Math 115

Spring 2019

Lecture 11

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

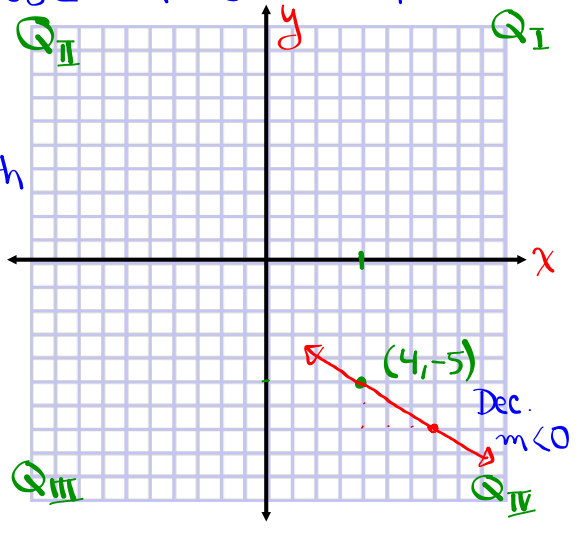
$y = mx + b \quad ? \quad d = rt$

Feb 19-8:47 AM

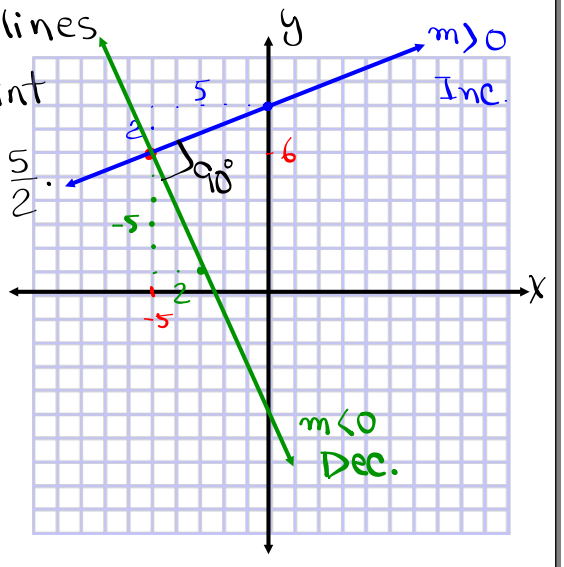
Slope $\Rightarrow \frac{\text{Rise}}{\text{Run}}$, when $-$, place $-$ in the numerator, always use m for slope.

Draw a line that contains $(4, -5)$ with slope $\frac{-2}{3}$.

$\frac{\text{Rise}}{\text{Run}} = \frac{-2}{3}$



Plot $(-5, 6)$, and two lines that contains this point with slope $\frac{2}{5}$ and $-\frac{5}{2}$.



$m = \frac{2}{5}$ $\frac{\text{Rise}}{\text{Run}}$

$m = -\frac{5}{2} = \frac{-5}{2} = \frac{\text{Rise}}{\text{Run}}$

Since $\frac{2}{5} \cdot \frac{-5}{2} = -1$

$\Rightarrow$ These two lines are $\perp$. ← Perpendicular

Write $4x - 3y = 18$ in Slope-Int. form, identify slope & y-Int, then draw.

$y = mx + b$

$4x - 3y = 18$

$-3y = -4x + 18$

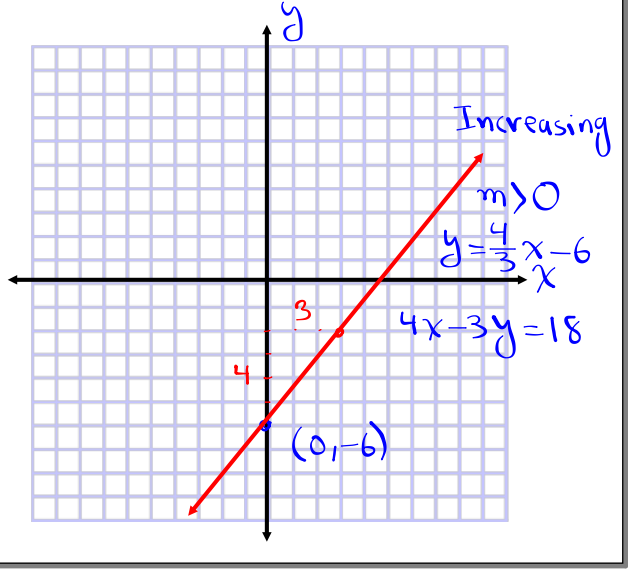
$y = \frac{-4}{-3}x + \frac{18}{-3}$

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

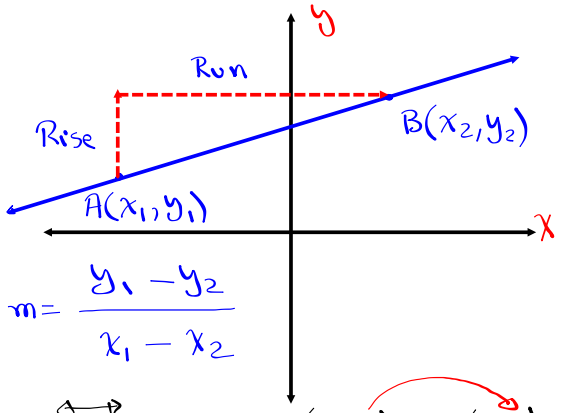
$y = mx + b$

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

Y-Int $(0, -6)$



How to find slope when two points are given:



Rise $= y_2 - y_1$

Run $= x_2 - x_1$

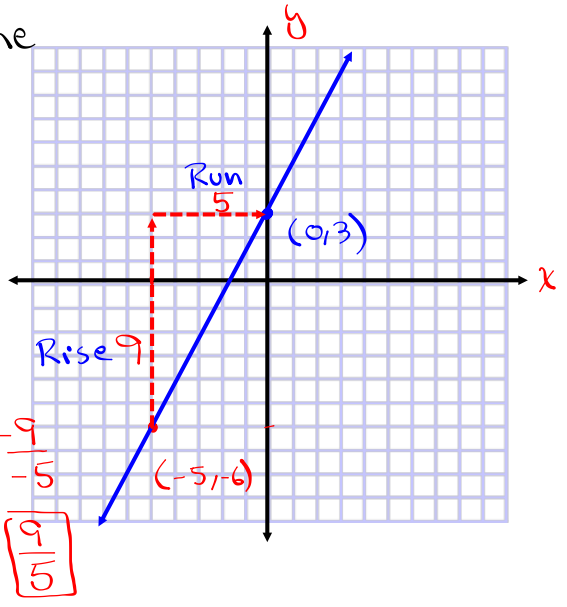
$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ or $m = \dfrac{y_1 - y_2}{x_1 - x_2}$

Find slope of line $\overleftrightarrow{AB}$ with A(-2,5) & B(4,1)

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

$m = \dfrac{y_1 - y_2}{x_1 - x_2}$ $\quad m = \dfrac{1-5}{4-(-2)} = \dfrac{-4}{6} = \boxed{\dfrac{-2}{3}}$

Find slope of a line that contains (-5,-6) and (0,3). Graph the line, show Rise & Run.

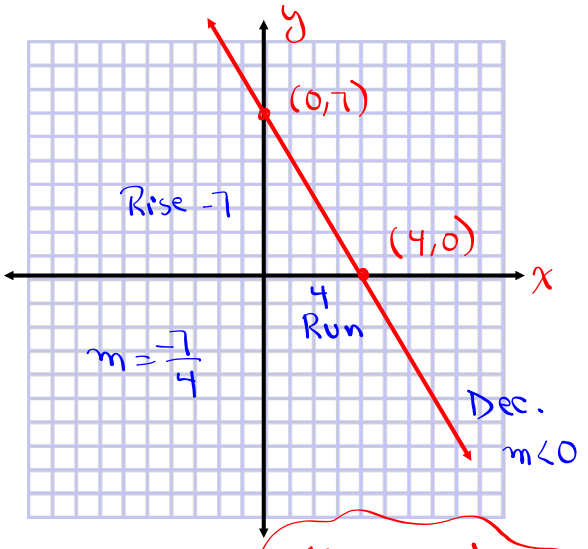


$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\quad m = \dfrac{-6-3}{-5-0} = \dfrac{-9}{-5} = \boxed{\dfrac{9}{5}}$

Graph a line that contains (0,7) and (4,0)

show rise & run of its slope.

Find its slope using the formula.



(0,7), (4,0)

$m=\frac{7-0}{0-4}=\frac{7}{-4}=\boxed{\frac{-7}{4}}$

(0,7), (4,0)

$m=\frac{0-7}{4-0}=\boxed{\frac{-7}{4}}$

No mixed numbers, No decimals for slope

Given: A(-3,-7) & B(0,5)

Suggestion: Draw first.

① Find d(A,B)

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

$=\sqrt{(-3-0)^2+(-7-5)^2}$

$=\sqrt{(-3)^2+(-12)^2}$

$=\sqrt{9+144}$

$=\sqrt{153}$

$\approx\boxed{12.4}$

② Find midpoint M of $\overline{AB}$

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

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

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

$=\boxed{M(-1.5,-1)}$

③ Find slope m of $\overleftrightarrow{AB}$

(-3,-7) & (0,5)

$m=\frac{y_1-y_2}{x_1-x_2}=\frac{-7-5}{-3-0}=\frac{-12}{-3}=\boxed{4}$

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

Point – Slope Formula

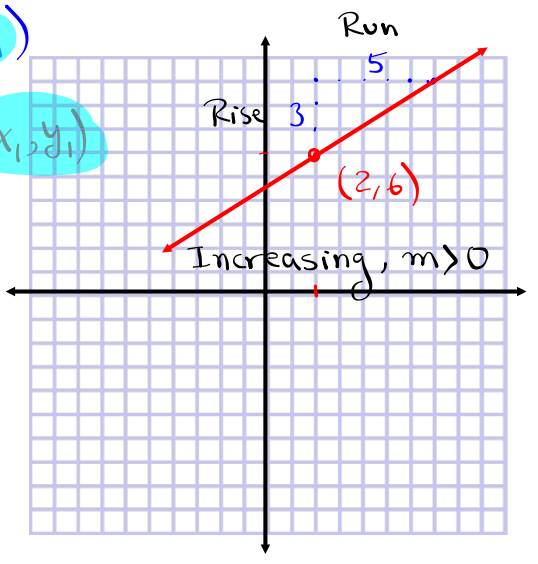
$y - y_1 = m(x - x_1)$

Slope $= m$

Point (x_1, y_1)

$y - 6 = \frac{3}{5}(x - 2)$

$m = \frac{3}{5}$ Point $(2, 6)$



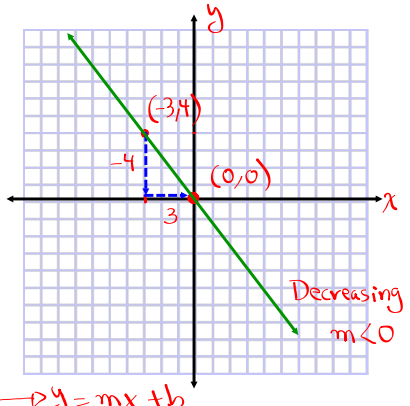
Given $y - 4 = \frac{-4}{3}(x + 3)$

Identify the slope & the point.

Draw the line.

Show rise and run.

$m = \frac{-4}{3}$ Point $(-3, 4)$



$y - 4 = \frac{-4}{3}(x + 3)$ → write in slope-Int form

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

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

$y = mx + b$

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

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

write in Stand. Form.

$Ax + By = C$

LCD = 3

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

$3y = -4x$

$4x + 3y = 0$

Vertical line $x = a$ NO slope or undefined slope

Horizontal line $y = b$ slope is zero, zero slope

Find eqn of a line that contain $(-4, 6)$ with

1) NO slope

$x = -4$

2) zero slope

$y = 6$

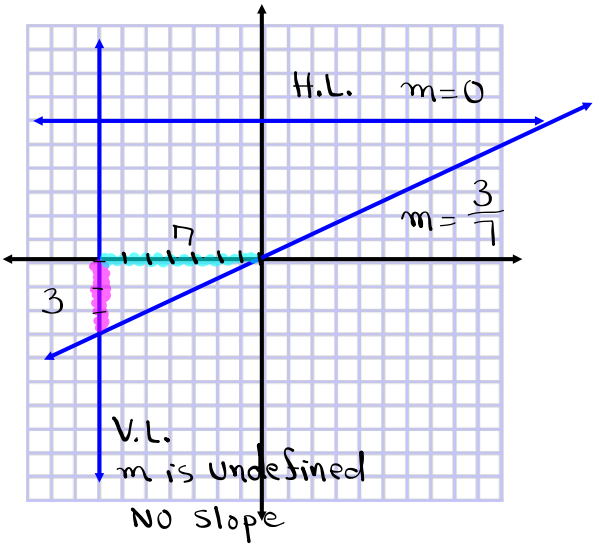
3) undefined slope

$x = -4$

4) $m = 0$

$y = 6$

Write the slope of each line given below.

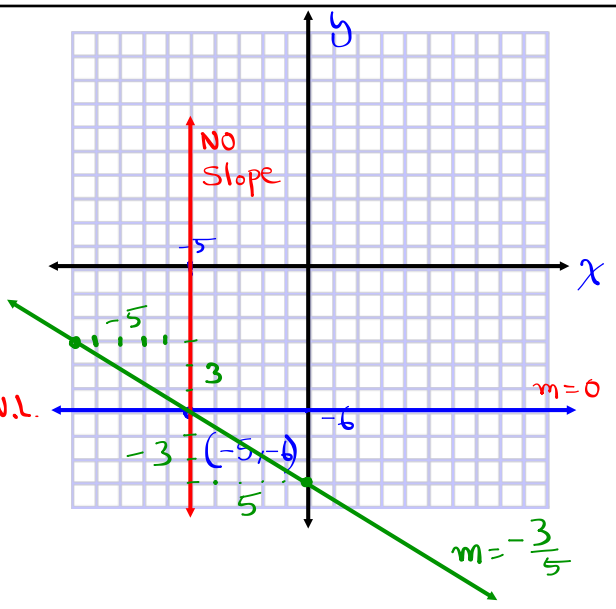


Plot the point $(-5,-6)$, draw 3 lines with following information

a) Zero slope → H.L.

b) undefined slope → V.L.

c) slope $\frac{-3}{5}$



How to find equation of a line with one point (x_1, y_1) and slope m:

Use point – slope formula, and then we simplify, and write final answer in slope-int form or standard form.

$y - y_1 = m(x - x_1)$ → $y = mx + b$ → $Ax + By = C$

Ex: Find equation of line that contain $(4,7)$ with slope -2.

Point $(x_1, y_1) = (4,7)$

Slope $m = -2$

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

$y - 7 = -2(x - 4)$

$y - 7 = -2x + 8$

$\boxed{y = -2x + 15}$

Slope-Int form

$\boxed{2x + y = 15}$

Standard form

Find eqn of a line that contains $(-2, 3)$ with slope $\frac{1}{2}$.

Point $(-2, 3)$

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

Point – Slope Formula

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

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

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

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

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

$\boxed{y = \frac{1}{2}x + 4}$ Slope-Int form

Multiply by 2

$2y = x + 8$

$-x + 2y = 8$

Multiply by -1.

$\boxed{x - 2y = -8}$ Standard form

Find equation of a line that contains $(0, -5)$ with slope $\frac{-1}{4}$.

Point $(0, -5)$

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

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

$y - -5 = \frac{-1}{4}(x - 0)$

$y + 5 = \frac{-1}{4}x$

$\boxed{y = \frac{-1}{4}x - 5}$ Slope-Int form

Multiply by 4 to clear fraction

$4y = -x - 20$

$\boxed{x + 4y = -20}$ Standard form.

Find equation of a line that contains $(-5,-3)$ with slope $\frac{3}{5}$.

Draw the line, show rise & run of the slope

Point $(-5,-3)$

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

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

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

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

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

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

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

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

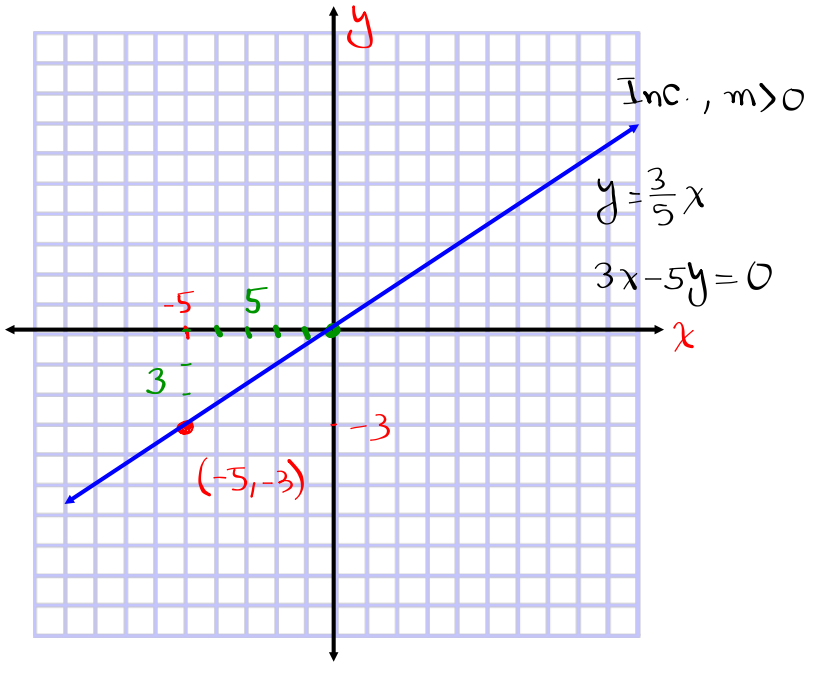
Multiply by 5

$5y = 3x$

$\boxed{3x - 5y = 0}$ Standard form.

$-3x + 5y = 0$

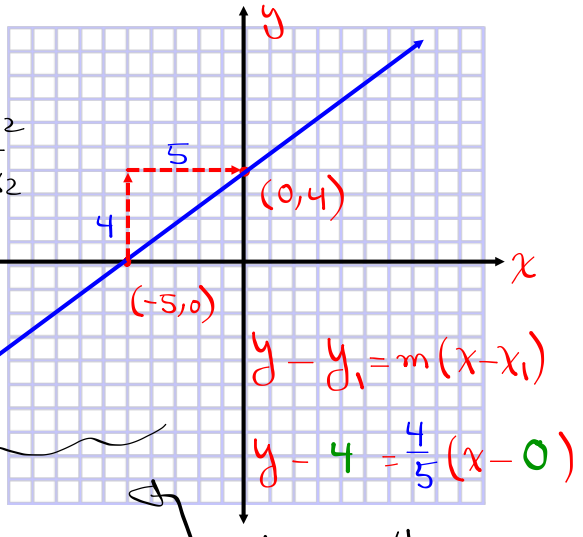
Multiply by -1



Find equation of a line that Contains $(-5,0)$ and $(0,4)$.

Draw it, show rise & run of the slope.

$m = \frac{4}{5}$



$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{0-4}{-5-0} = \frac{-4}{-5} = \boxed{\frac{4}{5}}$

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

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

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

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

Multiply by 5

$5y = 4x + 20$

$-4x + 5y = 20$ Multiply by -1

Stand. form $\boxed{4x - 5y = -20}$

Find equation of a line that Contains $(-2,5)$ and $(4,0)$.

Hint: You must have Slope.

$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{5-0}{-2-4} = \frac{5}{-6} = \boxed{\frac{-5}{6}}$

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

$y - 0 = \frac{-5}{6}(x - 4)$

$y = \frac{-5}{6}x + \frac{5}{6} \cdot \frac{2}{4}$

$\boxed{y = \frac{-5}{6}x + \frac{10}{3}}$ Slope-Int form

LCD = 6

$6 \cdot y = 6 \cdot \frac{-5}{6}x + 6 \cdot \frac{10}{3}$

$6y = -5x + 20$

$\boxed{5x + 6y = 20}$ Standard form

Complementary Angles:

Their Sum is 90°

Angle x

Complement $90 - x$

Find two complementary angles such that one of them is twice the other one.

Angle $\rightarrow x$

Complement $\rightarrow 90 - x$

Angle $= 2 \cdot$ Complement

$x = 2(90 - x)$

$x = 180 - 2x$

$x + 2x = 180$

$3x = 180 \rightarrow \boxed{x = 60}$

Angle $\rightarrow 60^\circ$

Complement $\rightarrow 30^\circ$

60° & 30°

Complement $= 2 \cdot$ Angle

$90 - x = 2 \cdot x$

$90 = 2x + x$

$90 = 3x$

$\frac{90}{3} = x$

$\boxed{x = 30}$

30° & 60°

Find two complementary angles such that one of them is 10° more than the other one.

x & $90-x$

$x = 90-x+10$

$x+x=100$ $\quad 2x=100$ $\quad x=50$

50° & 40°

$90-x = x+10$

$-x-x = 10-90$

$-2x = -80$

$x = \frac{-80}{-2}$ $\quad x=40$

40° & 50°

Find two complementary angles such that one of them is 10° less than 4 times the other one.

x & $90-x$

$x = 4(90-x)-10$

$x = 360-4x-10$

$x+4x = 350$

$5x = 350$

$x = 70$ $\Rightarrow$ 70° & 20°

$90-x = 4x-10$

$-x-4x = -10-90$

$-5x = -100$

$x = \frac{-100}{-5}$

$x = 20$

20° & 70°

Supplementary Angles

Their sum is 180°

Angle $\rightarrow x$, Supplement $\rightarrow 180 - x$

Find two supplementary angles such that one of them is equal to 3 times the other one.

x & $180 - x$

135° & 45°

Due Monday
SG 7
&
SG 8
at 6:00 AM
Work on
Graph & WP

$x = 3(180 - x)$

$x = 540 - 3x$

$x + 3x = 540$

$4x = 540$

$x = 135$