

Math 115

Fall 2018

Lecture 14

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

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

Feb 19-8:47 AM

Some Review:

① find eqn of a line that contains (4,-3) and parallel to $y = \boxed{-\frac{1}{2}}x + 2$. Graph both lines.

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

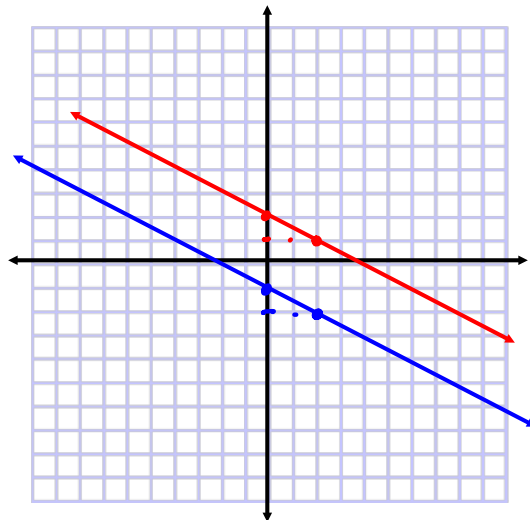
$$y - -3 = \frac{-1}{2}(x - 4)$$

$$y + 3 = -\frac{1}{2}(x - 4)$$

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

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

$$\boxed{y = -\frac{1}{2}x - 1}$$



Nov 14-6:03 AM

Find eqn of a line that contains $(-6, 4)$ and is perpendicular to $3x + 2y = -6$.

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

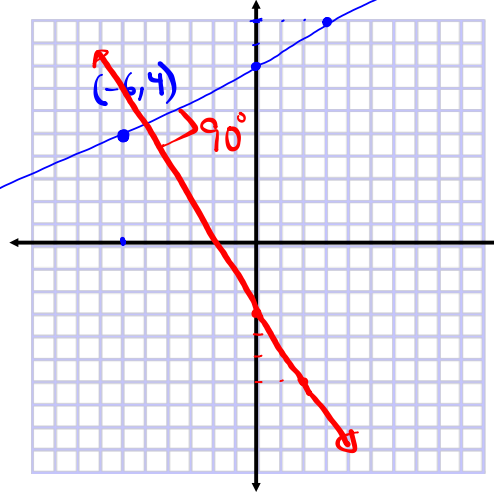
$$y - y_1 = m(x - x_1)$$

$$y - 4 = \frac{2}{3}(x - (-6))$$

$$y - 4 = \frac{2}{3}(x + 6)$$

$$y - 4 = \frac{2}{3}x + \frac{12}{3}$$

$$\boxed{y = \frac{2}{3}x + 8}$$



Nov 14-6:10 AM

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

a) with zero slope $\rightarrow y = b \rightarrow \boxed{y = -3}$

b) with undefined slope $\rightarrow x = a \rightarrow \boxed{x = -5}$

c) with slope $\frac{3}{5}$ $y - y_1 = m(x - x_1)$

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

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

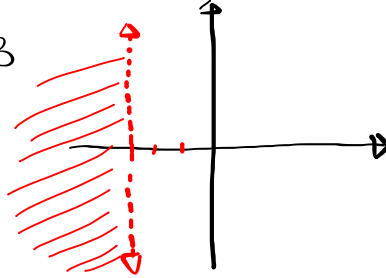
$$y + 3 = \frac{3}{5}x + 3$$

$$\boxed{y = \frac{3}{5}x}$$

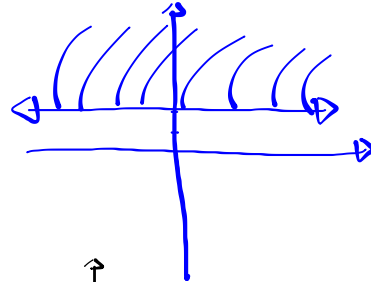
Nov 14-6:19 AM

Graph & shade:

① $x < -3$



② $y \geq 2$

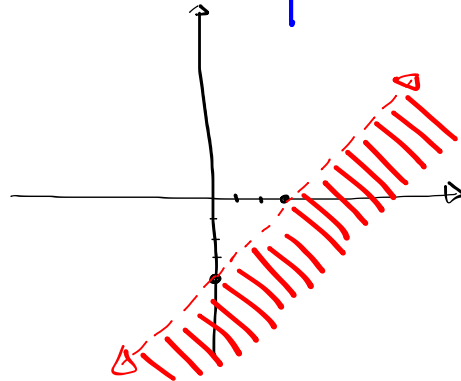


③ $4x - 3y > 12$

$$-3y > -4x + 12$$

$$y < \frac{-4}{-3}x + \frac{12}{-3}$$

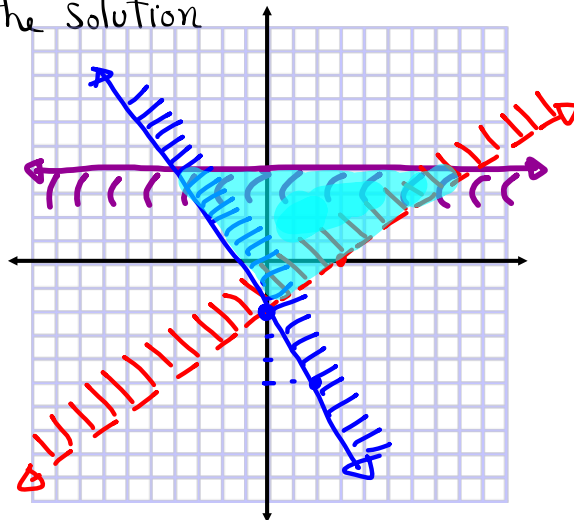
$$y < \frac{4}{3}x - 4$$



Nov 14-6:24 AM

Graph & shade the solution

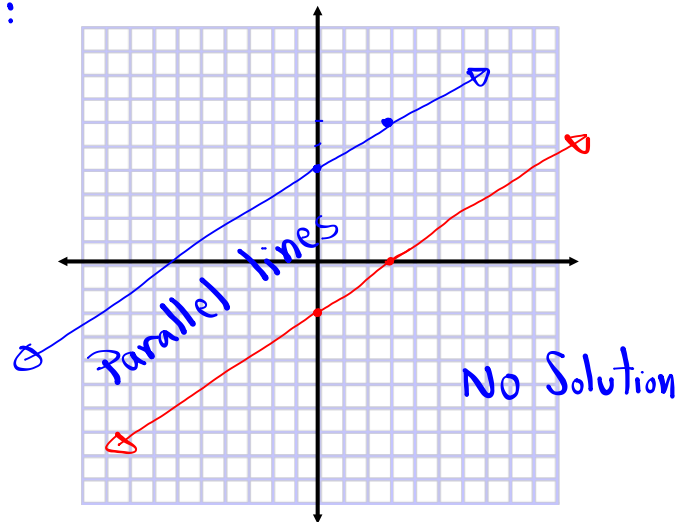
$$\begin{cases} y \leq 4 \\ y > \frac{2}{3}x - 2 \\ y \geq -\frac{3}{2}x - 2 \end{cases}$$



Nov 14-6:31 AM

Solve by graphing:

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



When no Solution:

- The System is inconsistent.
- Equations are independent.

Nov 14-6:37 AM

Solve by Subs. method:

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

$$3x - 2\left(\frac{3}{2}x - 2\right) = 4$$

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

$$\cancel{3x} - \cancel{3x} + 4 = 4$$

$$4 = 4$$

True

Infinitely many Solutions.

When there are infinitely many solutions

- System is consistent
- Equations are dependent.

Nov 14-6:42 AM

Solve by addition/elimination method:

$$\begin{cases} 5 \{ 3x - 2y = 13 \\ 2 \{ 4x + 5y = 2 \end{cases} \Rightarrow \begin{cases} 15x - 10y = 65 \\ 8x + 10y = 4 \end{cases}$$

$$\begin{matrix} 23x & & = 69 \end{matrix} \quad \boxed{x=3}$$

$$4(3) + 5y = 2 \quad 12 + 5y = 2 \quad 5y = -10$$

$$\boxed{y = -2}$$

Solution $(3, -2)$ or $\{(3, -2)\}$

when there is exactly one Solution

- System is consistent
- Equations are independent.

Nov 14-6:47 AM

The sum of two numbers is -2 .

Their difference is 12 .

Find both numbers.

You must use system of linear equations in two variables

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

$$\begin{matrix} 2x & & = 10 \end{matrix} \quad \boxed{x=5}$$

The numbers are 5 & -7 .

$$5 + y = -2$$

$$\boxed{y = -7}$$

Nov 14-6:54 AM

Two angles are Complementary.

3 times one of them plus twice the other one is 220° .

Use system of linear equations in two variables to find both angles.

$$\begin{cases} x + y = 90 \\ 3x + 2y = 220 \end{cases}$$

$$x + y = 90 \rightarrow y = 90 - x$$

$$3x + 2(90 - x) = 220$$

$$3x + 180 - 2x = 220$$

$$x = 40$$

$$y = 90 - 40$$

$$y = 50$$

$40^\circ \text{ \& } 50^\circ$

Nov 14-6:59 AM

Two angles are Supplementary.

5 times one of them less twice the other one is 410° .

Use system of linear equations in two variables to find both angles.

$$2 \begin{cases} x + y = 180 \\ 5x - 2y = 410 \end{cases}$$

$$5x - 2y = 410$$

$$\begin{cases} 2x + 2y = 360 \\ 5x - 2y = 410 \end{cases}$$

$$5x - 2y = 410$$

$$\begin{array}{r} 2x + 2y = 360 \\ 5x - 2y = 410 \\ \hline 7x = 770 \end{array}$$

$$x = 110 \rightarrow y = 70$$

$110^\circ \text{ \& } 70^\circ$

Nov 14-7:04 AM

Mary bought 30 boxes of markers.

Black and Red only.

Black costs \$5/box

Red costs \$8/box.

Use system of linear eqns in two variables to find how many boxes of each color.

Total cost was \$189

$$\begin{cases} B + R = 30 \\ 5B + 8R = 189 \end{cases}$$

$$\begin{cases} -5B - 5R = -150 \\ 5B + 8R = 189 \end{cases}$$

$$\begin{aligned} 3R &= 39 \\ R &= 13 \\ B &= 17 \end{aligned}$$

13 Red Boxes & 17 Black Boxes

Nov 14-7:10 AM

$A(-2, -6)$, $B(4, 2)$

① Draw $\overline{AB}$

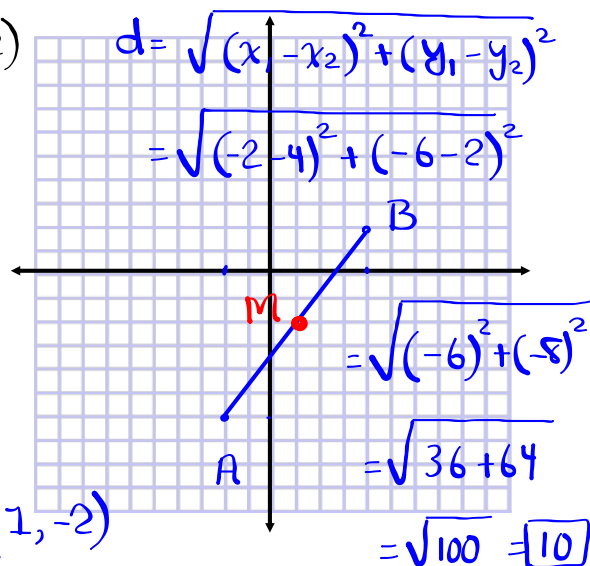
② Find $d(A, B)$

③ Find M of $\overline{AB}$

④ Find m of $\overline{AB}$.

$$M\left(\frac{-2+4}{2}, \frac{-6+2}{2}\right) = M(1, -2)$$

$$m = \frac{-6 - 2}{-2 - 4} = \frac{-8}{-6} = \boxed{\frac{4}{3}}$$

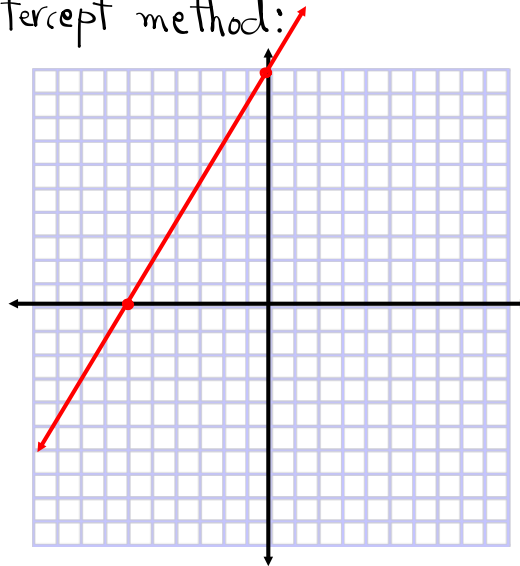


Nov 14-7:35 AM

Graph using intercept method:

$$5x - 3y = -30$$

x	y
0	10
-6	0

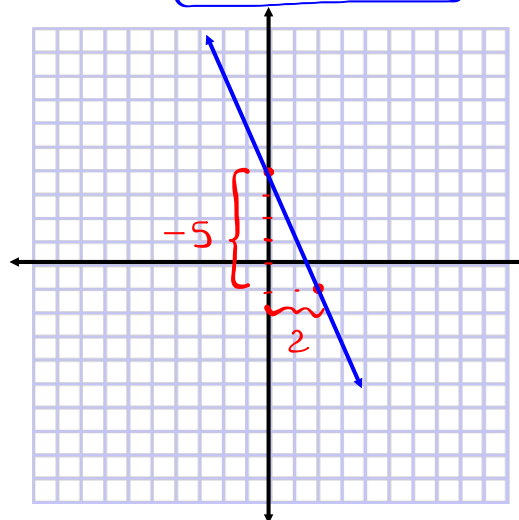


Nov 14-7:41 AM

write $5x + 2y = 8$ in slope-Int form,
then graph.
show rise & run of
the slope.

$$2y = -5x + 8$$

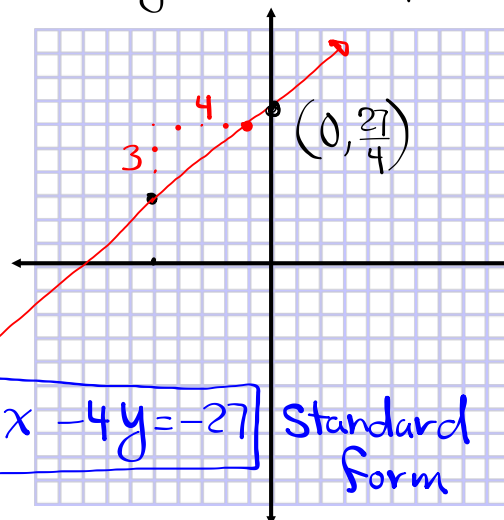
$$y = -\frac{5}{2}x + 4$$



Nov 14-7:43 AM

Graph $y - 3 = \frac{3}{4}(x + 5)$ using Point-Slope form.

Write the eqn of this line in slope-Int form as well as Stand. form with no fractions.



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

$$4y - 12 = 3(x + 5)$$

$$4y - 12 = 3x + 15$$

$$-3x + 4y = 27$$

$$3x - 4y = -27$$

Standard form

$$-4y = -3x - 27$$

$$y = \frac{3}{4}x - \frac{27}{4}$$

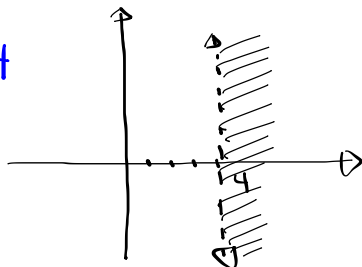
$$y = \frac{3}{4}x + \frac{27}{4}$$

Slope-Int.

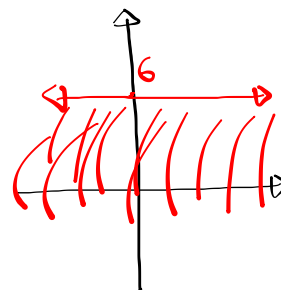
Nov 14-7:49 AM

Graph & Shade

① $x > 4$



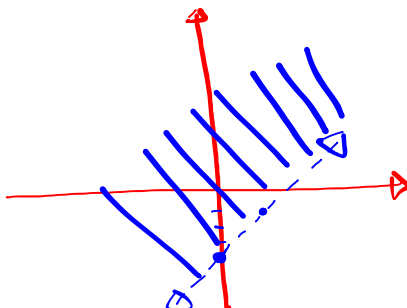
② $y \leq 6$



③ $3x - 2y < 8$

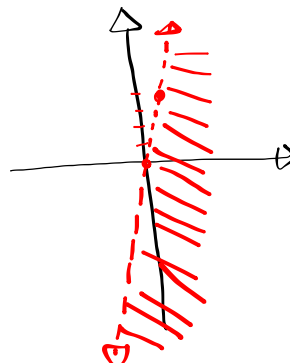
$$-2y < -3x + 8$$

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



④ $y < 4x$

$$4 = \frac{4}{1}$$



Nov 14-8:00 AM

Class Quiz

- ① find eqn of a line that contains $(-5, 4)$ with slope 2.

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

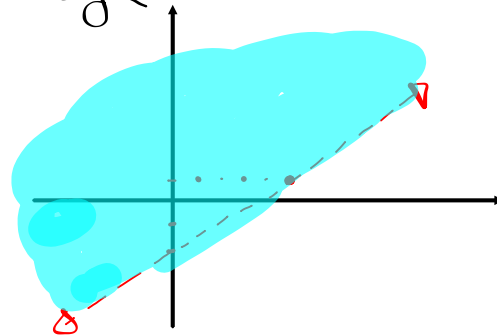
$$y - 4 = 2(x - (-5))$$

$$y - 4 = 2x + 10 \quad \boxed{y = 2x + 14}$$

- ② Graph & shade $3x - 5y < 10$.

$$-5y < -3x + 10$$

$$y > \frac{3}{5}x - 2$$



Nov 14-8:10 AM

Translate only:

3 times square root of one more than

Some number is equal to the number reduced

by -5.

$$3 \cdot \sqrt{x + 1} = x - (-5)$$

$\Downarrow$

$$3 \sqrt{x + 1} = x + 5$$

Nov 14-9:01 AM

24% of what number is 180?

$$\frac{P}{100} = \frac{\text{Part}}{\text{whole}}$$

$$\frac{24}{100} = \frac{180}{x}$$

$$24x = 100(180)$$

$$x = \frac{100(180)}{24}$$

$$x = 750$$

24% of 750 is 180.

$$.24 \cdot x = 180$$

$$x = \frac{180}{.24}$$

$$x = 750$$

Nov 14-9:04 AM

Mark used 4.5 cups of sugar to make 80 muffins. Using ratio, how many cups of sugar needed to bake 200 muffins?

$$\frac{4.5 \text{ cups sugar}}{80 \text{ muffins}} = \frac{x \text{ cups sugar}}{200 \text{ muffins}}$$

$$\frac{4.5}{80} = \frac{x}{200}$$

$$80x = 200(4.5)$$

$$x = \frac{200(4.5)}{80}$$

$$x = 11.25$$

11.25 cups of sugar needed.

Nov 14-9:08 AM

A candidate got 9200 votes on the last election. She got 5 times # of votes of Republicans from Independents.

She got 2000 more than 10 times the Republicans from Democrats. How many votes from each group did she get?

$$\underbrace{\text{Republicans}} + \underbrace{\text{Independents}} + \underbrace{\text{Democrats}} = 9200$$

$$x + 5x + 10x + 2000 = 9200$$

$$16x = 7200$$

$$x = \frac{7200}{16} \quad x = 450$$

450 votes from Republicans,
2250 " " Independents, and
6500 votes from Democrats.

Nov 14-9:12 AM

Find two consecutive odd integers
such that 5 times the smaller one
is equal to 58 more than 3 times
the larger one.

$$x \text{ \& \; } x+2$$

$$5 \cdot \text{Smaller} = 3 \cdot \text{larger} + 58$$

NO
Solution

$$5x = 3(x+2) + 58$$

$$5x = 3x + 6 + 58$$

$$5x - 3x = 64$$

$$2x = 64$$

$$x = 32$$

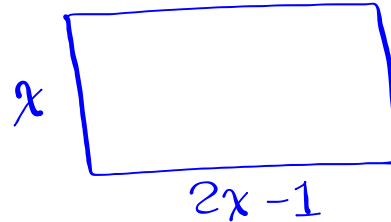
Not odd

Nov 14-9:20 AM

The perimeter of a rectangular garden is 106 meters.

The length is 1 meter shorter than twice its width.

find its area.



$$P = 106$$

$$2L + 2W = 106$$

$$2(2x - 1) + 2x = 106$$

$$4x - 2 + 2x = 106$$

$$\Rightarrow 6x = 108$$

$$\boxed{x = 18}$$

$$\text{width} = 18 \text{ m}$$

$$\text{Length} = 35 \text{ m}$$

$$A = LW = 35(18) = \boxed{630 \text{ m}^2}$$

Nov 14-9:24 AM

Finish Your
Graphing Project.

Nov 14-9:29 AM