Math 115

Fall 2018

Lecture 11

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

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

Feb 19-8:47 AM

Some Review:

Graph

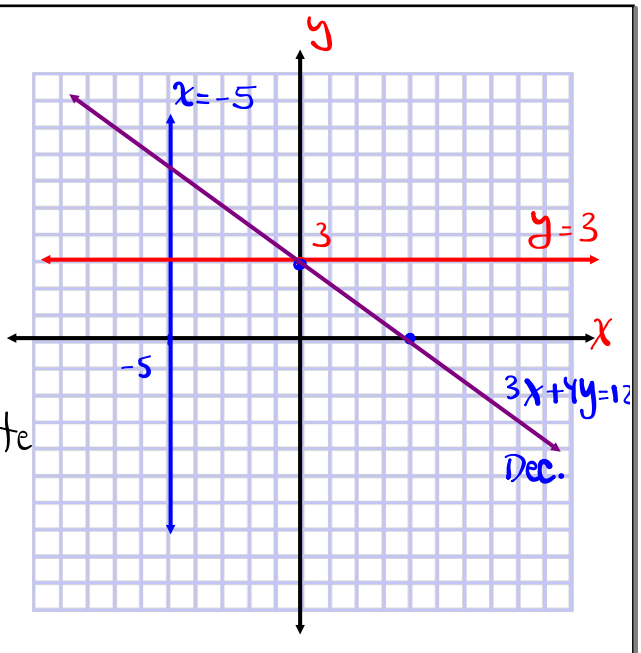
$x = -5$ → V.L.

$y = 3$ → H.L.

$3x + 4y = 12$ → S.L.

in the same Rectangular Coordinate System.

x	y
0	3
4	0



Nov 7-6:01 AM

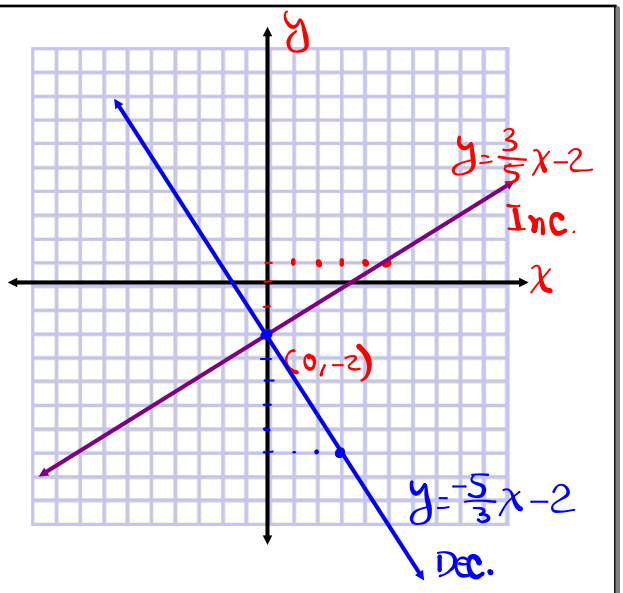
Graph

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

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

Slope-Int method

in the same Coordinate System.



$\frac{3}{5} \cdot \frac{-5}{3} = \frac{-15}{15} = -1$

Since the product of their slopes is -1, then the lines must be perpendicular.

Nov 7-6:09 AM

Graph

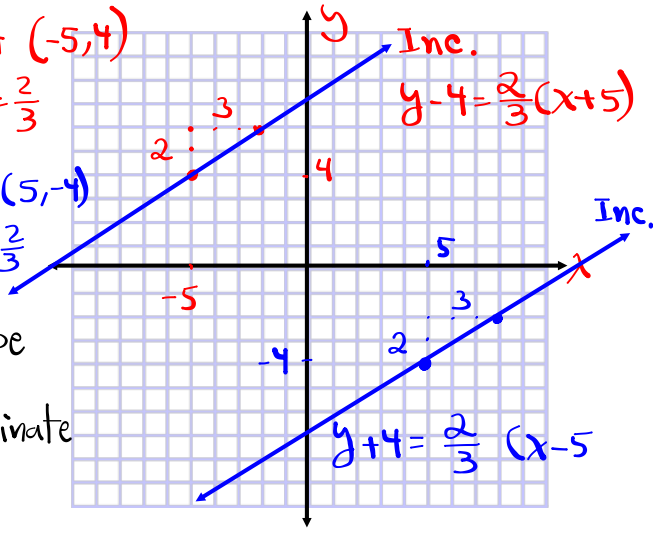
$y - 4 = \frac{2}{3}(x + 5)$

&

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

by using Point-Slope

in the Same Coordinate System.



Since both slopes are equal, then these two lines are parallel.

Nov 7-6:16 AM

Given A(-7, 3) and B(5, -3)

Find

1) Distance from A to B.

2) midpoint of $\overline{AB}$

3) Slope of $\overleftrightarrow{AB}$

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

$= \sqrt{(-7-5)^2+(3-(-3))^2}$

$= \sqrt{(-12)^2+6^2}$

$= \sqrt{144+36} = \sqrt{180}$

≈ 13.4

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

$= M\left(\frac{-7+5}{2}, \frac{3+(-3)}{2}\right) = M\left(\frac{-2}{2}, \frac{0}{2}\right) = M(-1, 0)$

$m = \frac{y_1-y_2}{x_1-x_2} = \frac{3-(-3)}{-7-5} = \frac{3+3}{-12} = \frac{6}{-12} = \frac{-1}{2}$

Always keep slope in reduced fraction, and keep − in the numerator.

Stay away from decimals or mixed numbers.

Nov 7-6:24 AM

Draw a line that contains (4, -3) with

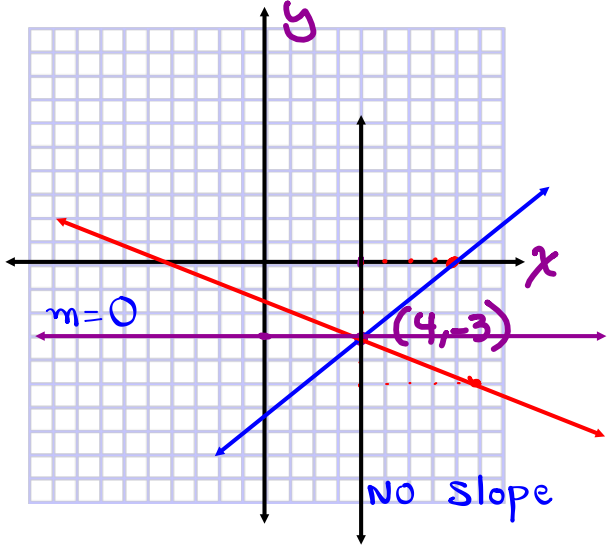
1) Slope $\frac{3}{4}$

2) Slope $\frac{-2}{5}$

3) Zero Slope → H.L.

4) Undefined Slope

V.L.

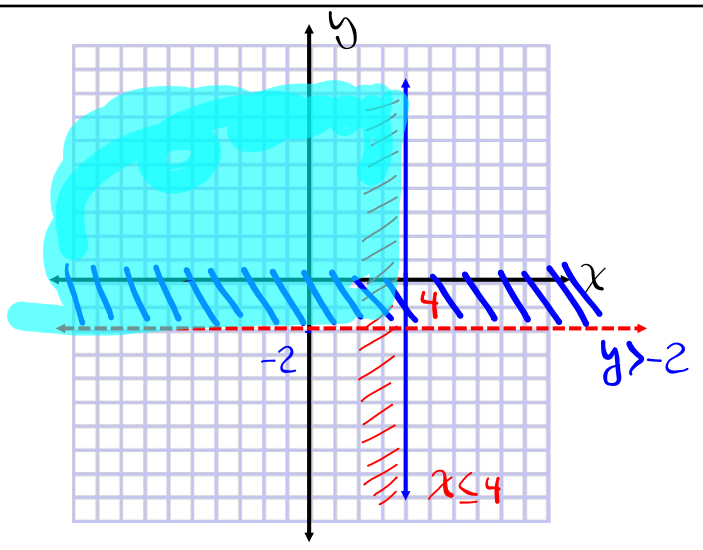


Nov 7-6:36 AM

Graph & Shade

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

in the same rectangular coordinate system.

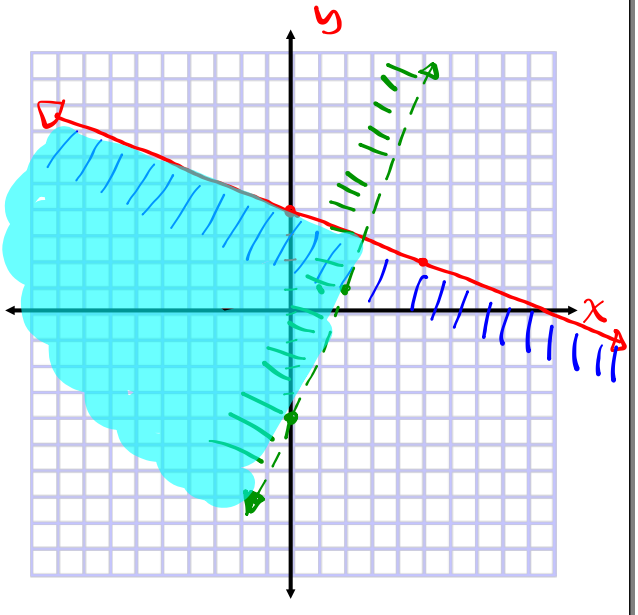


Nov 7-6:46 AM

Graph & Shade

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

in the same rectangular coordinate system.



Nov 7-6:52 AM

write $3x - 2y + 7 < 2x + 4y - 5$ in Slope-Int. form, then draw and shade.

Isolate y

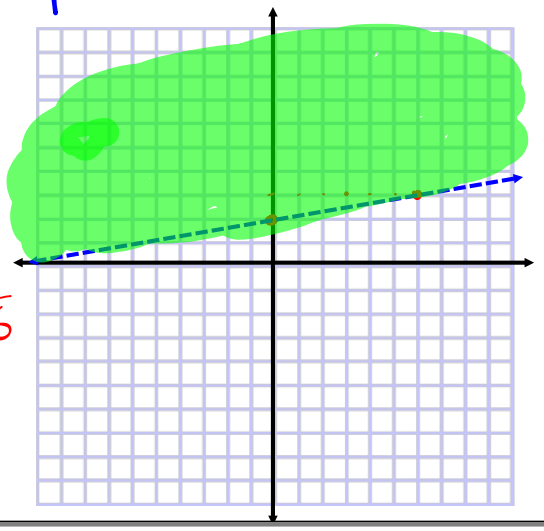
$-2y - 4y < 2x - 5 - 3x - 7$

$-6y < -x - 12$

Divide by -6

$\frac{-6}{-6}y > \frac{-x}{-6} - \frac{12}{-6}$

$y > \frac{1}{6}x + 2$



Nov 7-7:01 AM

How to find equation of a line that contains the point (x_1, y_1) with

1) Zero slope → H.L. → y-only → $\boxed{y = y_1}$

2) undefined slope → V.L. → x-only → $\boxed{x = x_1}$

3) given slope → use point-slope formula

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

we have to simplify this.

Nov 7-7:32 AM

Find equation of a line that contains $(-4, 3)$ with

1) Zero Slope → H.L. → y-only → $\boxed{y = 3}$

2) undefined slope → V.L. → x-only → $\boxed{x = -4}$

3) Slope -2. → use Point-Slope formula

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

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

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

$y - 3 = -2x - 8$ → $y = -2x - 8 + 3$

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

$y = mx + b$ → Slope-Int form

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

$Ax + By = C$ Standard form

Nov 7-7:35 AM

Find equation of a line that contains $(4, -2)$ with

1) $m = 0$ → H.L. → y-only → $\boxed{y = -2}$

2) NO Slope → V.L. → x-only → $\boxed{x = 4}$

3) Slope $-\frac{1}{4}$. → use Point-Slope formula

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

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

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

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

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

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

Slope-Int form

LCD = 4

$4y = -x - 4$

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

Nov 7-7:39 AM

Find eqn of a line that contains the origin (0,0) with

1) Zero slope
H.L. → y-only → $y=0$
3) $m=0$

2) Undefined slope
V.L. → x-only → $x=0$
4) No slope

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

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

$y=\frac{3}{5}x$ Slope-Int form

$5y=3x$

$-3x+5y=0$

$3x-5y=0$ Standard form

6) $m=\frac{-5}{3}$

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

$y=\frac{-5}{3}x$ Slope-Int form

$3y=-5x$

$5x+3y=0$ Standard form.

Nov 7-7:48 AM

How to find equation of a line that contains two points (x_1,y_1) and (x_2,y_2):

1) Find slope → $m=\frac{y_1-y_2}{x_1-x_2}$ or $m=\frac{y_2-y_1}{x_2-x_1}$

2) choose one of the points and slope
Now refer to earlier method.

ex: Find eqn of a line that contains $(4,3)$ and $(0,2)$.

$m=\frac{y_1-y_2}{x_1-x_2}=\frac{3-2}{4-0}=\frac{1}{4}$

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

$y-2=\frac{1}{4}(x-0)$

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

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

$4y=x+8$

$-x+4y=8$

$x-4y=-8$

Nov 7-7:55 AM

Find the equation of a line that contains $(-3, 0)$ and $(1, -5)$.

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

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

$m = \frac{0 - (-5)}{-3 - 1} = \frac{5}{-4} = \boxed{\frac{-5}{4}}$

$y - 0 = \frac{-5}{4}(x - -3)$

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

$\boxed{y = \frac{-5}{4}x - \frac{15}{4}}$ Slope-Int form

LCD = 4

$4y = -5x - 15$

$\boxed{5x + 4y = -15}$ Standard form

Nov 7-8:02 AM

Find equation of a line that contains $(5, -2)$ and

1) $(-3, -2)$ $(5, -2)$

$m = \frac{-2 - (-2)}{-3 - 5} = \frac{0}{-8} = 0$

$\boxed{y = -2}$

2) $(5, 4)$ $(5, -2)$

$m = \frac{4 - (-2)}{5 - 5} = \frac{6}{0}$

undefined

$\boxed{x = 5}$

3) $(4, 0)$ $(5, -2)$

$m = \frac{0 - (-2)}{4 - 5} = \frac{2}{-1} = -2$

$y - 0 = -2(x - 4)$

$\boxed{y = -2x + 8}$

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

Nov 7-8:09 AM

Find eqn of a line that contains $(3,-4)$ and is parallel to the line $y = 2x + 1$

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

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

$y + 4 = 2x - 6$

$y = 2x - 6 - 4$

$y = 2x - 10$

Nov 7-8:24 AM

Find eqn of a line that contains $(-3,4)$ and it is parallel to $y = \frac{-4}{3}x + 6$.

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

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

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

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

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

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

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

$3y = -4x$

$4x + 3y = 0$

Nov 7-8:27 AM

Find equation of a line that contains $(0, -2)$ and it is perpendicular to $y = \frac{3}{4}x + 4$.

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

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

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

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

$3y = -4x - 6$

$4x + 3y = -6$

$3y + 4x = -6$

- Reciprocal

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

Nov 7-8:32 AM

Find eqn of a line that contains the origin $(0,0)$ and it is perpendicular to the line $y = \frac{-1}{2}x + 3$.

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

$y - 0 = 2(x - 0)$

$y = 2x$ Slope-Int.

- Reciprocal

$-\frac{-2}{1} = 2$

$-2x + y = 0$

$2x - y = 0$ Standard form.

Nov 7-8:39 AM