Math 115

Spring 2018

Lecture 10

$? \; a^2 + b^2 = c^2 \; ?$
$?$
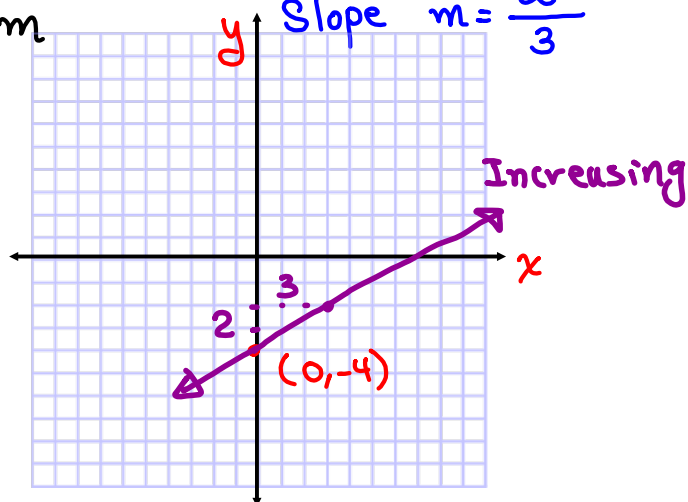$y = mx + b \quad d = rt$

Slope-Int. Form

$y = mx + b$

Y-Int $(0, b)$

Slope m

$y = \dfrac{2}{3} x - 4$
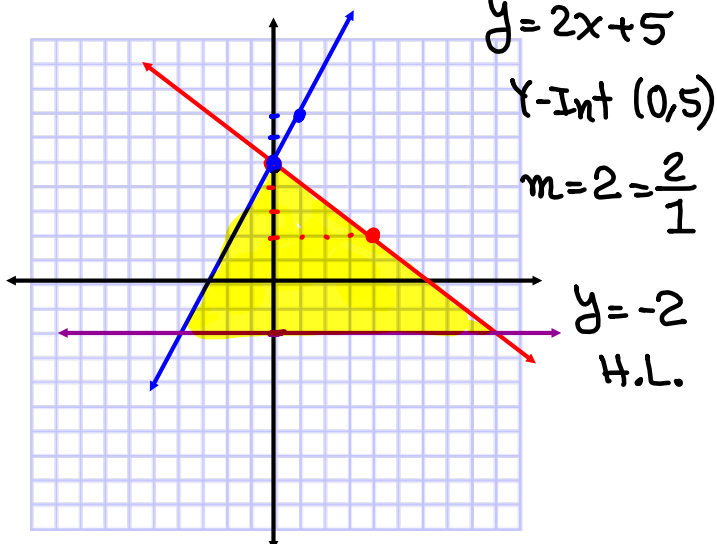
Y-Int $(0, -4)$

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

Increasing

$(0, -4)$

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

Y-Int $(0,4)$

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

Graph

Increasing / Decreasing.

(0,4)

Decreasing

$m > 0 \iff$ Increasing

$m < 0 \iff$ Decreasing

$m = 0 \iff$ Horizontal line

NO Slope $\iff$ m is undefined $\iff$ Vertical line

Graph $x = -4$, $y = 3$, and $y = \frac{2}{5}x - 2$ in the same coordinate system.

$x = -4$
V.L.

$y = 3$
H.L.

$x = -4$

$y = 3$ 3

-4

Slope-Int form

Slant line

Y-Int $(0, -2)$

$m = \frac{2}{5}$
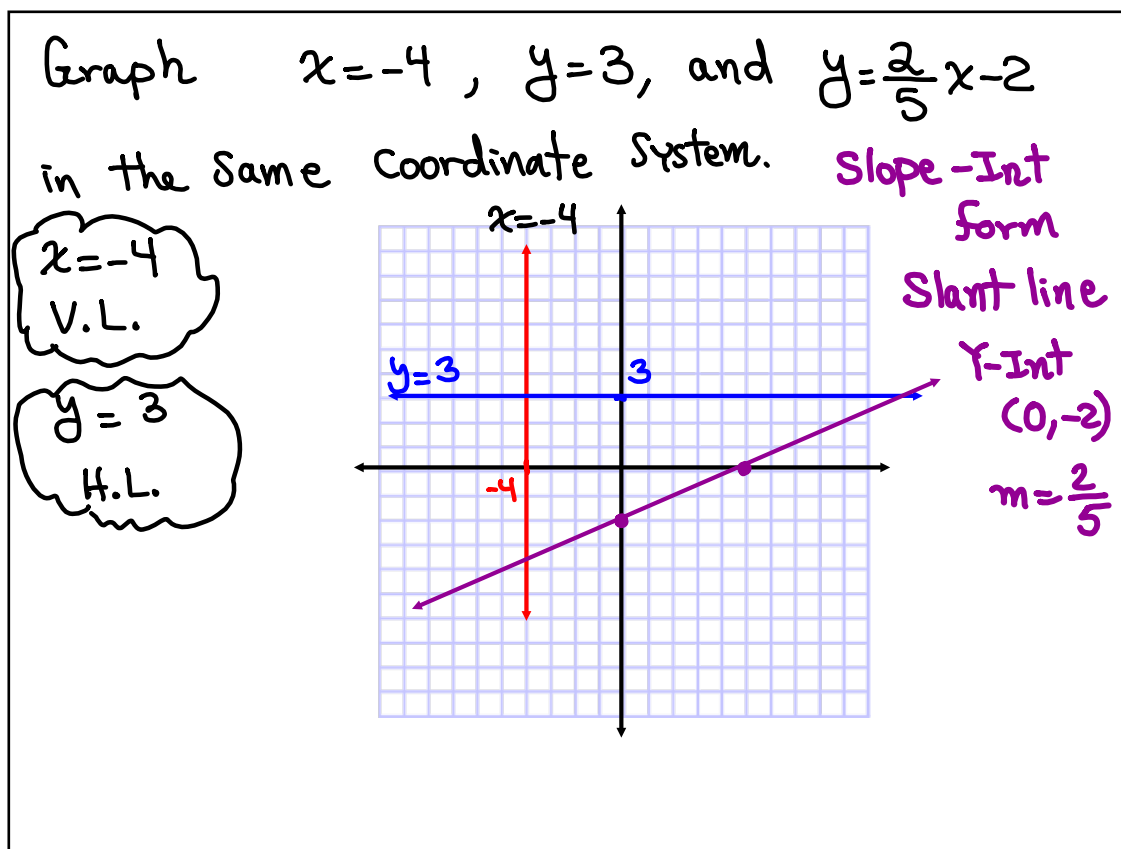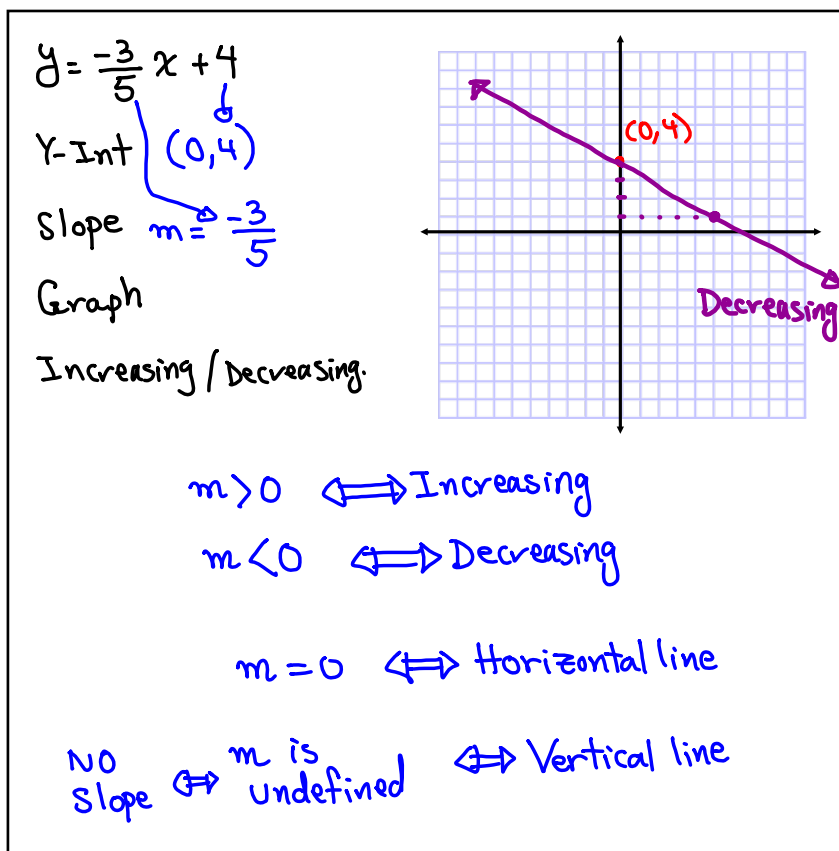
Graph $y = \frac{-3}{4}x + 5$, $y = 2x + 5$, and $y = -2$ in the same coordinate system

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

Y-Int $(0, 5)$

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

$y = 2x + 5$

Y-Int $(0, 5)$

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

$y = -2$

H.L.

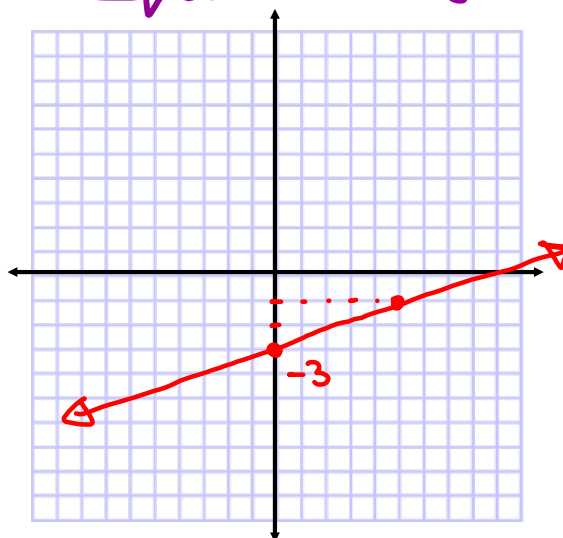Write $2x - 5y = 15$ in Slope-Int form, then draw it.

$y = mx + b$

Solve for y

$-5y = -2x + 15$

$\frac{-5}{-5}y = \frac{-2}{-5}x + \frac{15}{-5}$
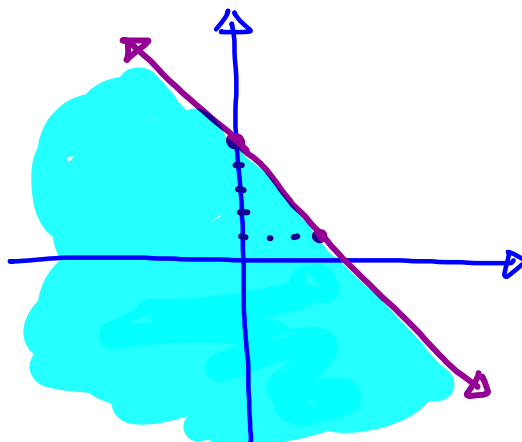
$y = \frac{2}{5}x - 3$

Y-Int $(0, -3)$
Slope $m = \frac{2}{5}$

-3

Write $4x + 3y = 15$ in slope-Int form, draw the line, and shade below it.

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

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

Point - Slope form
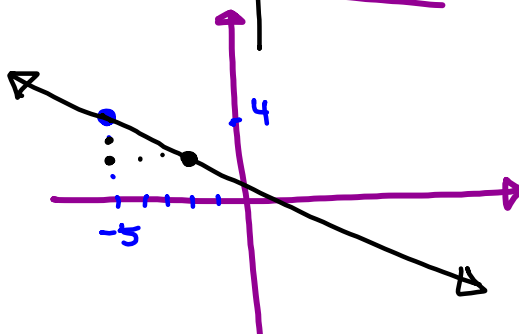
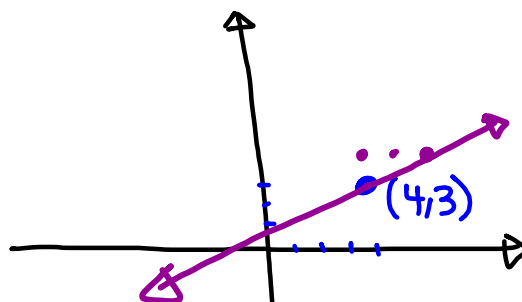$$y - y_1 = m(x - x_1)$$

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

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

Point $(4, 3)$

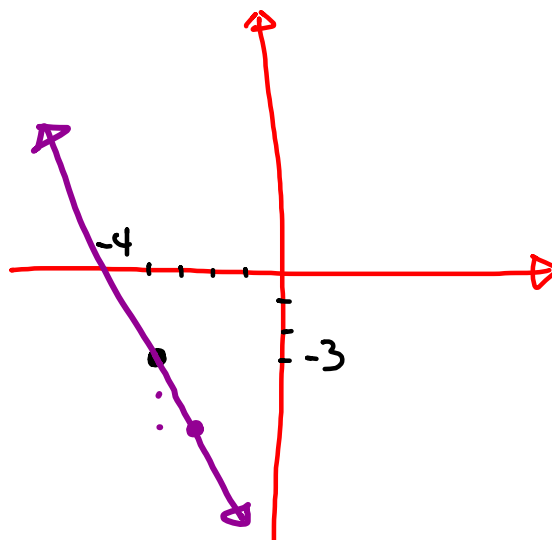$$y - 4 = \frac{-2}{3}(x + 5)$$

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

Point $(-5, 4)$

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

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

Point $(-4, -3)$

Draw

-4

-3

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

Y-Int $(0,2)$

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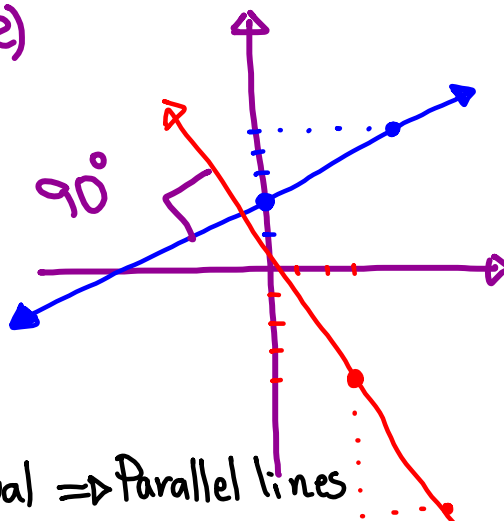
$y + 4 = \frac{-5}{3}(x-3)$

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

Point $(3, -4)$

$90°$

when slopes are equal $\Rightarrow$ Parallel lines

when product of slopes is -1 $\Rightarrow$ Perpendicular lines

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

$A(-5,3)$, $B(5,-6)$

$M\left(\dfrac{-5+5}{2}, \dfrac{3+\,-6}{2}\right)$

① Draw $\overline{AB}$

$M\left(0, \dfrac{-3}{2}\right)$

② Find midpoint

A

③ find distance

-9

M

④ find slope

10

$m = \dfrac{3-(-6)}{-5-5} = \dfrac{9}{-10}$

$\boxed{m = \dfrac{-9}{10}}$

$d = \sqrt{(-5-5)^2 + (3--6)^2}$

$= \sqrt{(-10)^2 + (9)^2}$

$= \sqrt{181} \approx \boxed{13.45}$

$A(-4,-6)$ $B(0,8)$

$M\left(\dfrac{-4+0}{2}, \dfrac{-6+8}{2}\right)$

① Draw $\overline{AB}$ line Segment

8 B

$M(-2,1)$

② find & Plot its Midpoint

$m = \dfrac{-6-8}{-4-0}$

M

$m = \dfrac{14}{4} = \boxed{\dfrac{7}{2}}$

$= \dfrac{-14}{-4} = \dfrac{7}{2}$

③ find its slope, show rise & run

-6

A

④ find the distance from A to B.

$d = \sqrt{(-4-0)^2 + (-6-8)^2}$

$= \sqrt{(-4)^2 + (-14)^2}$

$m = \dfrac{8-(-6)}{0-(-4)} = \dfrac{14}{4} = \dfrac{7}{2}$

$= \sqrt{212} \approx 14.56$

SG 8 Due Wednesday at 6:15 AM.

Finding equation of a line

a) when we have slope and one pt.

m & (x_1, y_2)

use Point-Slope formula

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

Simplify, write ans in Slope-Int form $y = mx + b$

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find equation of a line that contains (2, -3) with slope 4.
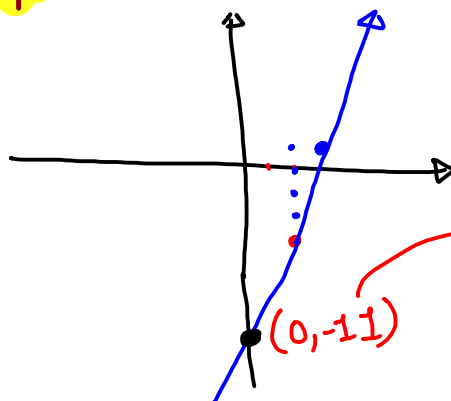
we have one pt (2, -3)

&

Slope 4

$\frac{4}{1}$

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

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

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

$$\boxed{y = 4x - 11}$$

(0, -11)

find equation of a line that contains
(3,-4) with slope $\frac{-2}{3}$.

one point (3,-4)

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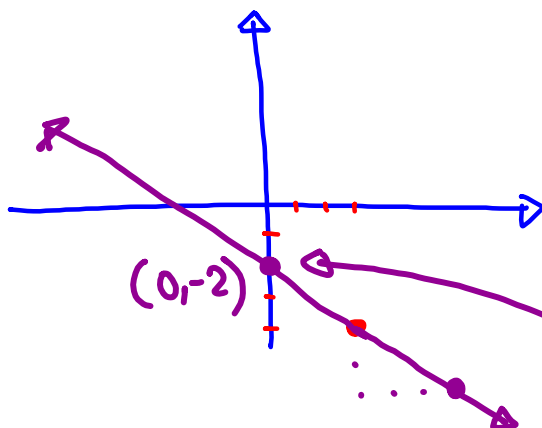
Point-Slope

$$\boxed{y - y_1 = m(x - x_1)}$$

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

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

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

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

(0,-2)

Finding equation of a line

b) when we have two Points
(x_1, y_1) & (x_2, y_2)

① find Slope $m = \dfrac{y_1 - y_2}{x_1 - x_2}$, $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

② use the slope and one of the pts
to proceed.

③ final Ans in Slope-Int form $y = mx + b$

find eqn of a line that contains
(2,-5) and (0,4)

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

$m = \dfrac{-5 \; -4}{2 - 0} = \dfrac{-9}{2}$

$y - 4 = \dfrac{-9}{2}(x - 0)$

$\boxed{m = \dfrac{-9}{2}}$

$y - 4 = \dfrac{-9}{2}x$

$\boxed{y = \dfrac{-9}{2}x + 4}$

4

-9 2

-5 2

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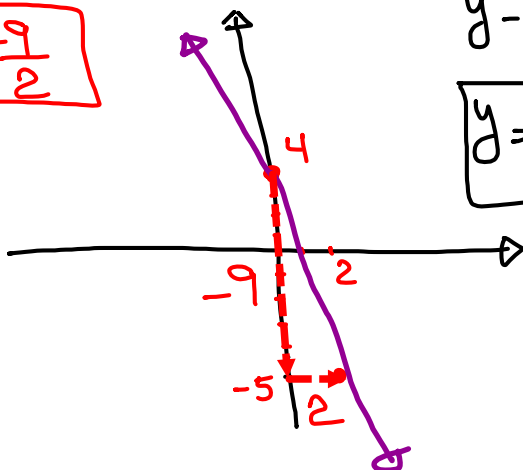
find eqn of aline that contains
(-3,5) and (2,-1)

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

$m = \dfrac{y_1 - y_2}{x_1 - x_2} = \dfrac{5 - (-1)}{-3 - 2}$

$y - 1 = \dfrac{-6}{5}(x - 2)$

$= \dfrac{6}{-5} = \boxed{\dfrac{-6}{5}}$

$y + 1 = \dfrac{-6}{5}(x - 2)$

LCD = 5

$5y + 5 = -6(x - 2)$

$\boxed{y = \dfrac{-6}{5}x + \dfrac{7}{5}}$

$5y + 5 = -6x + 12$

$5y = -6x + 7$

Special Cases:
find eqn of a line that contains
(x_1, y_1) with

a) Zero slope $\Rightarrow$ Horizontal $\Rightarrow y = y_1$
line

b) NO slope $\Rightarrow$ Vertical $\Rightarrow x = x_1$
line

c) Undefined slope $\Rightarrow$ Vertical $\Rightarrow x = x_1$
line

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find eqn of a line that contains
$(4, -3)$ with

a) Zero slope
Horizontal line
$y = -3$

b) NO slope
Vertical line
$x = 4$

c) Undefined slope
Vertical line
$x = 4$

find eqn of a line that contains
(-3,5) and (2,5).

$m = \dfrac{5-5}{-3-2} = \dfrac{0}{-5} = \boxed{0}$

Zero Slope → H.L. → $\boxed{y=5}$

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find eqn of a line that contains
(-4,7) and (-4,-2).

$m = \dfrac{7-(-2)}{-4-(-4)} = \dfrac{7+2}{-4+4} = \dfrac{9}{0}$

→ Undefined Slope
NO Slope
V.L. ⇒ $\boxed{x=-4}$

Class Quiz

① Graph $x=4$ & $y=-5$ in the same coordinate System.

② Write $2x + 3y = 12$ in Slope-Int form, then graph it. Show Rise & Run.