6/10/2014 - Sec 2.1 (cont.), Sec 2.2, and Sec 2.3

Sec 1.5

#61 $n^2 + 3n + \frac{9}{4}$

$\frac{3}{2}$

$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$

$(n + \frac{3}{2})^2$

#133 $h = -16t^2 + 96t + 408$

$t = ?$ $h = 0$ (aka the ground)

$$\frac{0}{-8} = \frac{-16t^2}{-8} + \frac{96t}{-8} + \frac{408}{-8}$$

$$0 = 2t^2 - 12t - 51$$

$a = 2$ $b = -12$ $c = -51$

$$t = \frac{12 \pm \sqrt{(-12)^2 - 4(2)(-51)}}{2(2)}$$

$$\frac{12 \pm \sqrt{144 + 408}}{4}$$

$$\frac{12 \pm \sqrt{552}}{4}$$

$$\frac{12 \pm 2\sqrt{138}}{4}$$

$$\frac{2(6 \pm \sqrt{138})}{4\ 2}$$

$$\frac{6 \pm \sqrt{138}}{2}$$

$\frac{6+\sqrt{138}}{2}$ sec, 8.87 sec

552
2 276
2 138 ✓
2 69
3 23

1.6

96

	Rate	time	distance
to Chicago	$x-25$	$\frac{300}{x-25}$	300
to Cincinnati	$x+25$	$\frac{300}{x+25}$	300
		5 hrs	

wind: 25

plane: x

$r \cdot t = d$

$t = \frac{d}{r}$

$$\frac{300}{x-25} + \frac{300}{x+25} = 5$$

LCD: $(x-25)(x+25)$

$$300(x+25) + 300(x-25) = 5(x-25)(x+25)$$

$$300x + 7500 + 300x - 7500 = 5(x^2 - 625)$$

$$600x = 5x^2 - 3125$$

$$-600x \quad\quad -600x$$

$$\frac{0}{5} = \frac{5x^2}{5} - \frac{600x}{5} - \frac{3125}{5}$$

$$0 = x^2 - 120x - 625$$

✓ finish solving

Sec 2.1 (cont.)

Standard Form of circle

$$(x-h)^2+(y-k)^2=r^2$$

tells us center: (h,k)

Radius = r

General Form:

$$Ax^2+Ay^2+Cx+Dy+E=0$$

$$(x-1)^2+(y-2)^2=25$$

center $(+1,+2)$

Radius = 5

General Form:

$$(x-1)(x+1)+(y-2)(y-2)=25$$

$$x^2-x-x+1+y^2-2y-2y+4=25$$

$$x^2+y^2-2x-4y+5=25$$

$$-25 \quad -25$$

$$x^2+y^2-2x-4y-20=0$$

#70 $x^2 + y^2 + 6x - 8y - 6 = 0$

$+6 \quad +6$

$x^2 + 6x + 9 + y^2 - 8y + 16 = 6 + 9 + 16$

$\frac{6}{2} = 3$

$3^2 = 9$

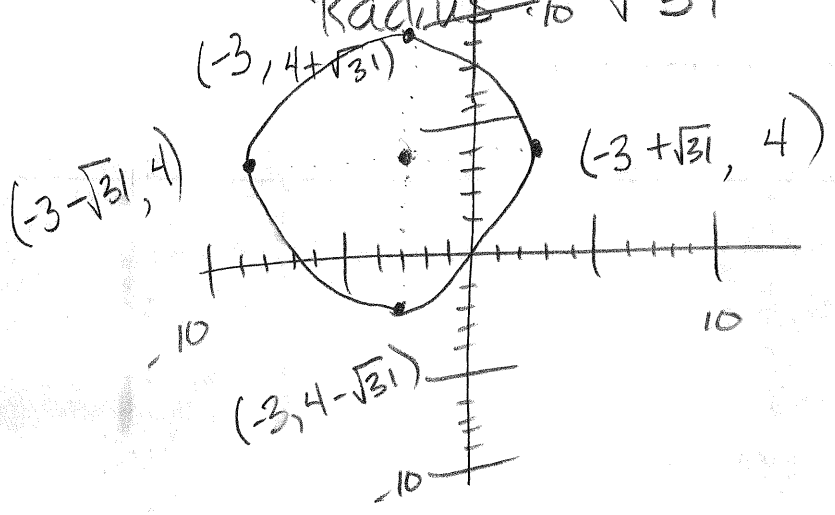
$-\frac{8}{2} = -4$

$(-4)^2 = 16$

$(x+3)^2 + (y-4)^2 = 31$ ✓

Center: $(-3, 4)$

Radius: $\sqrt{31} \approx 5.57$ ✓



Sec 2.2 Graphs of Linear Equations

Linear Equations

- Each variable has exponent of 1
- No variables in denominators
- No variables multiplied together

Ex! $xy = 5$ Not Linear

- can be written in the form

$$ax + by = c$$

(with both a & b not zero at the same time)

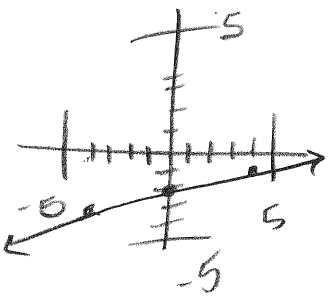
How to Graph

1. table
   - find points
   - plot points
   - connect points

#16

$-4y + x = 8$

x	y
-4	-3
0	-2
4	-1



$x = -4$

$-4y + -4 = 8$

$+4 \quad +4$

$\frac{-4y}{-4} = \frac{12}{-4}$ $y = -3$

$x = 0$

$-4y + 0 = 8$

$\frac{-4y}{-4} = \frac{8}{-4}$ $y = -2$

$x = 4$

$-4y + 4 = 8$

$-4 \quad -4$

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

2. Intercept Method

- x-int when $y=0$ $(\#, 0)$
- y-int when $x=0$ $(0, \#)$

$-4y + x = 8$

x-int

$y=0$

$-4(0) + x = 8$

$x = 8$

$(8, 0)$

y-int

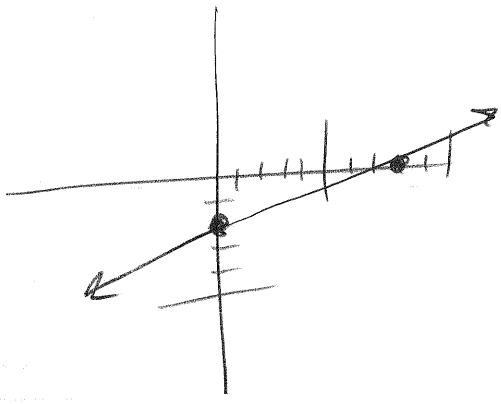
$x=0$

$-4y + 0 = 8$

$\frac{-4y}{-4} = \frac{8}{-4}$

$y = -2$

$(0, -2)$



3. Use the slope $\left(\frac{\text{Rise}}{\text{Run}}\right)$

- Calculate the slope

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

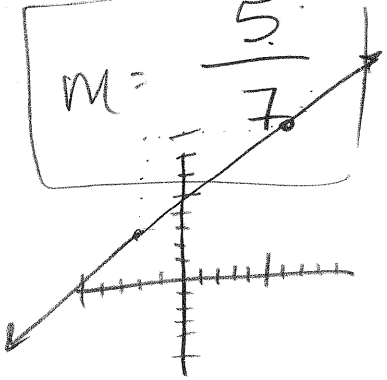
#34

$(\overset{x_1}{-2}, \overset{y_1}{3}), (\overset{x_2}{5}, \overset{y_2}{8})$

$$m = \frac{8-3}{5+2}$$

$$\boxed{m = \frac{5}{7}}$$

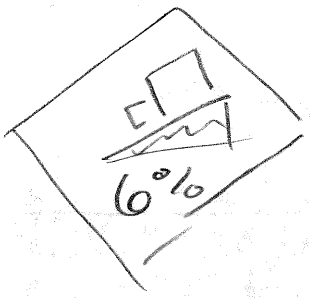
- plot known point then plot 2nd point using slope
- connect points



Slope: a Measure of Steepness

$$m = \frac{\text{Rise}}{\text{Run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x}$$

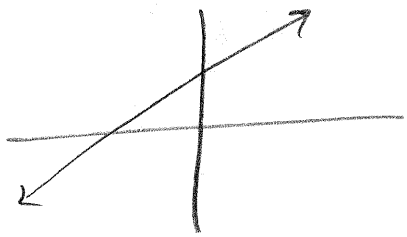
Slope is the Rate of change



$$\text{Slope} = 6\% = .06 = \frac{6}{100}$$

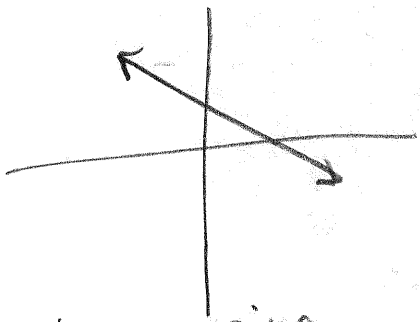
Slope:

$m > 0$



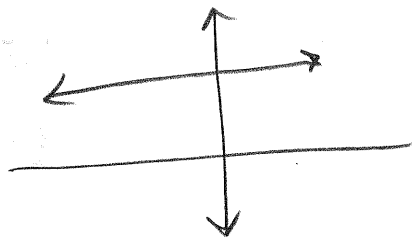
increasing left to Right

$m < 0$



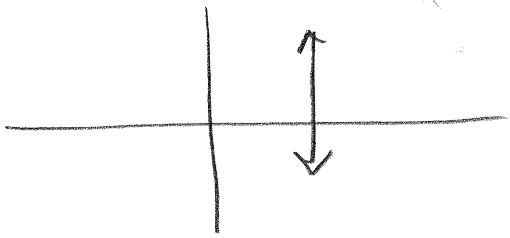
decreasing left to Right

$m = 0 : \frac{0 \text{ NO Rise}}{1 \text{ plenty of Run}}$



horizontal Line.
Equation: $y = b$

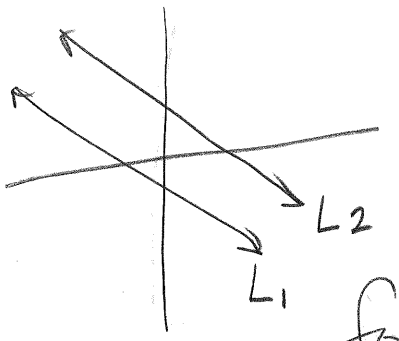
m undefined $\left(\frac{1 \leftarrow \text{plenty of Rise}}{0 \leftarrow \text{NO Run}}\right)$



Equation: $x = a$

2 Lines can be Parallel, Perpendicular, or Neither

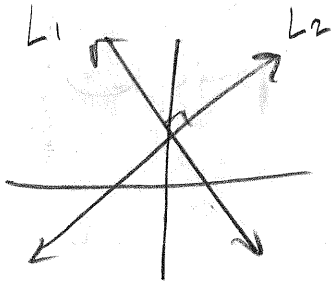
Parallel Lines: two lines in the same plane that never intersect



Symbol: $L_1 \parallel L_2$

for parallel Lines, slopes are equal

Perpendicular Lines: two lines in the same plane that intersect at Right angles



Symbol: $L_1 \perp L_2$

for perpendicular Lines

Slopes are Negative Reciprocals

(or multiply to -1)

Ex: $m_1 = \frac{2}{3}$ $m_2 = -\frac{3}{2}$

Ex: $m_1 = \frac{-2}{1}$ $m_2 = \frac{1}{2}$

Sec 2.3 Linear Graphs and Rate of Change

Slope-Intercept Form

$$y = mx + b$$

m = Slope of Line

b = y-int $(0, b)$

Ex # 13 $6x - 3y = 9$

Goal: Slope-int Form

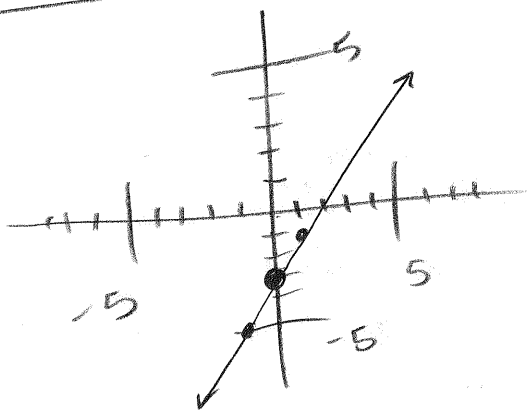
Goal: Graph

$$6x - 3y = 9$$
$$-6x \quad -6x$$
$$\frac{-3y}{-3} = \frac{-6x}{-3} + \frac{9}{-3}$$
$$y = 2x - 3 \quad \checkmark$$

$m = 2/1$

y-int: $(0, -3)$

Graph



If $m = \frac{3}{4}$, y-int: $(0, -2)$

$b = -2$

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

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

If I have 1 point and the slope I can build my equation

Method 1

Use the point-slope form of the line

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

Method 2

Use the slope-int form by substituting the point in for x and y then solve for b.

48 $m = -4$; $(-3, 2)$ on Line

Method 1

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

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

$$y - 2 = -4x - 12$$

$$+2 \qquad +2$$

$$\boxed{y = -4x - 10}$$

Method 2

$m = -4$; $(-3, 2)$

$$y = mx + b$$

$$2 = -4(-3) + b$$

$$2 = 12 + b$$

$$-12 \quad -12$$

$$-10 = b$$

$$\boxed{y = -4x - 10}$$

#86 $P_1 = (-1, 6)$, $P_2 = (5, 1)$

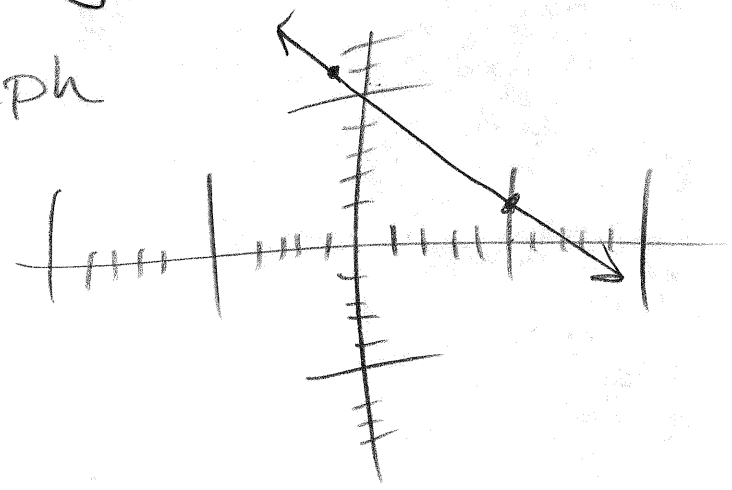
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 6}{5 + 1} = \frac{-5}{6}$$

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

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

$$y - 6 = -\frac{5}{6}(x + 1)$$ ✓

Graph



#63 Parallel to $2x-5y=10$ through $(-5,2)$ (Ans in slope-int form)

1st find my slope by finding the slope of $2x-5y=10$

$$2x-5y=10$$
$$-2x \quad -2x$$
$$\frac{-5y}{-5}=\frac{-2x}{-5}+\frac{10}{-5}$$
$$y=\frac{2}{5}x-2$$

← y-int of parallel line Not my line

$$m=2/5$$

my slope $= 2/5$ ✓

my point $(-5,2)$

$$y=mx+b$$
$$2=\frac{2}{5}(-5)+b$$
$$2=-2+b$$
$$+2 \quad +2$$
$$4=b$$

← my y-int

$$\boxed{y=\frac{2}{5}x+4}$$

Applications

Slope = Rate of change = $\frac{\Delta y}{\Delta x}$

if x is a measure of time

and y is measure of distance

$$m = \frac{\Delta \text{ dist}}{\Delta \text{ time}} \leftarrow \text{"per"}$$

75 mph ←

#108

time of purchase

(x, y) $t = 0$ $V = 18{,}500$ ✓

(x, y) $t = 2$ $V = 11{,}500$

Note t is x-var, V is y-var

$$m = \frac{18{,}500 - 11{,}500}{0 - 2}$$

$$= \frac{7000}{-2}$$

$$m = -3500$$

Equation

$y = -3500x + 18500$

$V = -3500t + 18500$

c) $V = -3500t + 18500$

$V = ?$ $\quad t = 4$

$V = -3500(4) + 18500$

$= -14000 + 18500$

$\boxed{V = 4500}$

d) $V = 6000$, $t = ?$

$6000 = -3500t + 18500$

Solve for Ans

e) $V = 1000$, $t = ?$

$1000 = -3500t + 18500$

Solve for Ans