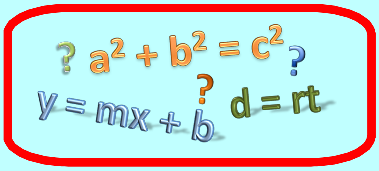
Math 115

Fall 2018

Lecture 13



Some Review:

① Find equation of a line that contains $(-3,2)$ with slope $\frac{2}{5}$. Graph & label it clearly. we have one pt & slope, then we can use point-slope formula.

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

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

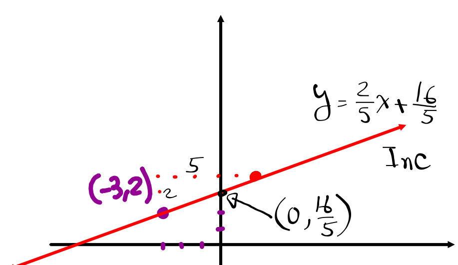
$$y - 2 = \frac{2}{5}(x + 3)$$

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

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

$$y = \frac{2}{5}x + \frac{6}{5} + \frac{10}{5}$$

Slope-Int. form $\boxed{y = \frac{2}{5}x + \frac{16}{5}}$



$5y = 2x + 16$ Standard

$-2x + 5y = 16 \Rightarrow \boxed{2x - 5y = -16}$ form

② Find equation of a line that contains (-3,5) and (3,1). Graph it, and label it clearly. We have two points, we can find slope of the line.

(-3,5), (3,1)

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{5-1}{-3-3} = \frac{4}{-6} = \boxed{\frac{-2}{3}}$$

Now we can use the slope and one of the points with Point-Slope formula.

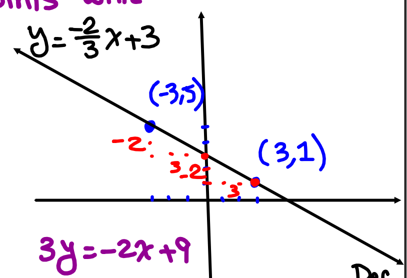
$$y - y_1 = m(x - x_1)$$

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

$$y - 1 = \frac{-2}{3}x + \frac{2}{\cancel{3}}\cdot\cancel{3}$$

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

Slope-Int form.



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

$$\boxed{2x + 3y = 9}$$

Standard form

③ Find eqn of a line that contains (-4,0) and it is parallel to $3x - 2y = 4$. Graph both lines.

Parallel lines must have same slope.

$$3x - 2y = 4$$

$$-2y = -3x + 4$$

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

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

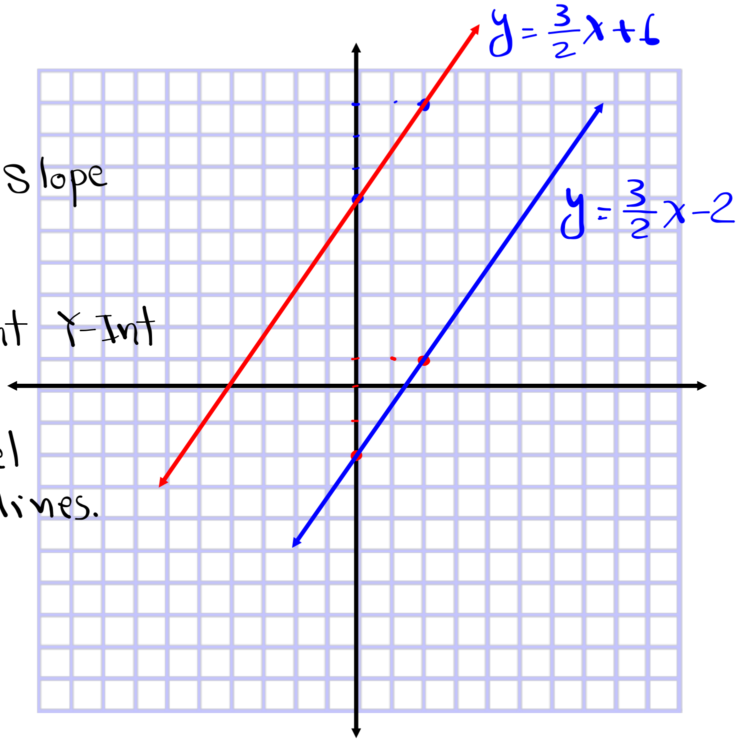
Use this slope with given Point.

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

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

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

$$\boxed{y = \frac{3}{2}x + 6}$$



Same Slope

&

Different Y-Int

→ Parallel lines.

④ Find equation of a line that contains (5, −2) and perpendicular to $3x + 4y = -8$. Graph both lines.

$4y = -3x - 8$

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

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

we have Perpendicular lines.
Slopes are negative reciprocal of each other.

Slope for our line has to be $\frac{4}{3}$.

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

$y - {-2} = \frac{4}{3}(x - 5)$

$y + 2 = \frac{4}{3}x - \frac{20}{3}$

$3y = 4x - 26$

$-4x + 3y = -26$

$\boxed{4x - 3y = 26}$ Standard Form

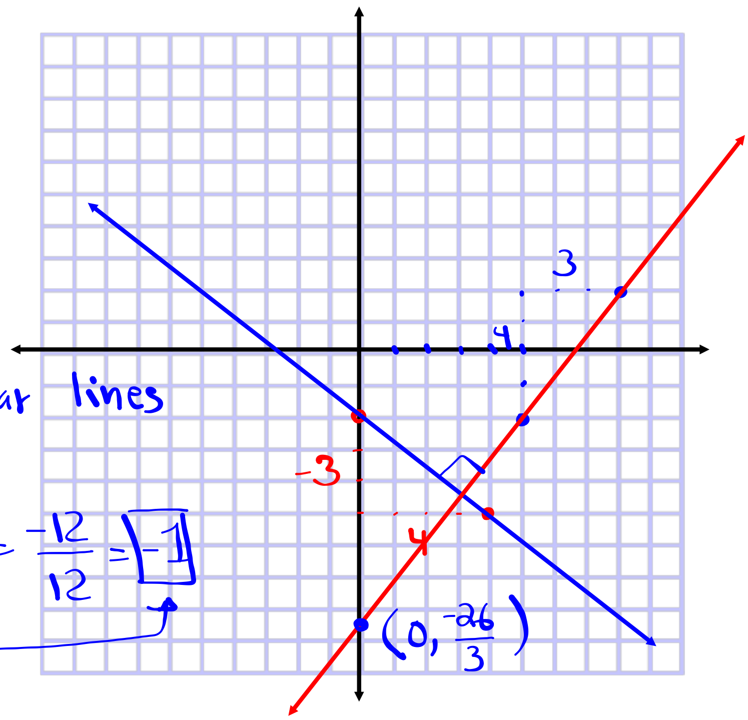
$y = \frac{4}{3}x - \frac{20}{3} - 2$

$y = \frac{4}{3}x - \frac{20}{3} - \frac{6}{3}$

$\boxed{y = \frac{4}{3}x - \frac{26}{3}}$ Slope-Int. form

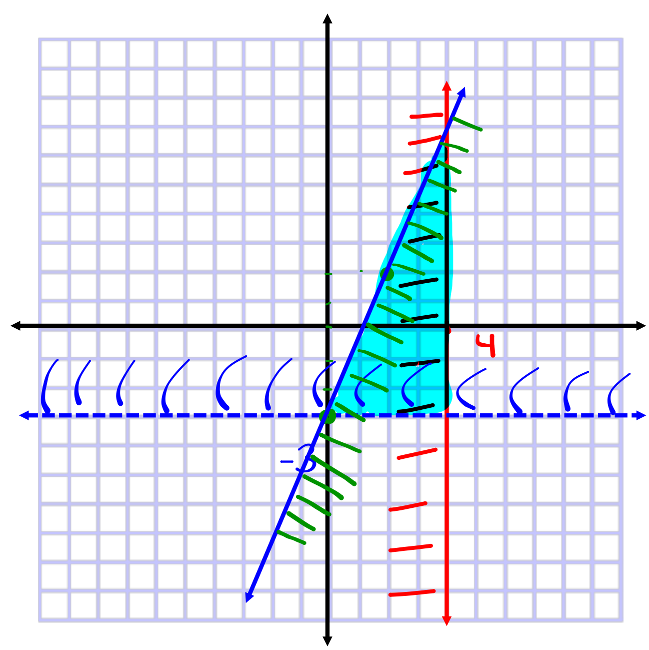
Perpendicular lines

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



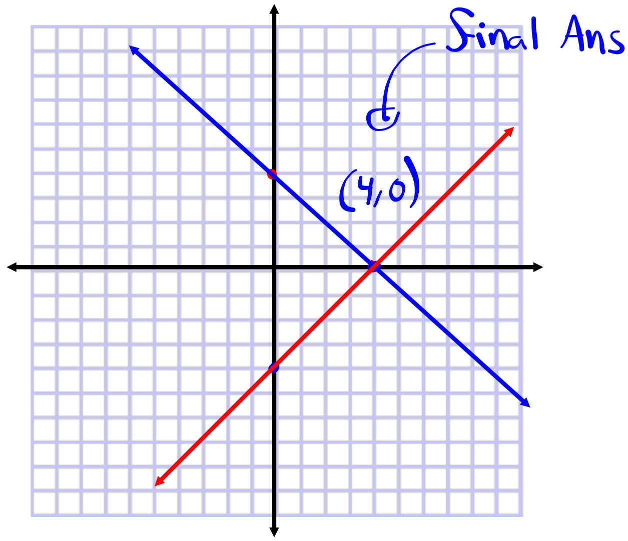
Graph & Shade

$$\begin{cases} x \le 4 \\ y > -3 \\ y \le \frac{5}{2}x - 3 \end{cases}$$



Solve by graphing

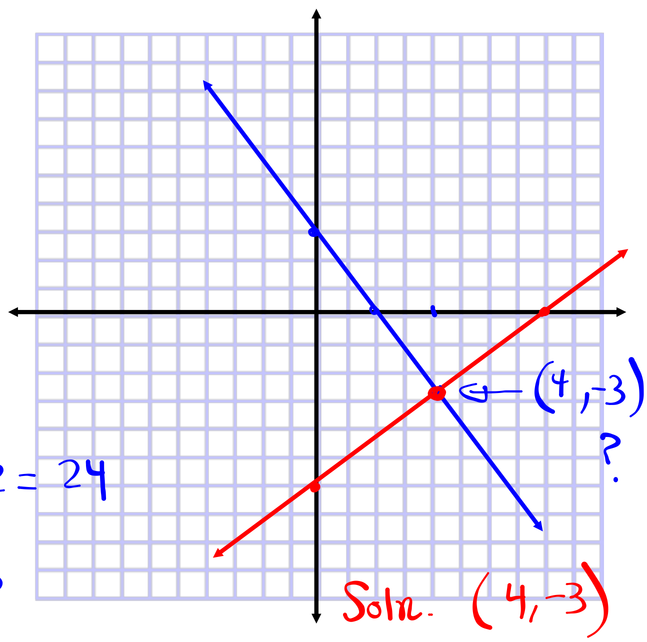
$$\begin{cases} x + y = 4 \\ x - y = 4 \end{cases}$$



Solve by graphing

$$\begin{cases} 3x - 4y = 24 \checkmark \\ y = -\frac{3}{2}x + 3 \checkmark \end{cases}$$

$\frac{-3}{2}$



$3(4) - 4(-3) = 12 + 12 = 24$

$-3 = \frac{-3}{\cancel{2}}(\cancel{4}^{2}) + 3$

$-3 = -6 + 3 = -3$

Solve by Substitution method:

$$\begin{cases} 3x + 2y = 7 \\ x = y + 4 \end{cases}$$

$3(y + 4) + 2y = 7$

$3y + 12 + 2y = 7$

$5y = 7 - 12$

$5y = -5$

$\boxed{y = -1}$

$x = -1 + 4$

$\boxed{x = 3}$

Final Ans: $(3, -1)$

Solve by Subs. method:

$$\begin{cases} 2y = 14 - 6x \\ y = 7 - 3x \end{cases}$$

$2(7 - 3x) = 14 - 6x$

$14 - 6x = 14 - 6x$

$-6x + 6x = 14 - 14$

$0 = 0$

True

infinite number of Solutions.

Solve by Subs. method:

$$\begin{cases} 2x + 10y = 3 \\ x = 1 - 5y \end{cases}$$

$$2(1-5y) + 10y = 3$$

$$2 - \cancel{10y} + \cancel{10y} = 3$$

$$2 = 3$$

false

No Solution

Solve by addition/elimination method:

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

$$2x = 6$$

$$\boxed{x=3}$$

$$3 + y = 10$$

$$\boxed{y=7}$$

Final Ans

$$(3, 7)$$

Solve by addition / elimination method:

$$2\begin{cases} 2x - y = 12 \\ 3x + 2y = -3 \end{cases} \Rightarrow \begin{cases} 4x - 2y = 24 \\ 3x + 2y = -3 \end{cases}$$

$$7x = 21$$

$$\boxed{x = 3}$$

$3(3) + 2y = -3$

$9 + 2y = -3$

$2y = -12$

$\boxed{y = -6}$

$(3, -6)$

Solve by addition/elimination method:

$$2\begin{cases} 6x - 2y = -22 \\ -3x + 4y = 17 \end{cases} \Rightarrow \begin{cases} 12x - 4y = -44 \\ -3x + 4y = 17 \end{cases}$$

$$9x = -27$$

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

$-3(-3) + 4y = 17$

$9 + 4y = 17$

$4y = 8$

$\boxed{y = 2}$

$\boxed{(-3, 2)}$

Solve

$$\begin{cases} 4x - 3y = -19 & \cdot 2 \\ 3x + 2y = 24 & \cdot 3 \end{cases} \Rightarrow \begin{cases} 8x - 6y = -38 \\ 9x + 6y = 72 \end{cases}$$

$$17x = 34$$

$$\boxed{x = 2}$$

$$3(2) + 2y = 24$$

$$6 + 2y = 24 \qquad 2y = 18 \qquad \boxed{y = 9}$$

$$\boxed{(2, 9)}$$

Class Quiz

① Find slope of a line that contains $(4, -6)$ and $(0, 3)$.

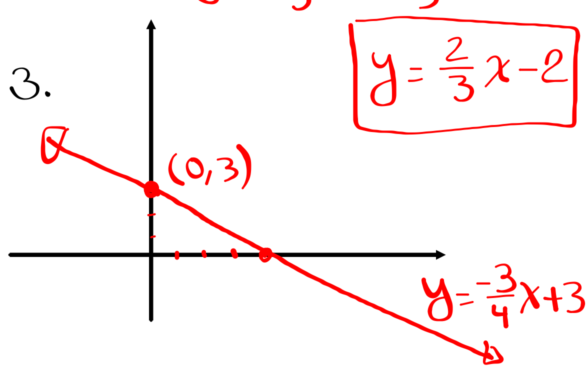
$$m = \frac{-6-3}{4-0} \qquad \boxed{m = \frac{-9}{4}}$$

② write $2x - 3y = 6$ in slope-Int. form.

$$-3y = -2x + 6 \qquad y = \frac{-2}{-3}x + \frac{6}{-3}$$

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

③ Graph $y = \frac{-3}{4}x + 3$.



Graph & shade

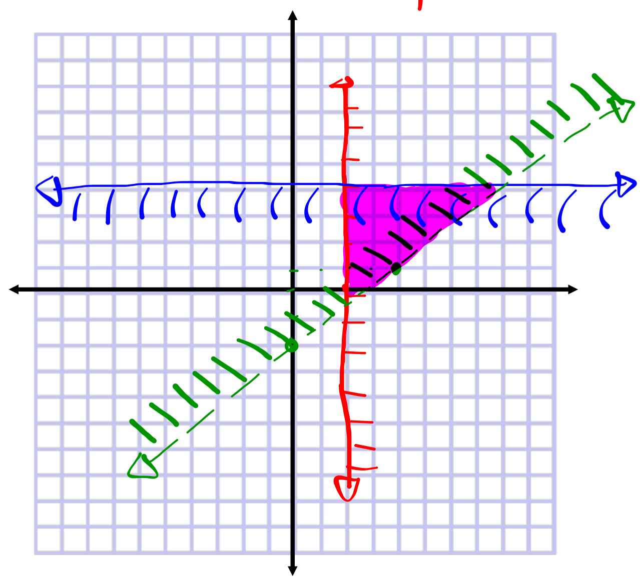
$$\begin{cases} x \geq 2 \\ y \leq 4 \\ 3x - 4y < 8 \end{cases}$$

Hint: Convert the last one to slope-Int. form.

$$-4y < -3x + 8$$

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

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



Sum of two numbers is 8. Their difference is 4. Use system of linear equations in two variables to find them.

$$\begin{cases} x + y = 8 \\ x - y = 4 \end{cases}$$

$$2x = 12$$

$$\boxed{x = 6}$$

$$6 + y = 8$$

$$\boxed{y = 2}$$

The numbers are 6 & 2.

The perimeter of a rectangular shape is 44 meters. The length is 1 m longer than twice its width. Use system of linear equations in two variables to find its dimensions.

$$\begin{cases} 2L + 2W = 44 \\ L = 2W + 1 \end{cases}$$

$$2(2W+1) + 2W = 44$$

$$4W + 2 + 2W = 44$$

$$6W = 42 \rightarrow \boxed{W = 7}$$

$$L = 2(7) + 1$$

$$\boxed{L = 15}$$

Dimensions 7m by 15m.

Lisa has 5 Coins.
Dimes & Nickels only
She has 40 ¢.
Use system of linear equations in two variables to find How Many of each?

D → Dimes

N → Nickels

$$-5\begin{cases} D + N = 5 \\ 10D + 5N = 40 \end{cases}$$

$$\begin{cases} -5D - 5N = -25 \\ 10D + 5N = 40 \end{cases}$$

$$5D = 15$$

$$\boxed{D = 3}$$

$$3 + N = 5$$

$$\boxed{N = 2}$$

She has 2 Nickels & 3 Dimes

Two angles are Complementary.
One of them is 5 times
the other one.
Use system of linear equations
in two variables to find the
measure of both angles.

$$\begin{cases} \boxed{x} + y = 90 \\ x = 5y \end{cases}$$

$5y + y = 90$

$6y = 90$

$\boxed{y = 15}$

$x = 5(15)$

$\boxed{x = 75}$

Two angles are
15° & 75°.

Two angles are Supplementary.
One of them is 20°
less than the other one.
Find both angles by using
System of linear equations in
two Variables.

$$\begin{cases} \boxed{x} + y = 180 \\ x = y - 20 \end{cases}$$

$y - 20 + y = 180$

$2y = 200$

$\boxed{y = 100}$

$x = 100 - 20$

$\boxed{x = 80}$

100° & 80°

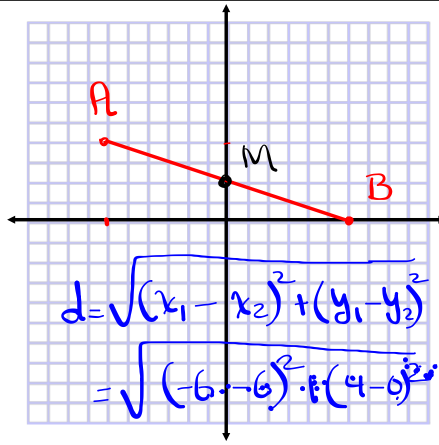
$A(-6,4)$, $B(6,0)$

① Draw $\overline{AB}$

② Find $d(A,B)$

③ Find M for $\overline{AB}$.

④ Find m for $\overline{AB}$.



$$d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$$

$$=\sqrt{(-6-6)^2+(4-0)^2}$$

$$d=\sqrt{(-12)^2+4^2}$$

$$=\sqrt{144+16}=\sqrt{160}$$

$$\approx \boxed{12.6}$$

$$M\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$$

$$=M\left(\frac{-6+6}{2},\frac{4+0}{2}\right)=M(0,2)$$

$$m=\frac{y_1-y_2}{x_1-x_2}=\frac{4-0}{-6-6}$$

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

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20 TKTs were purchased.

Kids & Adults only.

Kids Pay \$5.

Adults Pay \$12.

Total cost \$156

How many of each?

You must use system of linear eqns in two variables.

$$-5\begin{cases} A + K = 20 \\ 12A + 5K = 156 \end{cases}$$

$$\begin{cases} -5A - 5K = -100 \\ 12A + 5K = 156 \end{cases}$$

$$7A = 56$$

$$\boxed{A=8}$$

$$8 + K = 20$$

$$\boxed{K=12}$$

8 Adults & 12 kids

Find the measure of an angle whose Complement is four times its measure.

Angle → x

Complement → $90-x$

Complement = 4 · Angle

$90 - x = 4x$

$90 = 4x + x$

$90 = 5x$

$\frac{90}{5} = x$ $\boxed{x=18}$

18°

Find an angle whose supplement is three times its measure.

Angle → x

Supplement → $180-x$

Supplement = 3 · Angle

$180 - x = 3 \cdot x$

$180 = 3x + x$

$180 = 4x$

$\frac{180}{4} = x$ $\boxed{x=45}$

45°

Find an angle such that the sum of its Complement and its Supplement is 160°.

Angle → x

Complement → $90-x$

Supplement → $180-x$

$\underbrace{\text{Complement}} + \underbrace{\text{Supplement}} = 160°.$

$90-x + 180-x = 160$

$270 - 2x = 160$

$-2x = 160 - 270$

$-2x = -110$

$x = \frac{-110}{-2}$

$x = 55$

55°

Find an angle such that the difference between its Supplement and 3 times its complement is 10°.

Angle → x

Complement → $90-x$

Supplement → $180-x$

Suppl. $- 3 \cdot$ Comp. $= 10°$

$180-x-3(90-x)=10$

$180-x-270+3x=10$

$2x-90=10$

$2x=100$ $\boxed{x=50}$

50°

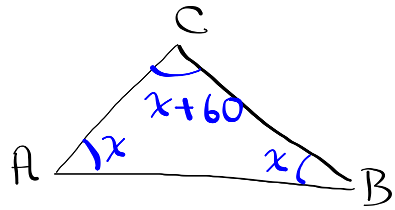
In triangle ABC,

angles A & B are equal

angle C is 60° more than

angle A.

Find all 3 angles.



$A + B + C = 180°$

$x + x + x + 60 = 180$

$\vdots$

$x = 40$

40°, 40°, and 100°

WP on Angles & Triangles due @ 6:00 AM

Quiz at 6:00. Do not forget about graphing Project.