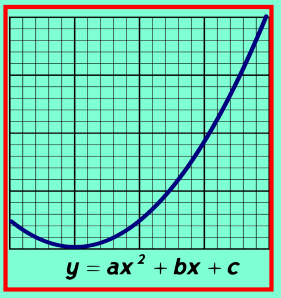
Math 125

Fall 2021

Lecture 5



Class QZ 3

1) Simplify: $(3x+5)(3x-5) - 25$

$= 9x^2 - 15x + 15x - 25 - 25 = \boxed{9x^2 - 50}$

2) Factor: $5x^3y^2 - 20xy^4$

GCF $= 5xy^2(x^2 - 4y^2) = \boxed{5xy^2(x+2y)(x-2y)}$

3) Factor: $x^2 - 6x + 9$

$1 \cdot 9$

$3 \cdot 3$

$= (x-3)(x-3) = \boxed{(x-3)^2}$

Given two Points $P_1(x_1, y_1)$ & $P_2(x_2, y_2)$

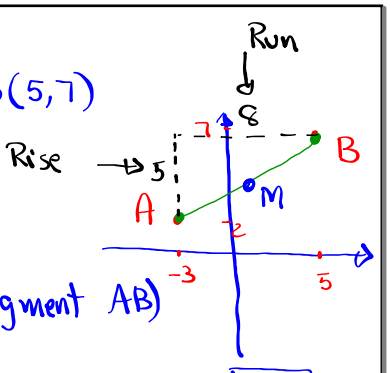
1) Slope $m = \dfrac{y_1 - y_2}{x_1 - x_2}$ $\quad m = \dfrac{y_2 - y_1}{x_2 - x_1}$

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

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

Given $A(-3, 2)$ & $B(5, 7)$

1) Plot the points



2) Draw $\overline{AB}$ (line Segment AB)

3) Find its slope $m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{7 - 2}{5 - (-3)} = \boxed{\dfrac{5}{8}}$

4) Find its midpoint $M\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right) = M\left(\dfrac{5 + (-3)}{2}, \dfrac{7 + 2}{2}\right) = M(1, 4.5)$

5) Find the distance from A to B

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

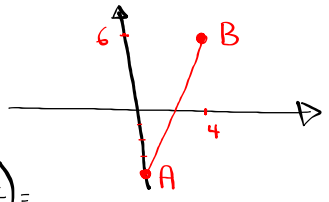
$= \sqrt{(-3 - 5)^2 + (7 - 2)^2} = \sqrt{(-8)^2 + 5^2}$

$= \sqrt{64 + 25} = \sqrt{89}$

$\sqrt{89} \approx \boxed{9.434}$

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

1) Draw $\overline{AB}$



2) Midpoint M

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

$$M\left(\frac{0+4}{2}, \frac{-4+6}{2}\right) = M\left(\frac{4}{2}, \frac{2}{2}\right) = M(2,1)$$

3) Slope

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{6-(-4)}{4-0} = \frac{10}{4} = \boxed{\frac{5}{2}}$$

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

$$= \sqrt{(0-4)^2+(-4-6)^2} = \sqrt{(-4)^2+(-10)^2}$$

$$= \sqrt{16+100}$$

$$= \sqrt{116}$$

$$\approx \boxed{10.770}$$

Find the slope of the line segment AB with $A(3,-5)$ and

1) $B(6,2)$ $A(3,-5)$

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{-5-2}{3-6} = \frac{-7}{-3} = \boxed{\frac{7}{3}}$$

2) $B(3,4)$ $A(3,-5)$

$$m = \frac{-5-4}{3-3} = \frac{-9}{0}$$ undefined

No slope

3) $B(0,-5)$ $A(3,-5)$

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

Zero Slope

What does slope tell us?

$m > 0$ Increasing Slant line

$m < 0$ Decreasing Slant line

$m = 0$ Horizontal line

m is undefined (No slope) Vertical line

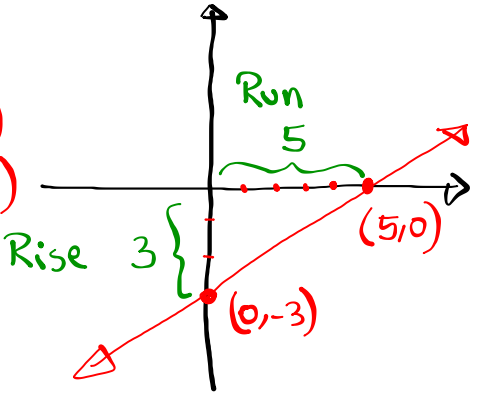
Given $3x - 5y = 15$

1)

x	y
0	-3
5	0

Y-Int $(0,-3)$

x-Int $(5,0)$



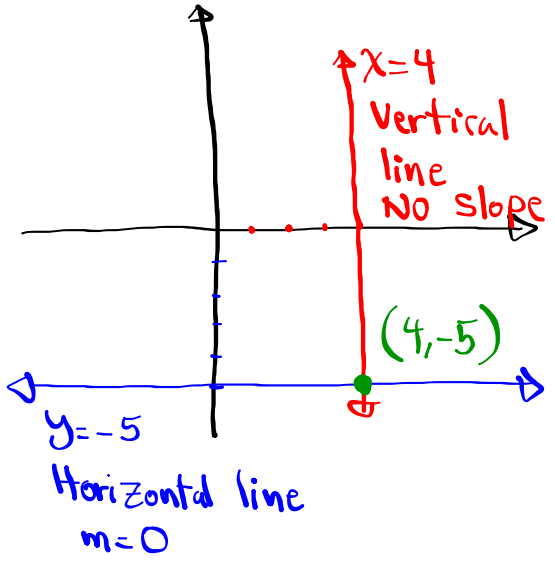
2) Draw the line

3) Give Slope $\boxed{m = \frac{3}{5}}$

Draw $x=4$ and $y=-5$

Give slope of each line

Find point of intersection.



Slope-Int Form

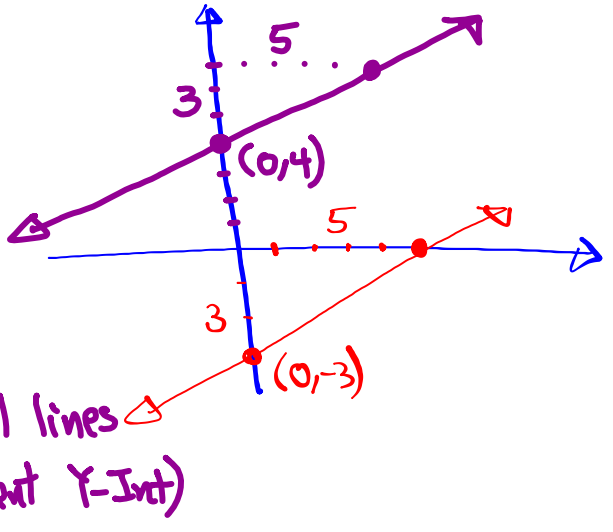
$y = mx + b$

Slope $m = \frac{\text{Rise}}{\text{Run}}$

Y-Int $(0, b)$

Graph

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



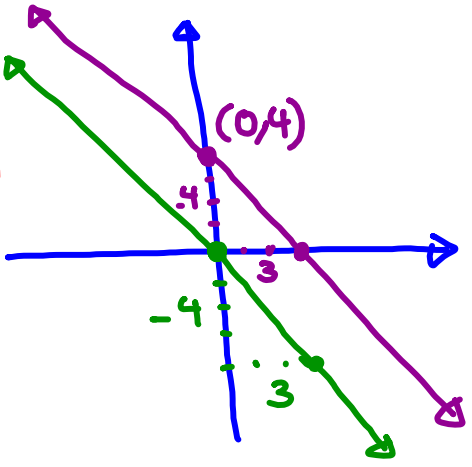
Parallel lines

$m_1 = m_2 \Leftrightarrow$ Parallel lines (different Y-Int)

$y = \frac{-4}{3}x$ $\quad m = \frac{-4}{3}$ $\quad$ Y-Int $(0,0)$

$y = \frac{-4}{3}x + 4$ $\quad m = \frac{-4}{3}$ $\quad$ Y-Int $(0,4)$

Parallel lines



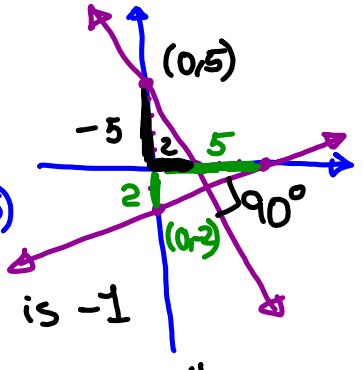
Draw both lines

Draw

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

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

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



Anytime product of slopes is -1

$\Rightarrow$ Lines are perpendicular to each other.
(Form 90° angle)

$$\frac{2}{5} \cdot \frac{-5}{2} = \frac{-10}{10} = -1$$

$m_1 \cdot m_2 = -1 \iff$ Perpendicular lines

$5x + 3y = 15$ & $y = \frac{3}{5}x - 4$

x	y	
0	5	Y-Int
3	0	x-Int

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

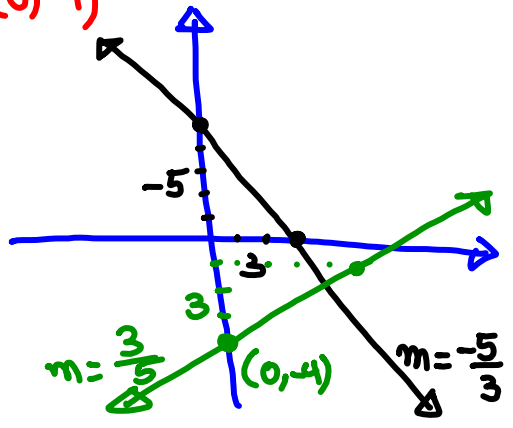
Y-Int $(0,-4)$

Draw both lines

$m_1 \cdot m_2 = \frac{-5}{3} \cdot \frac{3}{5}$

$= \frac{-15}{15} = -1$

$\Rightarrow$ Perpendicular lines



Point-Slope Form

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

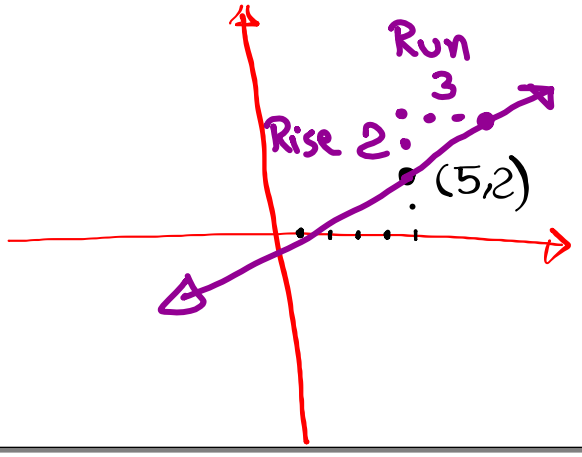
Slope m

Point (x_1, y_1)

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

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

Point $(5,2)$

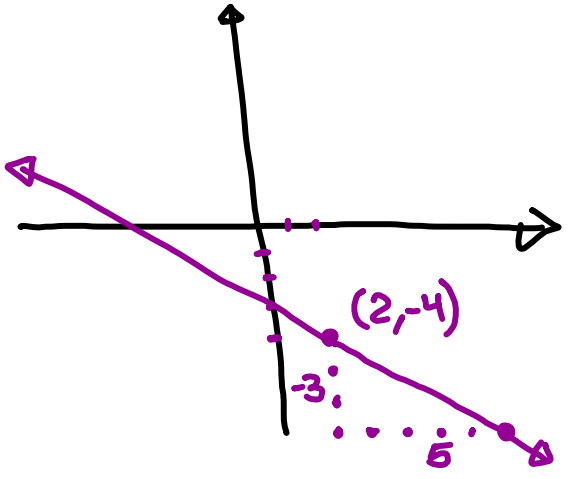


$y+4=\frac{-3}{5}(x-2)$

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

Point $(2,-4)$

Draw

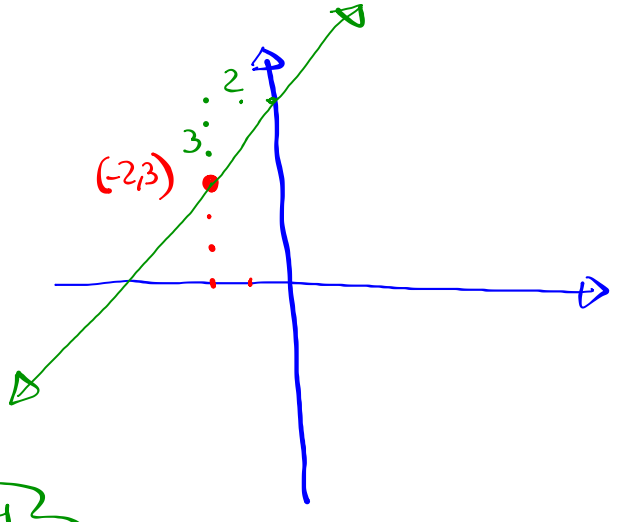


$y-3=\frac{3}{2}(x+2)$

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

Point $(-2,3)$

Draw



WORK on SG 1

Class QZ 4

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

1) Find slope $m=\frac{y_2-y_1}{x_2-x_1}=\frac{0-(-6)}{8-0}=\frac{6}{8}=\boxed{\frac{3}{4}}$

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

$\boxed{M(4,-3)}$

3) Find distance

$d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}=\sqrt{(0-8)^2+(-6-0)^2}=\sqrt{(-8)^2+(-6)^2}=\sqrt{64+36}=\sqrt{100}$

$=\boxed{10}$