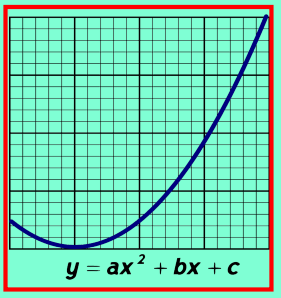
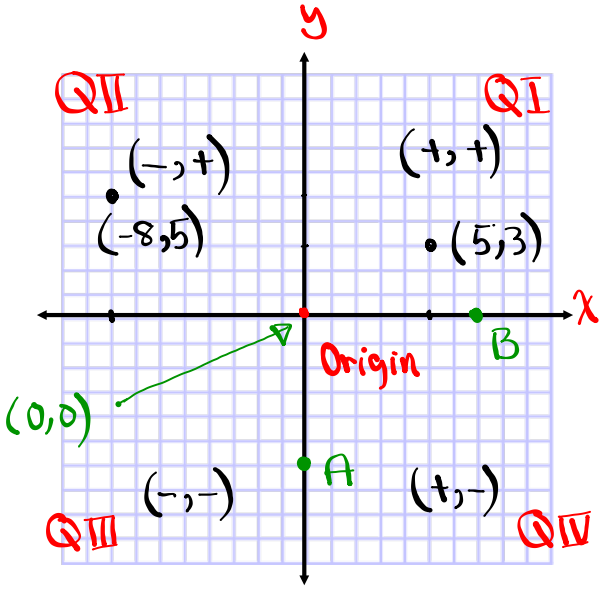
Math 125

Spring 2021

Lecture 2





Rectangular Coordinate System

Points ⇒ Ordered-Pairs (x, y)

Plot $(5,3)$

Plot $(-8,5)$

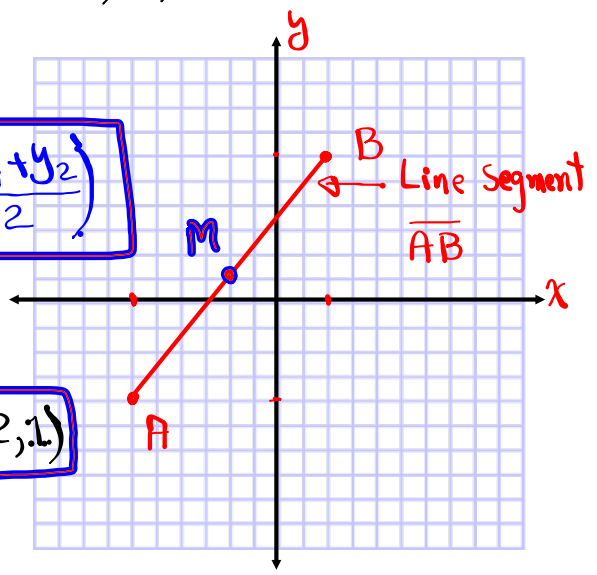
Plot $A(0,-6)$ & $B(7,0)$

Plot $A(-6,-4)$ & $B(2,6)$, then connect A to B by a straight line.

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

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

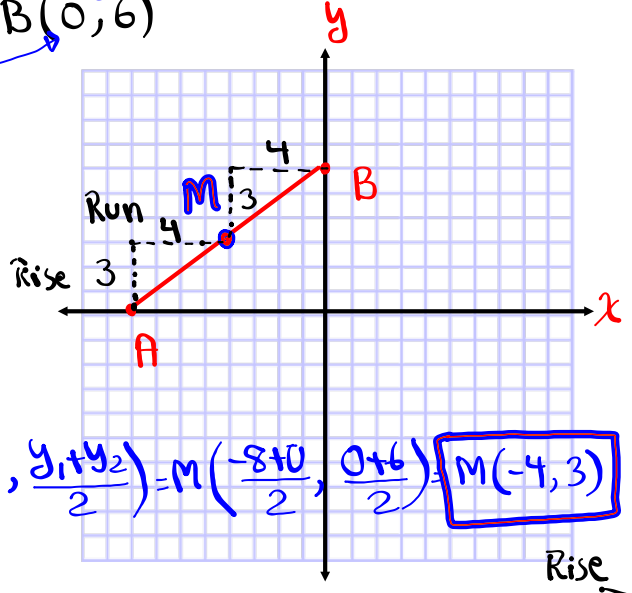
$= M\left(\frac{-6+2}{2}, \frac{-4+6}{2}\right) = M(-2,1)$



Given $A(-8,0)$ & $B(0,6)$

1) Draw $\overline{AB}$ line Segment

2) Find & Plot its midpoint M



$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = M\left(\frac{-8+0}{2}, \frac{0+6}{2}\right) = M(-4,3)$

Slope of a line

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

$$m = \frac{0-6}{-8-0} = \frac{-6}{-8} = \frac{3}{4}$$

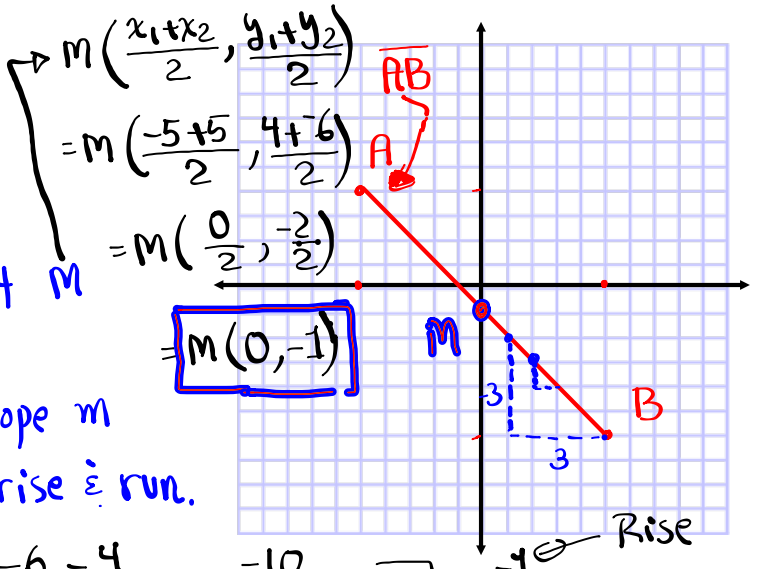
Rise / Run

Consider $A(-5,4)$ & $B(5,-6)$

1) Draw $\overline{AB}$

2) Find & plot its midpoint M

$$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$
$$= M\left(\frac{-5+5}{2}, \frac{4+(-6)}{2}\right)$$
$$= M\left(\frac{0}{2}, \frac{-2}{2}\right)$$
$$= \boxed{M(0,-1)}$$

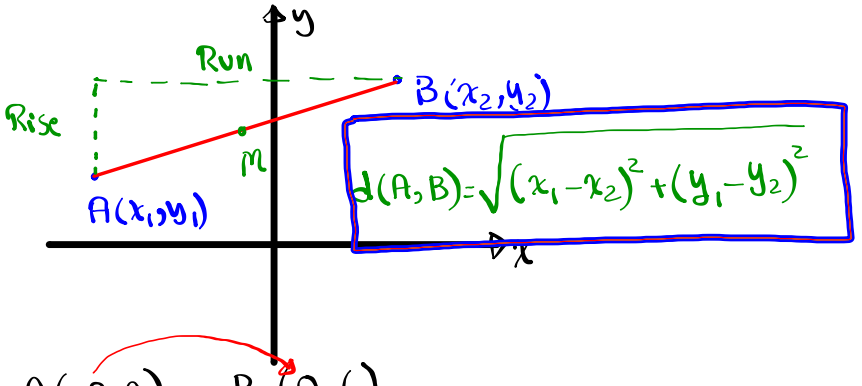


3) Find its slope m and show rise & run.

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{-6-4}{5-(-5)} = \frac{-10}{10} = \boxed{-1} = \frac{-1}{1}$$

Rise / Run

Distance between two Points $A(x_1,y_1)$ & $B(x_2,y_2)$



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

$A(-3,2)$, $B(0,6)$

$$d(A,B) = \sqrt{(x_1-x_2)^2+(y_1-y_2)^2} = \sqrt{(-3-0)^2+(2-6)^2}$$
$$= \sqrt{(-3)^2+(-4)^2}$$
$$= \sqrt{9+16} = \sqrt{25} = \boxed{5}$$

Given $A(-6,-2)$ & $B(8,6)$

1) Find midpoint M

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

$$= M\left(\frac{-6+8}{2}, \frac{-2+6}{2}\right)$$

$$= \boxed{M(1,2)}$$

2) Find Slope m

$$m = \frac{y_1-y_2}{x_1-x_2} = \frac{-2-6}{-6-8} = \frac{-8}{-14}$$

Rise → 4

Run → 7

$$= \frac{4}{7}$$

3) Find d(A, B)

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

$$= \sqrt{(-6-8)^2+(-2-6)^2} = \sqrt{(-14)^2+(-8)^2} = \sqrt{196+64} = \sqrt{260}$$

$$\approx \boxed{16.125}$$

Equation & Type of lines:

$x = a$ Vertical line

$y = b$ Horizontal line

Slant lines:

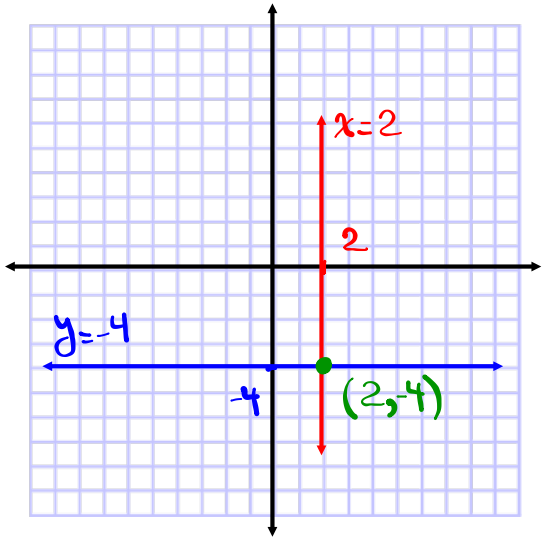
- $Ax + By = C$ Standard Form
- $Ax + By + C = 0$ Standard Form
- $y = mx + b$ Slope-Int. Form
- $y - y_1 = m(x - x_1)$ Point-Slope Form

Draw $x=2$ & $y=-4$ in the Same Coordinate System.

Clearly mark & label their intersection Point.

$x=2$ Vertical line

$y=-4$ Horizontal line

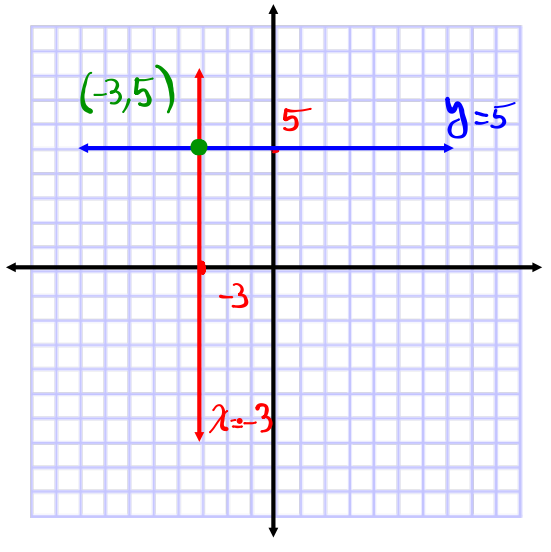


Draw $x=-3$ & $y=5$ in the Same rectangular Coordinate System.

Clearly mark & label their intersection point.

$x=-3$ V.L.

$y=5$ H.L.



Draw $2x - 5y = 10$ by intercept method.

Standard form

x	y
0	-2
5	0

$2(0) - 5y = 10$

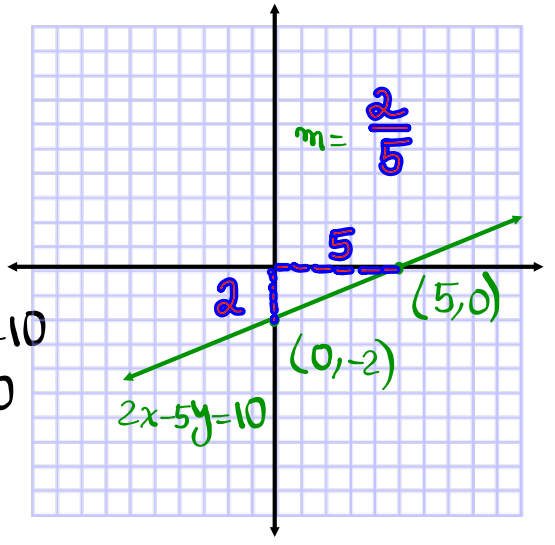
$-5y = 10$

$y = -2$

$2x - 5(0) = 10$

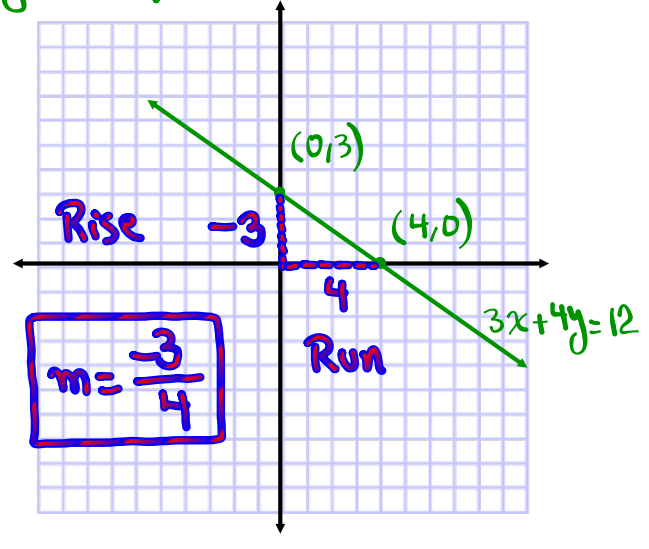
$2x = 10$

$x = 5$



Draw $3x + 4y = 12$ by intercept method.

x	y
0	3
4	0



Draw $y = \frac{2}{5}x + 4$ using Y-Int & slope.

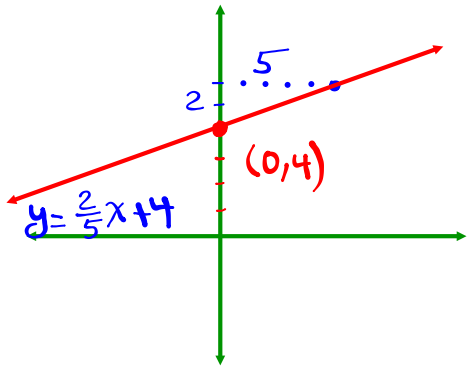
Slope-Int Form

$y = mx + b$

Y-Int $(0, b)$

$(0, 4)$

$m = \frac{2}{5}$

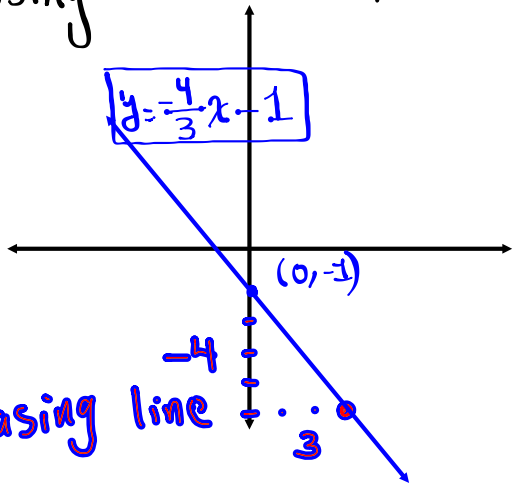


Draw $y = \frac{-4}{3}x - 1$ using Y-Int & Slope.

$y = mx + b$

$m = \frac{-4}{3}$ $\frac{\text{Rise}}{\text{Run}}$

Y-Int $(0, -1)$



$m > 0 \Leftrightarrow$ Increasing line

$m < 0 \Leftrightarrow$ Decreasing line

Graph $4x-3y=-12$ and $y=\frac{-3}{4}x-2$ in the Same Coordinate System.

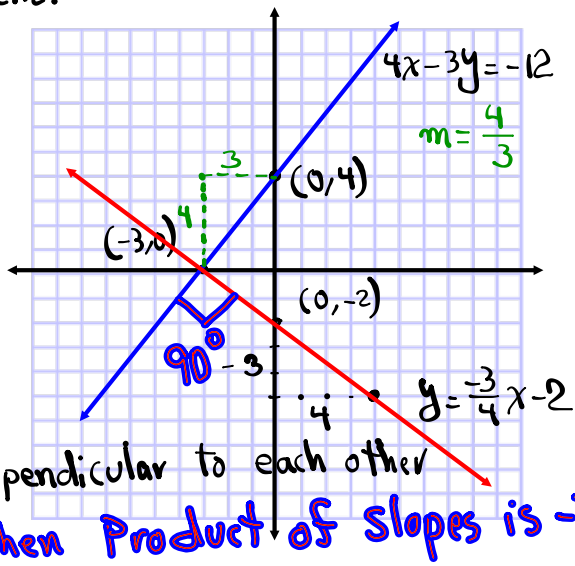
$4x-3y=-12$

x	y
0	4
-3	0

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

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

y-Int $(0,-2)$



Perpendicular to each other when Product of slopes is -1.

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

Draw $y=\frac{2}{5}x$ and $2x-5y=-10$ in the Same Coordinate System.

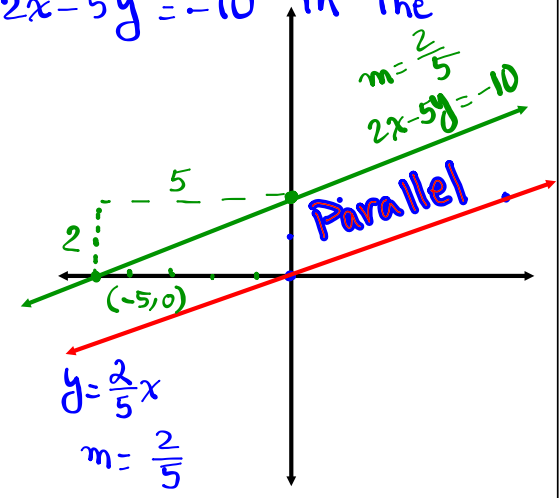
$y=\frac{2}{5}x$

$m=\frac{2}{5}$

Y-Int $(0,0)$

$2x-5y=-10$

x	y
0	2
-5	0



When two slopes are equal ⇒ lines are Parallel "Different Y-Ints"

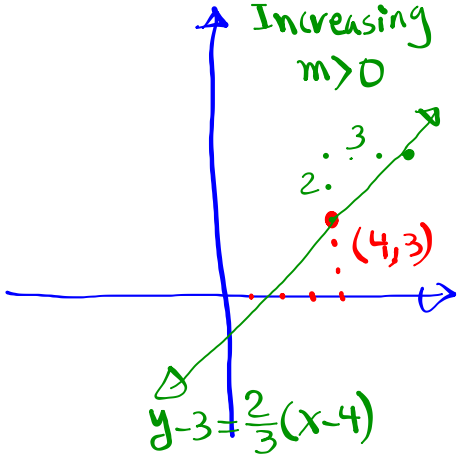
Graph $y-3=\frac{2}{3}(x-4)$

Point-slope

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

$m=\frac{2}{3}$ ← Rise / Run

$(x_1, y_1)=(4, 3)$



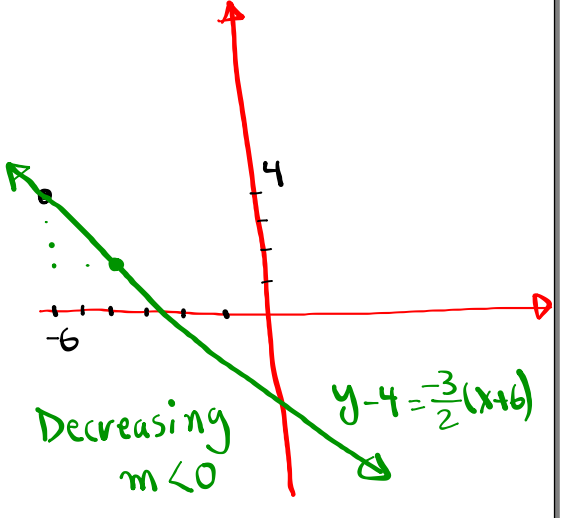
Draw $y-4=\frac{-3}{2}(x+6)$

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

Point $(-6,4)$

Slope $m=\frac{-3}{2}$ Rise / Run

Draw

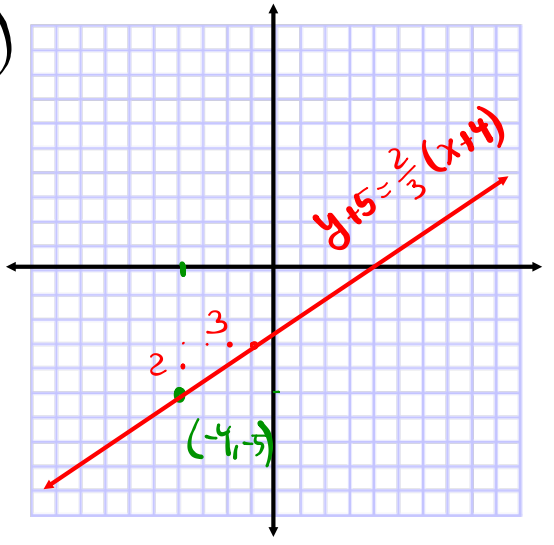


Draw $y+5=\frac{2}{3}(x+4)$

Point $(-4,-5)$

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

Draw



Some algebra review:

Solve $3(x+2)-10=5x+12$

$3x+6-10=5x+12$

$3x-4=5x+12$

$3x-5x=12+4$

$-2x=16$

$x=\frac{16}{-2}$

$x=-8$

Solution Set $\{-8\}$

Simplify $(x^6)^4 \cdot (x^7)^3$

$= x^{24} \cdot x^{21}$

$= x^{24+21} = \boxed{x^{45}}$

Exponential Rules

$(x^m)^n = x^{m \cdot n}$

$x^m \cdot x^n = x^{m+n}$

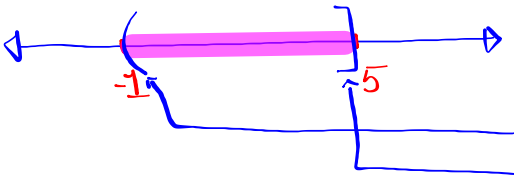
Solve & graph $-5 < 3x - 2 \leq 13$

isolate x in the middle.

$-5+2 < 3x - 2 + 2 \leq 13 + 2$

$-3 < 3x \leq 15$

$\frac{-3}{3} < \frac{3}{3}x \leq \frac{15}{3}$



$\boxed{-1 < x \leq 5}$

use FOIL to multiply

$(5x^2 + 4y^3)(5x^2 - 4y^3)$

$= 5x^2 \cdot 5x^2 - 5x^2 \cdot 4y^3 + 4y^3 \cdot 5x^2 - 4y^3 \cdot 4y^3$

$= 25x^4 - 20x^2y^3 + 20x^2y^3 - 16y^6$

$= \boxed{25x^4 - 16y^6}$

1) Do SG 0, and submit one File only.
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Portrait Style

2) WORK on SG 1
Review Your notes when doing SG 1

3) Read the Syllabus, ask Q on Wednesday.

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

1) Draw $\overline{AB}$

2) Find midpoint M

3) Find Slope m