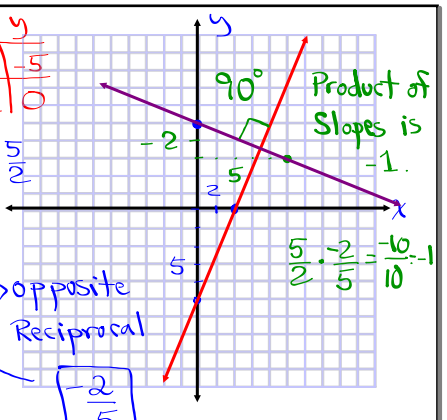
Standard form → $\boxed{2x + 3y = -3}$

1) Draw $5x - 2y = 10$

x	y
0	-5
2	0

2) Identify its slope $m = \frac{5}{2}$

3) Draw a second line that contains $(0,5)$ and perpendicular to the first line. → Opposite Reciprocal $\boxed{-\frac{2}{5}}$



4) Now find the eqn of the second line.

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

$y - 5 = \frac{-2}{5}(x - 0)$

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

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

Multiply by 5

$5y = -2x + 25$

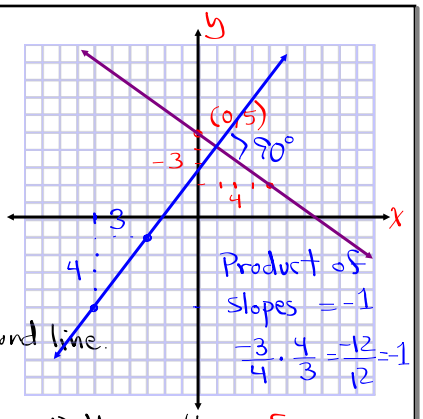
$\boxed{2x + 5y = 25}$ Standard Form

1) Graph $y = \frac{-3}{4}x + 5$

Y-Int $(0,5)$, $m = \frac{-3}{4}$

2) Graph a second line that contains $(-6,-5)$ that is **perpendicular** to the first line.

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



Product of slopes $= -1$

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

3) Find eqn of the second line.

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

$y - -5 = \frac{4}{3}(x - -6)$

$y + 5 = \frac{4}{3}x + \frac{4}{3} \cdot 6^2$

$y + 5 = \frac{4}{3}x + 8$

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

Multiply by 3

$3y = 4x + 9$

$-4x + 3y = 9$

Multiply by -1

$\boxed{4x - 3y = -9}$ Stand. form

Find equation of a line that contains $(5,-3)$ with

a) No slope

V.L. → x-only → $\boxed{x = 5}$

b) Zero slope

H.L. → y-only → $\boxed{y = -3}$

c) Undefined slope

V.L. → x-only → $\boxed{x = 5}$

d) Slope $\frac{1}{2}$

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

$y + 3 = \frac{1}{2}(x - 5)$

$2y + 6 = x - 5$

$2y = x - 11$

$\boxed{y = \frac{1}{2}x - \frac{11}{2}}$ Slope-Int.

$2y = x - 11$

$-x + 2y = -11$

$\boxed{x - 2y = 11}$ Standard form

e) Slope $\frac{-2}{3}$

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

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

$3y + 9 = -2(x - 5)$

$3y + 9 = -2x + 10$

$\boxed{2x + 3y = 1}$ Standard form

$3y = -2x + 1$

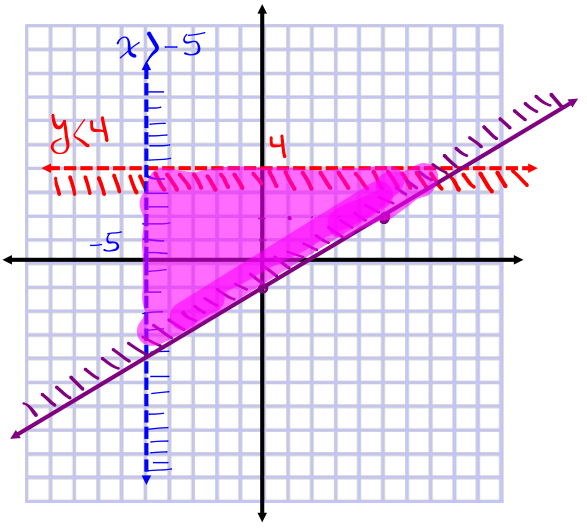
$\boxed{y = \frac{-2}{3}x + \frac{1}{3}}$ Slope-Int form

Graph & Shade

$$\begin{cases} y < 4 \\ x > -5 \\ y \geq \frac{3}{5}x - 1 \end{cases}$$

Y-Int $(0, -1)$

$m = \frac{3}{5}$



Graph & Shade

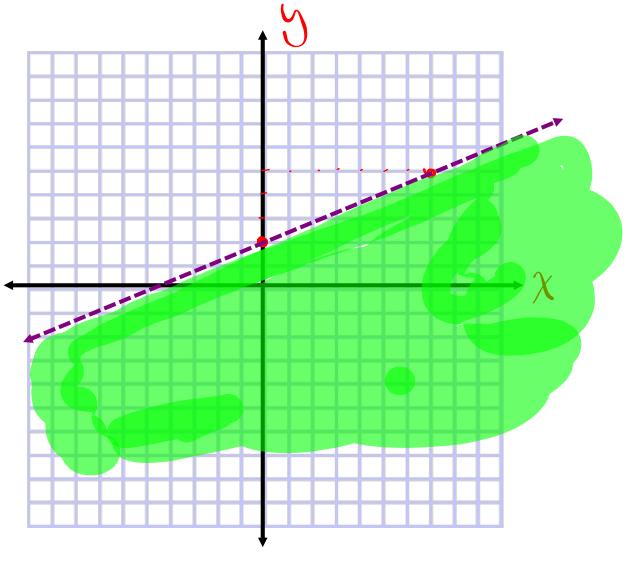
$3x - 7y > -14$

Hint: write in Slope-Int form

$-7y > -3x - 14$

Divide by -7

$y < \frac{3}{7}x + 2$



Ch. 8

System of linear equations in two Variables

$Ax+By=C$, $y=$ ___ , $x=$ ___

↳ More than one equation

$\begin{cases} x+y=7 \\ x-y=3 \end{cases}$, $\begin{cases} 3x-2y=9 \\ y=2x-1 \end{cases}$, $\begin{cases} y=\frac{2}{3}x-4 \\ y=\frac{1}{2}x+6 \end{cases}$

Solution, if there is any, is an ordered-pair (x,y) that satisfies every equation in the system.

Is $(5,2)$ a solution of

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

$x+y=7$: $5+2=7$, $7=7\checkmark$

$x-y=3$: $5-2=3$, $3=3\checkmark$

Yes, $(5,2)$ is a solution.

Is $(3,-1)$ a solution of

$\begin{cases} 2x-y=7 \ \checkmark \\ x-2y=-5 \ \times \end{cases}$?

$2x-y=7$: $2(3)-(-1)=7$, $6+1=7$, $7=7\checkmark$

$x-2y=-5$: $3-2(-1)=-5$, $3+2=-5$, $5=-5$ false

So $(3,-1)$ is not a solution.

How to Solve system of linear equations in two Variables:

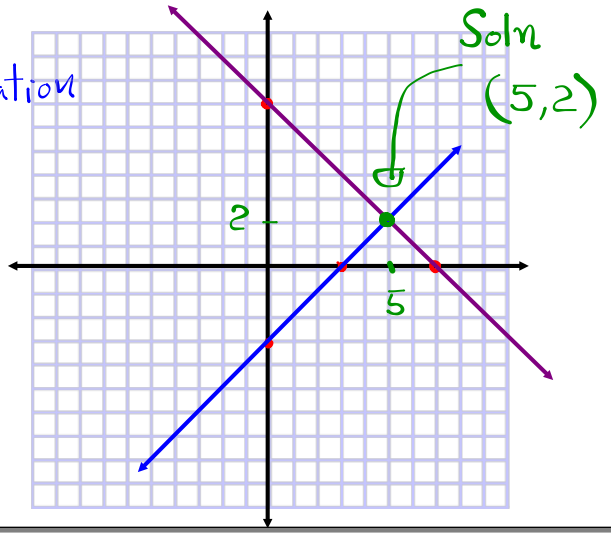
- Graphing
- Substitution
- Addition/Elimination

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

by graphing.

x	y
0	7
7	0

x	y
0	-3
3	0



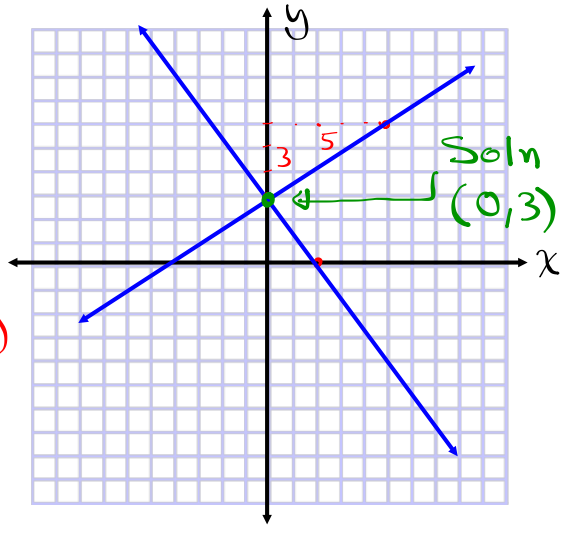
Solve $\begin{cases} 3x+2y=6 \\ y=\frac{3}{5}x+3 \end{cases}$

by graphing method.

x	y
0	3
2	0

Y-Int (0,3)

$m=\frac{3}{5}$



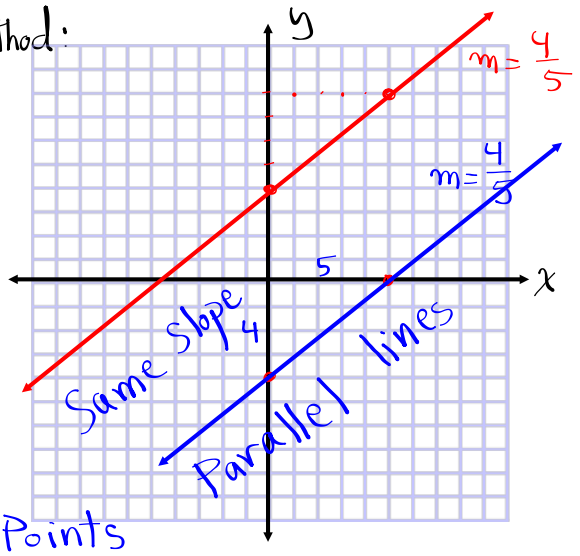
Solve by graphing method:

$$\begin{cases} 4x - 5y = 20 \\ y = \frac{4}{5}x + 4 \end{cases}$$

x	y
0	-4
5	0

y-Int $(0,4)$

$m = \frac{4}{5}$



No intersection Points

$\Rightarrow$ No Solution.

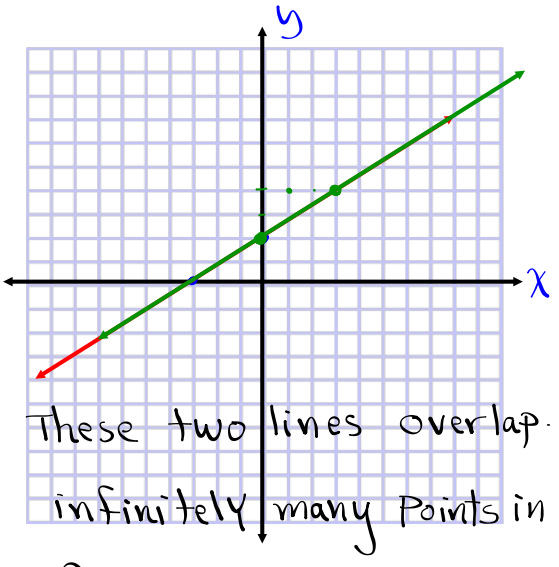
Solve by graphing:

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

x	y
0	2
-3	0

y-Int $(0,2)$

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



These two lines overlap.

infinitely many Points in Common.

Infinitely Many Solutions.

Solve by Substitution method:

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

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

$3x - 2x + 6 = 4$

$x + 6 = 4$

$x = 4 - 6$

$\boxed{x = -2}$

$y = -2 - 3$

$\boxed{y = -5}$

Final Ans

$(-2, -5)$

Solve by Subs. method:

$\begin{cases} 4x + 3y = 5 \\ x = 1 - y \end{cases}$

$4x + 3y = 5$

$4(1 - y) + 3y = 5$

$4 - 4y + 3y = 5$

$4 - y = 5$

$4 - 5 = y$

$\boxed{y = -1}$

$x = 1 - (-1)$

$= 1 + 1$

$\boxed{x = 2}$

Final Soln:

$(2, -1)$

Solve by Substitution method:

$$\begin{cases} 2x - 3y = 5 \\ y = \frac{2}{3}x + 6 \end{cases}$$

$2x - 3\left(\frac{2}{3}x + 6\right) = 5$

$2x - 3 \cdot \frac{2}{3}x - 3 \cdot 6 = 5$

$2x - 2x - 18 = 5$

$-18 = 5$

False

$\emptyset$

Solve by Addition / Elimination

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

$2x = 10$

$x = 5$

$x + y = 7$

$5 + y = 7$

$y = 2$

Final Ans

$(5, 2)$

Solve by Addition / Elimination method:

$$\begin{cases} 3x + 2y = 7 \\ x - y = -1 \end{cases} \quad (\times 2)$$

$$\Rightarrow \begin{cases} 3x + 2y = 7 \\ 2x - 2y = -2 \end{cases}$$

$$5x = 5$$

$$3x + 2y = 7$$

$$\boxed{x = 1}$$

$$3(1) + 2y = 7$$

$$2y = 4$$

$$\boxed{y = 2}$$

Final Ans

$(1, 2)$

Solve by Addition / Elimination method:

$$\begin{cases} 2x + 3y = 6 \\ 3x + 4y = 7 \end{cases} \quad (-4, \ 3)$$

$$\Rightarrow \begin{cases} -8x - 12y = -24 \\ 9x + 12y = 21 \end{cases}$$

$$x = -3$$

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

$$3(-3) + 4y = 7$$

$$-9 + 4y = 7$$

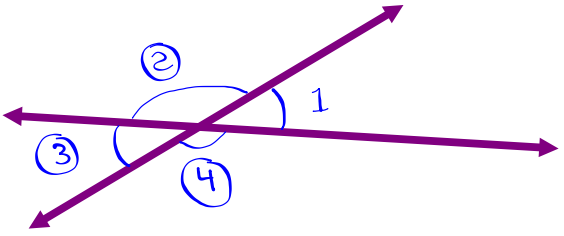
$$4y = 7 + 9$$

$$4y = 16$$

$$y = \frac{16}{4}$$

$$\boxed{y = 4}$$

Final Soln: $(-3, 4)$



Opposite angles are equal and are called Vertical Angles.

$\textcircled{1} = \textcircled{3}$

$\textcircled{2} = \textcircled{4}$

Adjacent angles are Supplementary angles.

Sum $= 180^\circ$

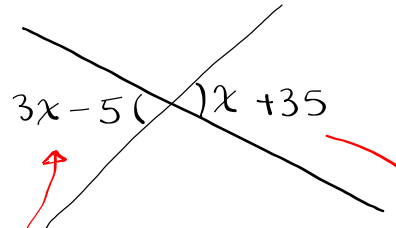
$\textcircled{1} + \textcircled{2} = 180^\circ$

$\textcircled{2} + \textcircled{3} = 180^\circ$

$\textcircled{3} + \textcircled{4} = 180^\circ$

$\textcircled{1} + \textcircled{4} = 180^\circ$

Find x and then each angle



Vertical Angles are equal.

$3x - 5 = x + 35$

$3x - x = 35 + 5$

$2x = 40$

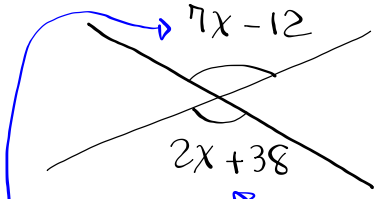
$\boxed{x = 20}$

$3(20) - 5 = 60 - 5 = \boxed{55}$

$20 + 35 = \boxed{55}$

Angles are 55° each.

Find x then each angle.



Vertical Angles.

They must be equal.

$7x - 12 = 2x + 38$

$7x - 2x = 38 + 12$

$5x = 50$ $\quad \boxed{x = 10}$

$7(10) - 12$

$= 70 - 12 = \boxed{58}$

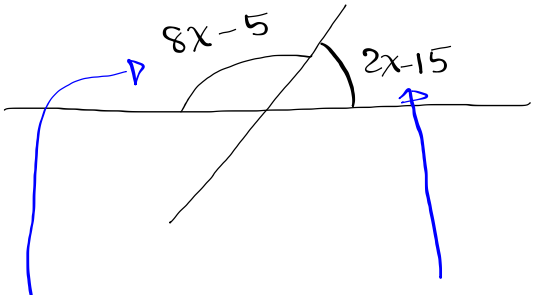
$2(10) + 38$

$= 20 + 38$

$= \boxed{58}$

Angles are 58° each

Find x, then each angle



Adjacent angles.

Supplementary angles.

Total = 180°

$8x - 5 + 2x - 15 = 180$

$10x - 20 = 180$

$10x = 200$

$\boxed{x = 20}$

$8(20) - 5$

$= 160 - 5$

$= \boxed{155}$

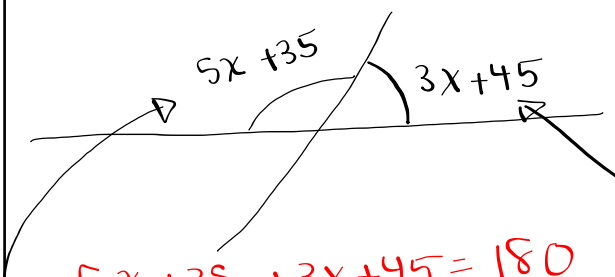
$2(20) - 15$

$= 40 - 15$

$= \boxed{25}$

Angles are 155° & 25°.

Find x, then each angles



Adjacent Angles

Supplementary Angles

Their total = 180°

$5x+35+3x+45=180$

$8x+80=180$

$8x=100$

$x=\frac{100}{8}$

$x=12.5$

$5(12.5)+35=$

$62.5+35=\boxed{97.5}$

$3(12.5)+45=$

$37.5+45=$

$\boxed{82.5}$

Angles are $82.5°$ & $97.5°$

Due Wednesday:

Graphing Project 1

&

WP: Angles & Triangles

} collect at 6:00 AM

Also work on SG 9

Exam II:

Monday