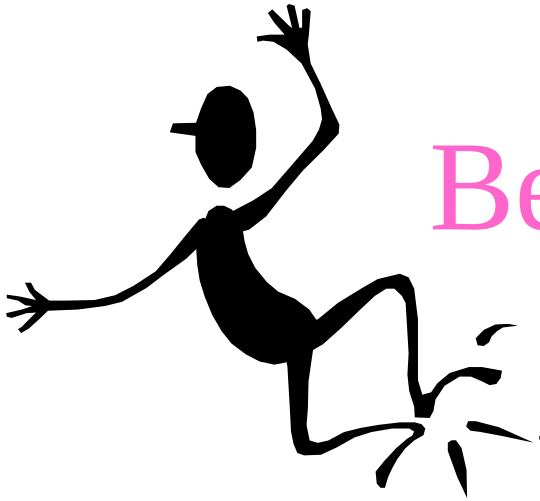
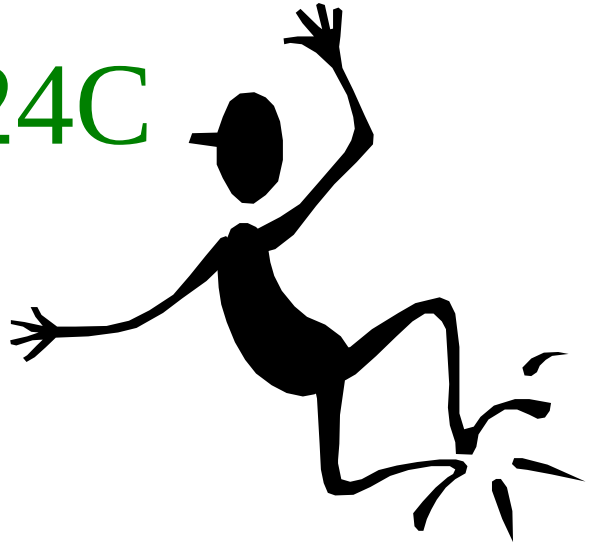


Beginning Algebra

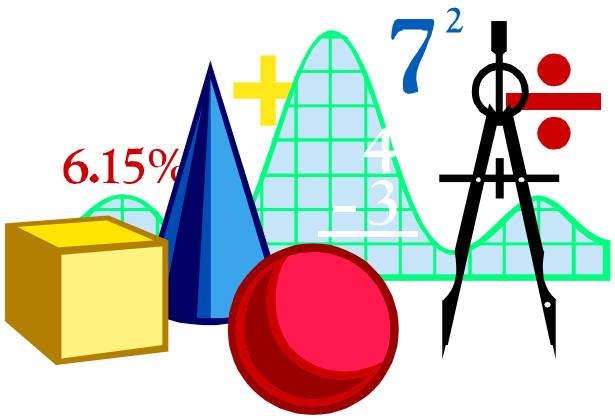
Professor Sikora

MAT0024C

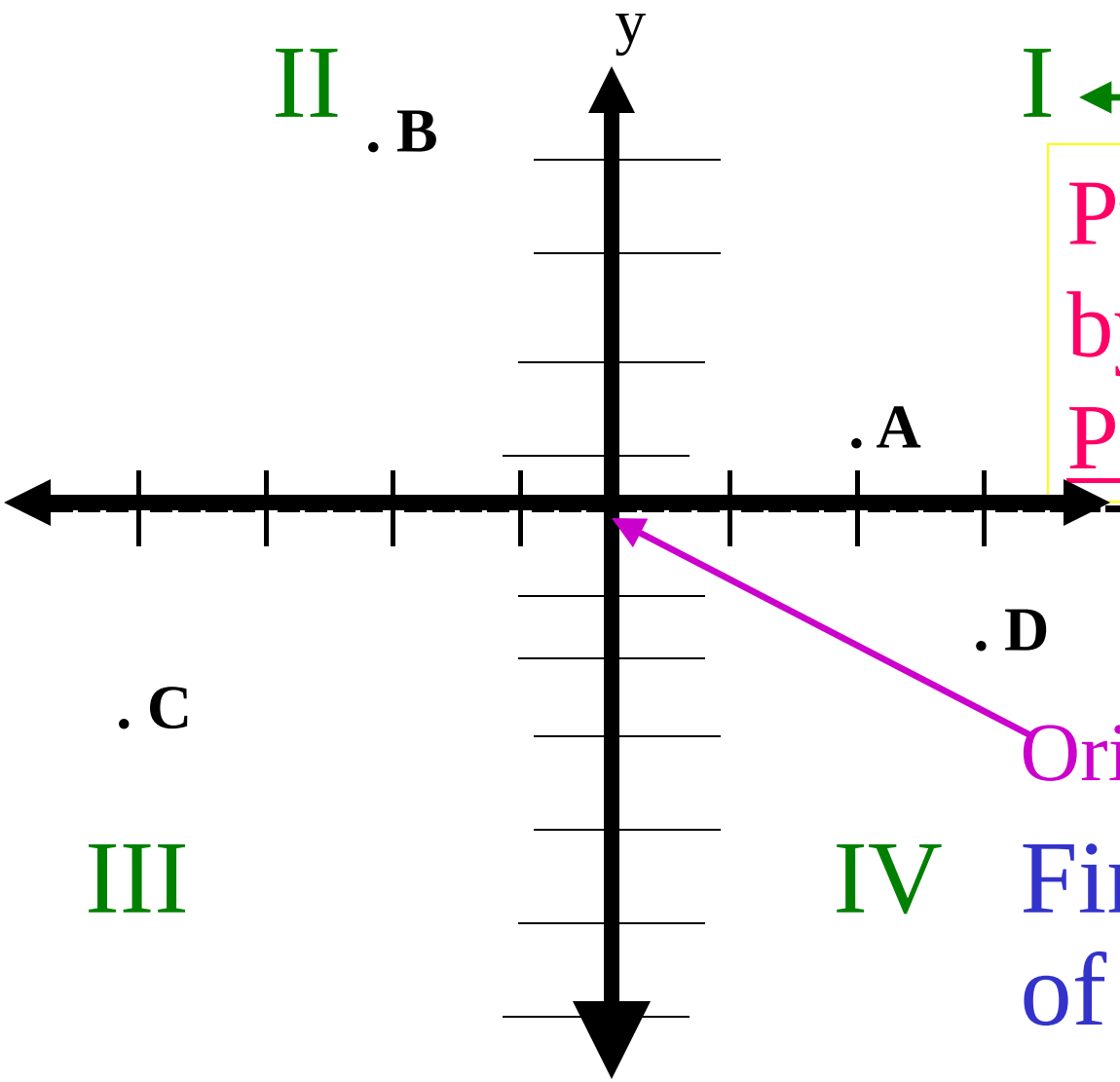


CHAPTER 4

GRAPHING LINEAR EQUATIONS



4.1 **The Rectangular Coordinate System**



II

I ← Quadrant

Pts. named by Ordered Pairs: (x,y)

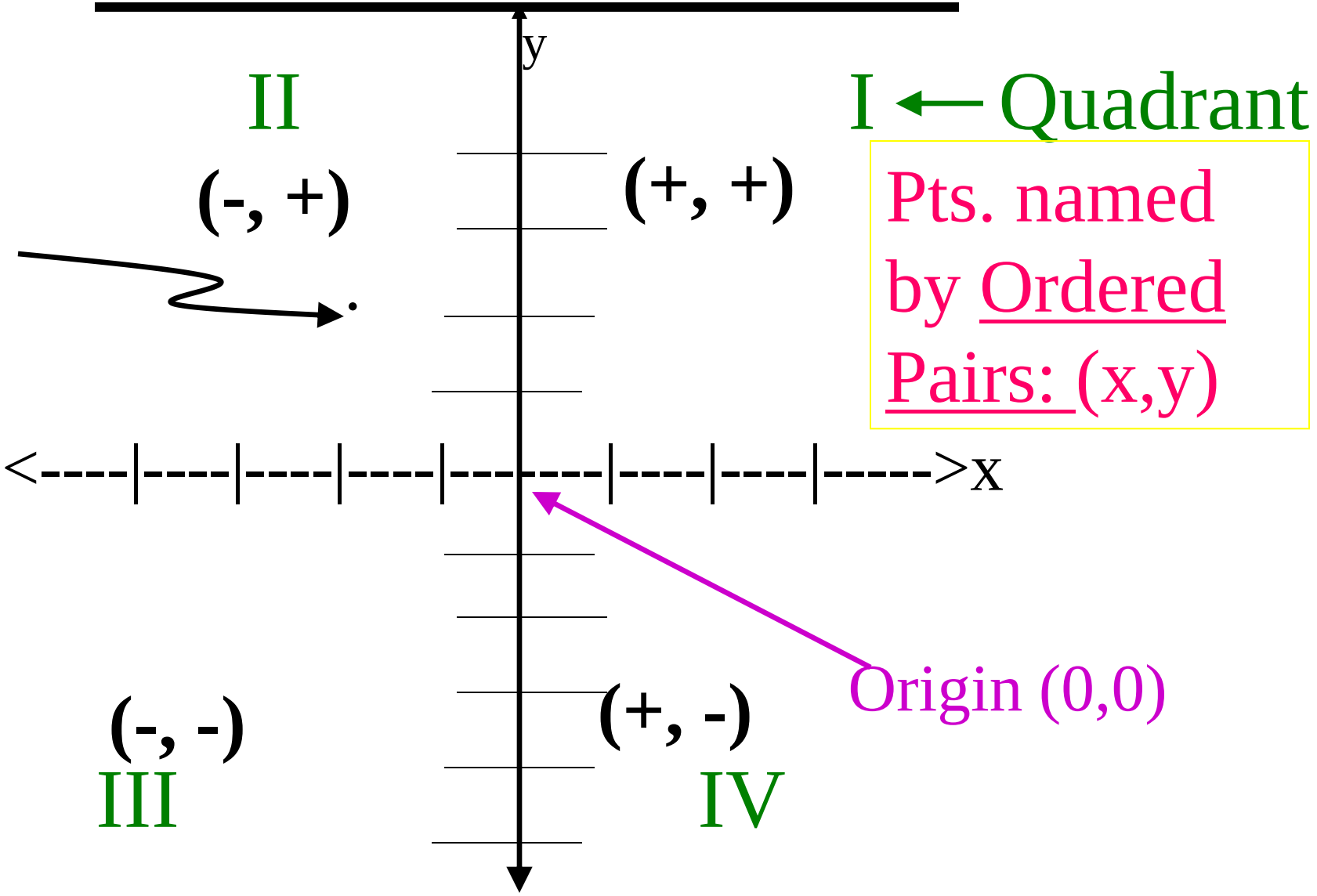
Origin (0,0)

III

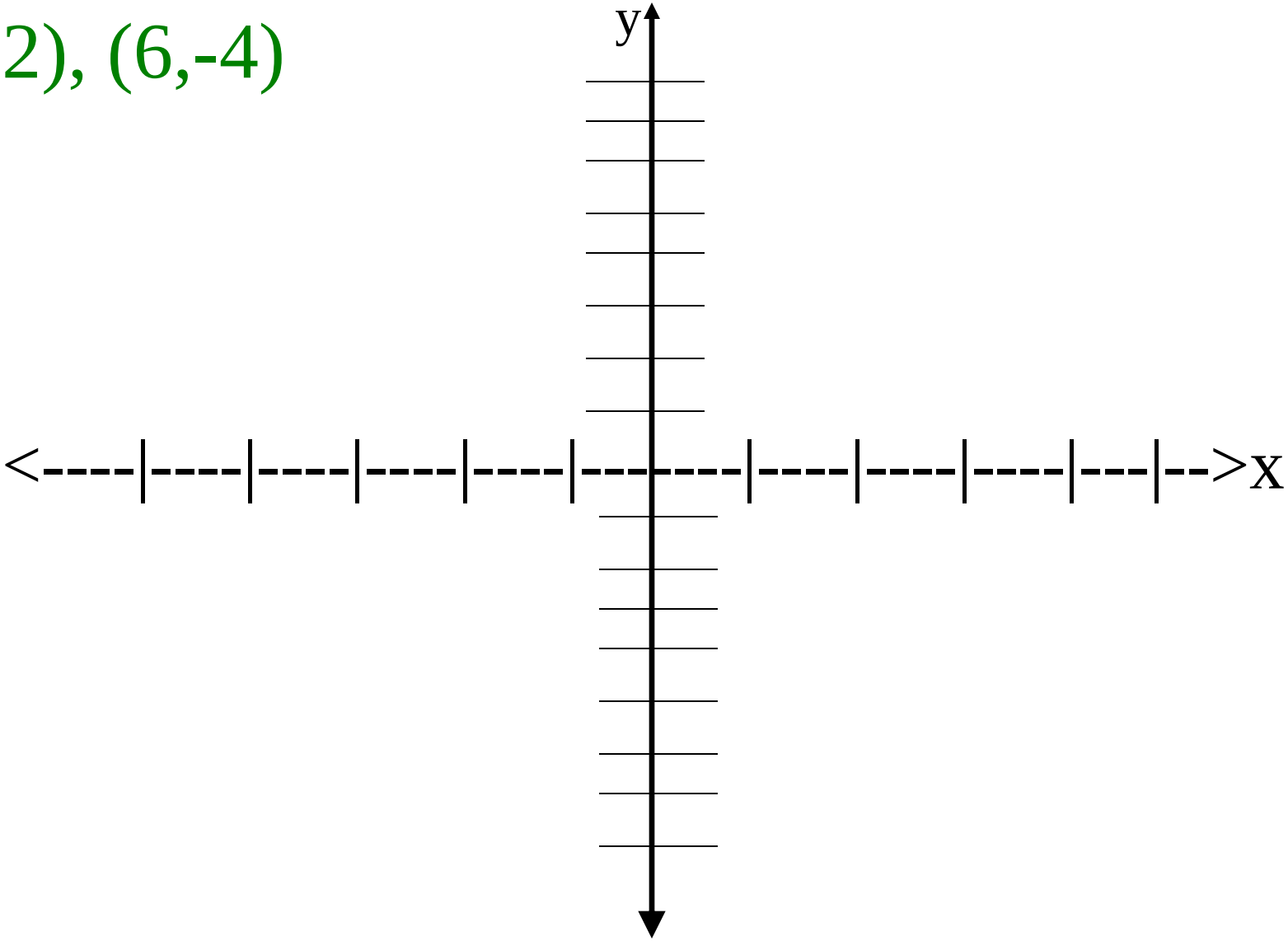
IV

Find coord. of A, B, C, D

4.1 **The Coordinate Plane**



4.1 Pts linear or non-linear? (-5,7), (-1,3), (2,0), (4,-2), (6,-4)



4.2 **Linear Eqs. ~ 2 Variables**

Linear Equation in 1 variable: $A,B \in$ Reals

$Ax + B = 0$ $A \neq 0$

Ch 2 graphs = pt. on a line

Linear Equation in 2 variables: $A,B,C \in$ Reals

$Ax + By = C$ A & B both $\neq 0$

We are going to graph these now in the rectangular coordinate system

4.2 **Linear Eqs. ~ 2 Variables**

Solution to a Linear Equation in 2 variables:

$Ax + By = C$ is (x, y) an ORDERED PAIR

[Note: the **x** is always **1st** & **y** always **2nd**]

Ex: Is (2, -5) a solution of $5x + 2y = 20$? Y N

Ex: Complete the ordered pair (___, 7) for

$y = 2x - 9$

4.2 **Linear Eqs. ~ 2 Variables - Table**

Ex: Complete the table of values for

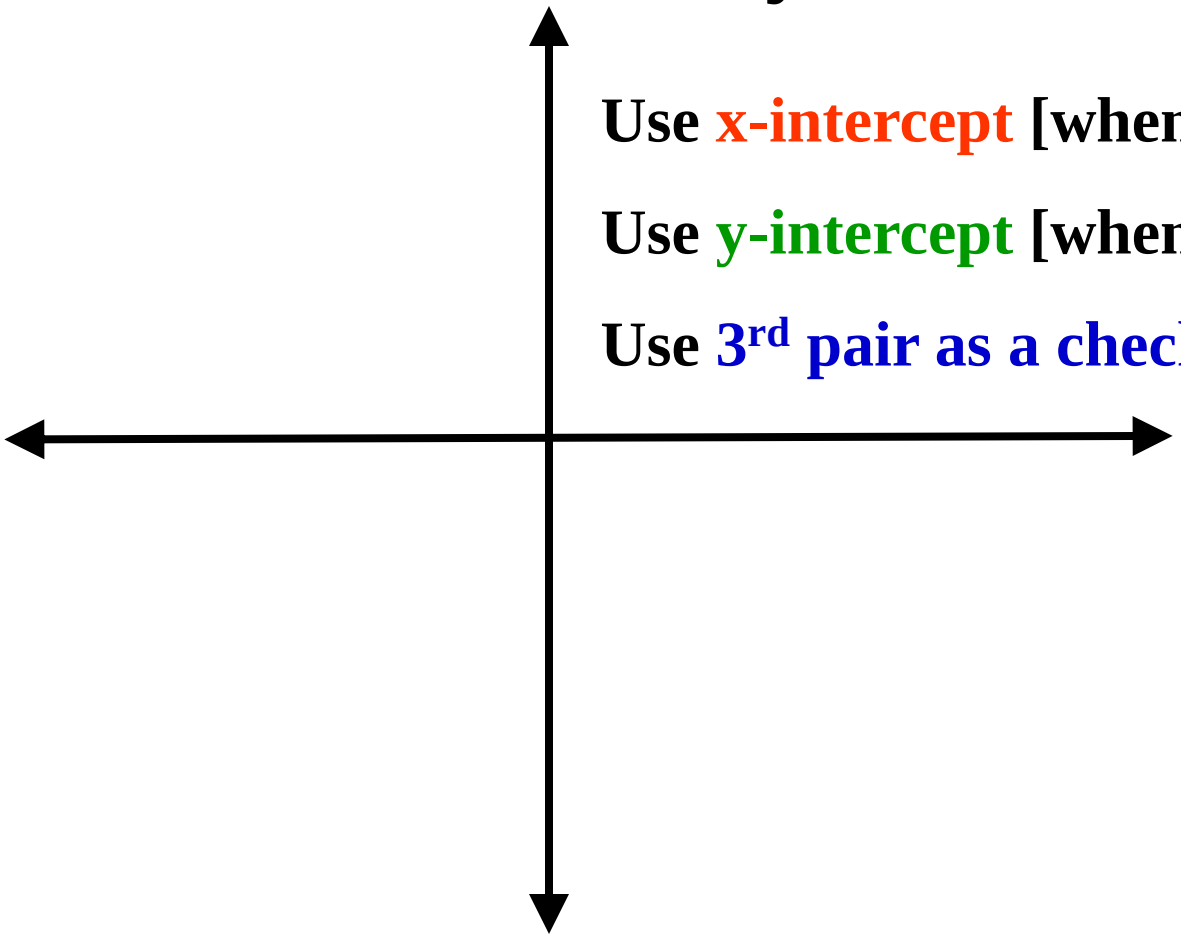
$2x - 3y = 12$ then write results as ordered prs:

x	y
0	
	0
3	
	-3

4.2 **Graphing:Linear Eqs. ~2 Variables**

Graph the Linear Eq: $5x + 2y = -10$ Use 3 entries in a table of values for your 3 ordered pairs:

x	y



4.2 **Identifying Linear Eqs.**

Linear Equation in 2 variables: A,B,C $\in$ Reals

$Ax + By = C$ ➔ **GENERAL FORM** [A & B both $\neq 0$]

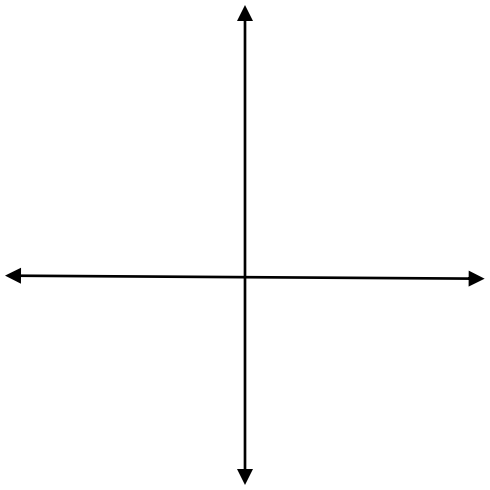
Write with A, B & C as Integers & A ≥ 0

Exponents of x & y must be 1 for eq. To be Linear

Ex: Solve for y, generate a (x, y) table of Integers & Graph:

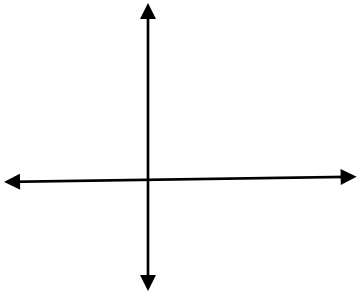
$3y = 3 + x$

x	y

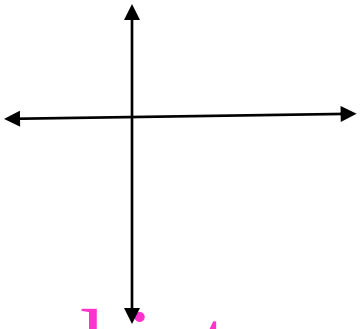


4.3 **Graphing:Eqs. ~ using Intercepts**

Find intercepts of: $5x + 2y = 10$ (,);(,)



Find intercepts of: $2x - 3y = 12$ (,);(,)



Find intercepts of: $4x - 2y = 0$

Graph of equation: $Ax + By = 0$ passes through _____

4.3 **Graphing:Linear Eqs. ~2 Variables**

Graph of equation: $y = k$ is _____

Ex: $y + 5 = 0$

Graph of equation: $x = k$ is _____

Ex: $x = 2$

Mini-Quiz 4.1➔4.3 Draw 4 xy-axes on ans sheet back

1-3 [top axis] Plot & label A(-3, 1) B(4, -2) C(-2,0)
[on front] Specify quadrant or axis for the location of your 3 pts: 1) A 2) B 3) C

4) Which of these equations are LINEAR?
A) $y = x^2$ B) $y = 2x - 3$ C) $y = |x|$ D) $2x + 3y = 7$

5) Identify & write as ordered pairs the x & y – intercepts for: $-4x + 2y = 8$

6) Is (-3, 5) a solution of $4x + 3y = 3$? Y or N

7) Is (-3, 5) a solution of $y = |2 + x|$? Y or N

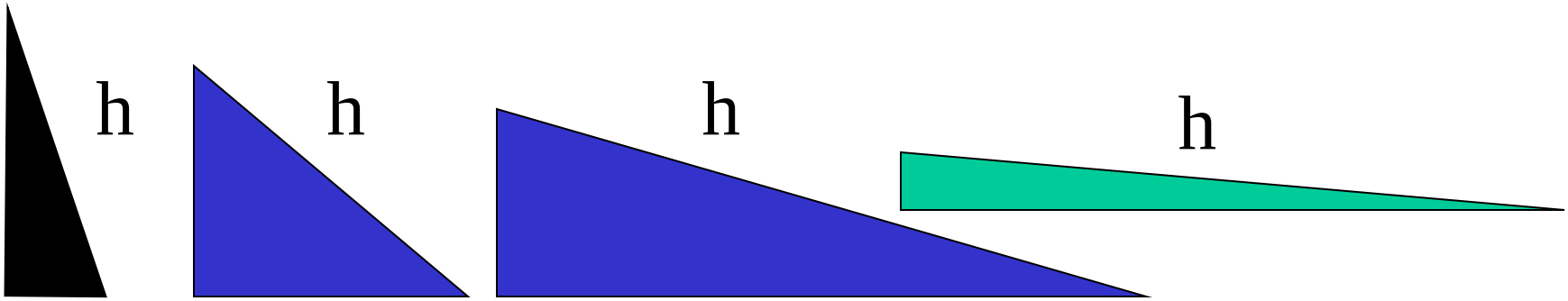
8-10) Put table of 3 integer values sideways of front & graph on the 3 remaining axes on the back:
8) $3x + 2y = 6$ 9) $y = 4$ 10) $x = -2$

4.4 **Slope of a Line**

Slope - Slant uphill  or Slant downhill 

- Steepness of h

very steep ----------> least steep



Black Diamond ==========> Easy Circle

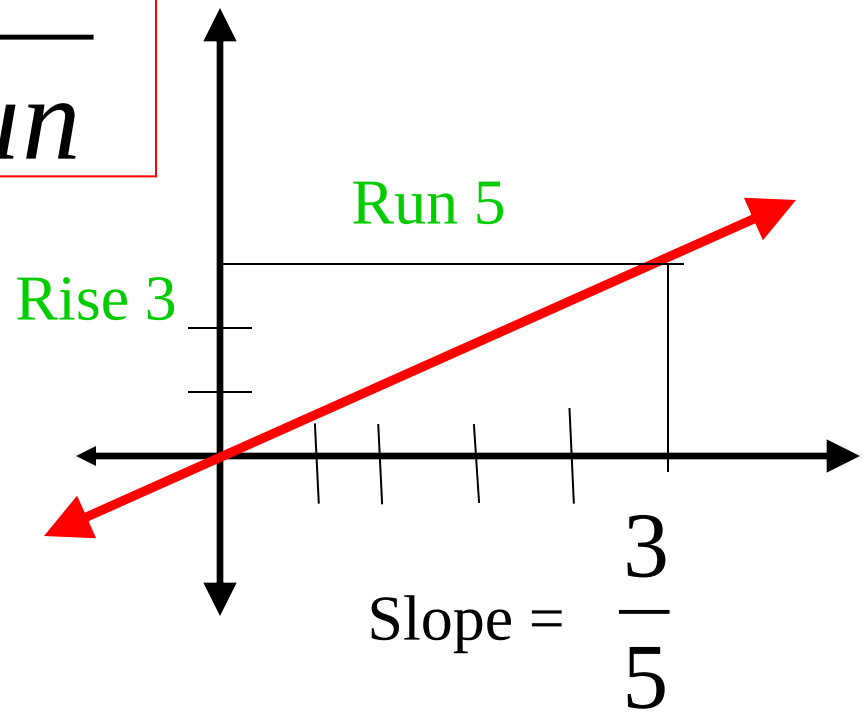
4.4 **Slope of a Line**

Slope of a line ==> Ratio of the **rise** [Vert. Change] to the **run** [Horiz. Change]

$$\text{Slope} = \frac{rise}{run}$$

Change in y

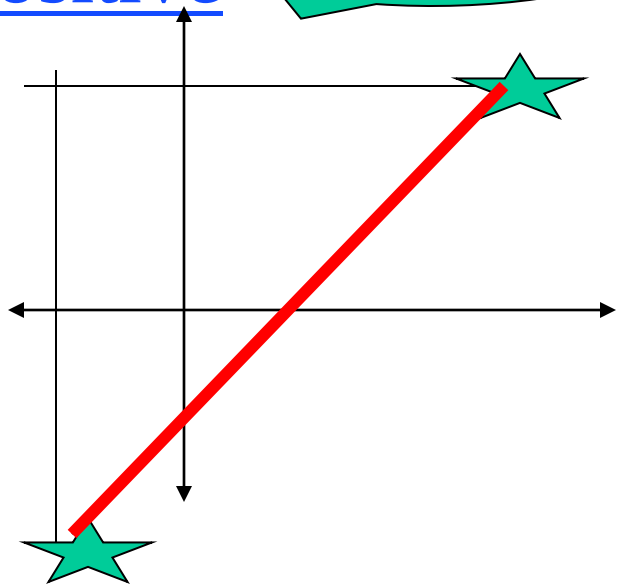
Change in x



4.4 SLOPE = $\frac{Rise}{Run}$

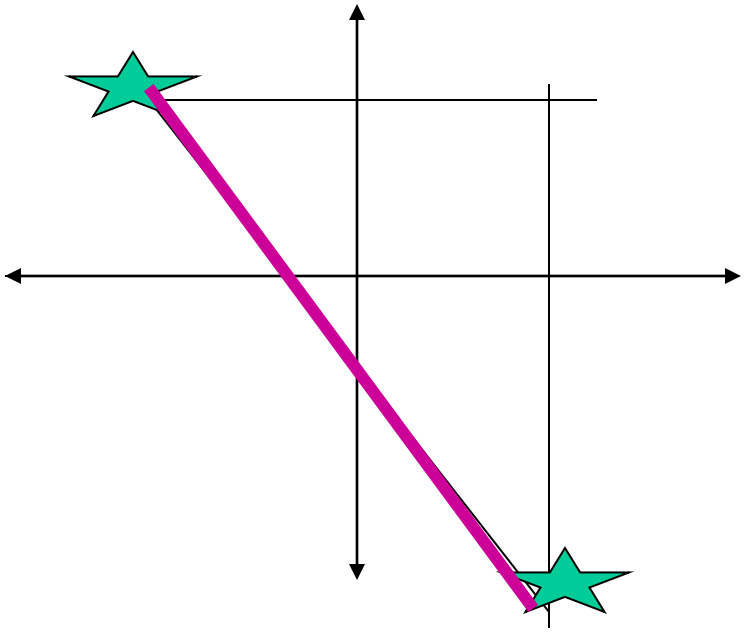
Positive

Rise up &
Run forward



Negative

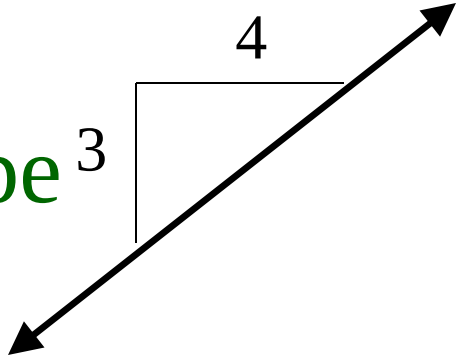
Rise up &
Run bckwrds



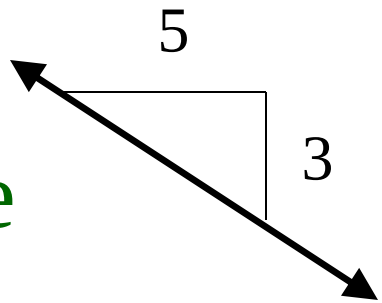
4.4 **Slope of a Line**

Every line has a SLOPE

Pos. Slope



Neg. Slope

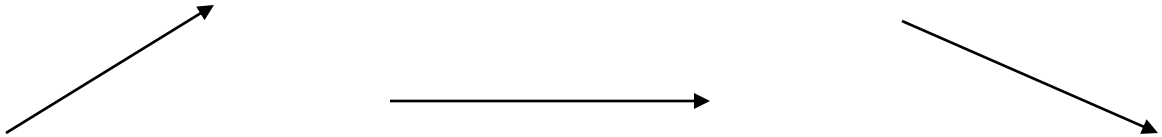


Horiz. = 0 slope

Vert. = undefined slope

4.4 **Slope of a Line**

- Line positions that DO have slope::



- Slope of line thru 2 pts: (x_1, y_1) & (x_2, y_2)

  is $$m = \frac{y_2 - y_1}{x_2 - x_1}$$ ← Vertical change (rise)

  ← Horizontal change (run)

- **Pos. slope** --> Incre. --> slant up
- **0 slope** --> no change --> horizontal
- **Neg. slope**--> Decre. --> slant down

4.4 **Slope of a Line**

Slope = **m** = $\dfrac{y_2 - y_1}{x_2 - x_1}$ $x_1 \neq x_2$

Ex: Find slope of line thru (-5, 3) & (2, 1)

Ex: Find slope of line thru (4, 3) & (1, -1)

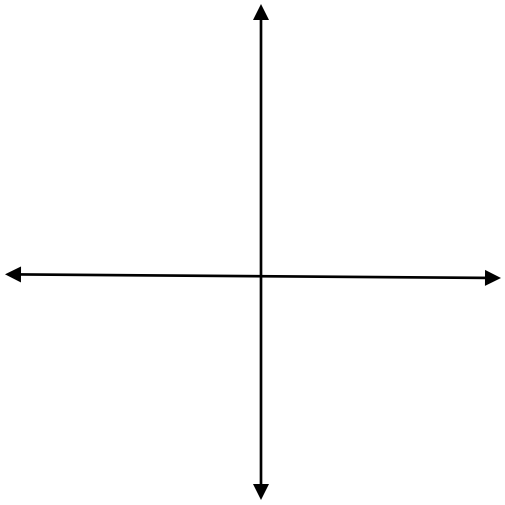
Always: Label one pt. $\mathbf{x_1}$, $\mathbf{y_1}$ & other $\mathbf{x_2}$, $\mathbf{y_2}$

4.4 **Slope of a Line**

Slope = $\mathbf{m} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\quad x_1 \neq x_2$

Ex: Find slope of a line thru (-1, -2) and (1, -7)

Ex. Graph a line thru (3, -5) with slope of $-\dfrac{2}{5}$



4.4 **Slope of a Line**

Slope: $\mathbf{m} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\quad x_1 \neq x_2$

Find slope of the Horizontal line thru (-5, 3) & (2, 3) ➔ eq: **y = k** ⇨ **slope 0**

Find slope of the Vertical line thru (-5, 3) & (-5, 1) ➔ eq: **x = k** ⇨ **slope undefined**

4.4 **Find Slope from the eq.of a Line**

Steps to Find Slope from the eq.of a Line:

(1)Solve the equation for y

(2)The slope [m] is the coefficient of x

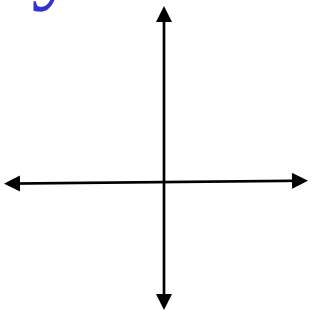
(3) The y-intercept is the (0, b) in

$$y = mx + b$$

SLOPE-INTERCEPT FORM

Ex: Find the y-int & slope of : $3x + 2y = 6$

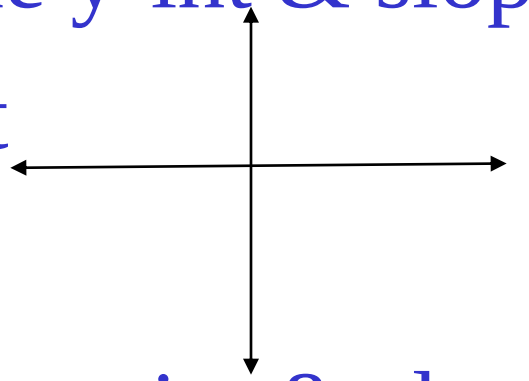
& graph it



4.4 Using $y = mx + b$ to graph equations

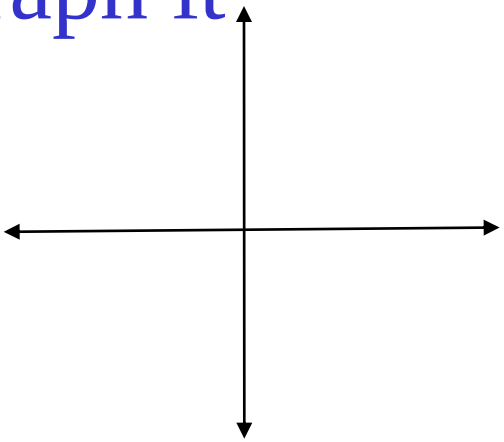
Ex: Find the y-int & slope of : $4x - 3y = 12$

& graph it



Ex: Find the y-int & slope of : $2x + y = 4$

& graph it



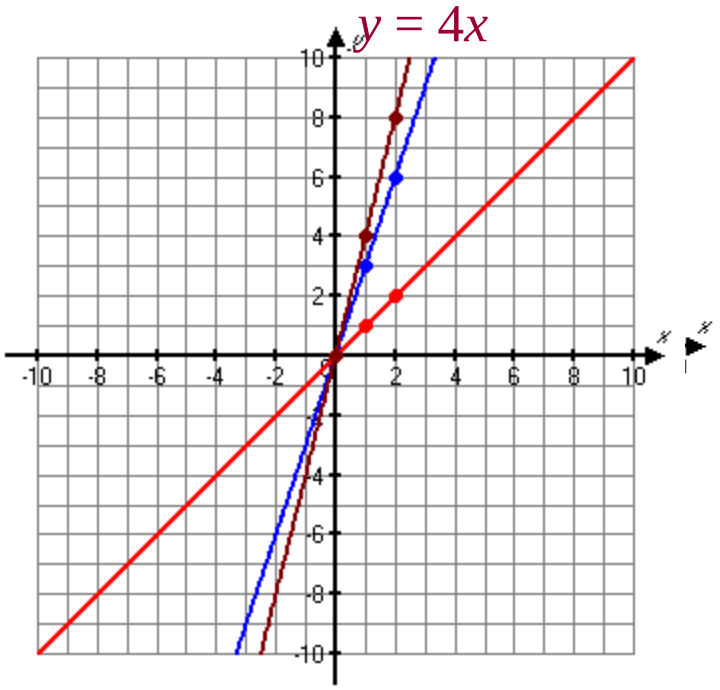
4.4 **Find Slope from the eq.of a Line**

Graph each of the following on the same grid.

$y = x$ $y = 3x$ $y = 4x$

Solution Complete a table of values.

If x is	$y = x$	$y = 3x$	$y = 4x$
0	0	0	0
1	1	3	4
2	2	6	8

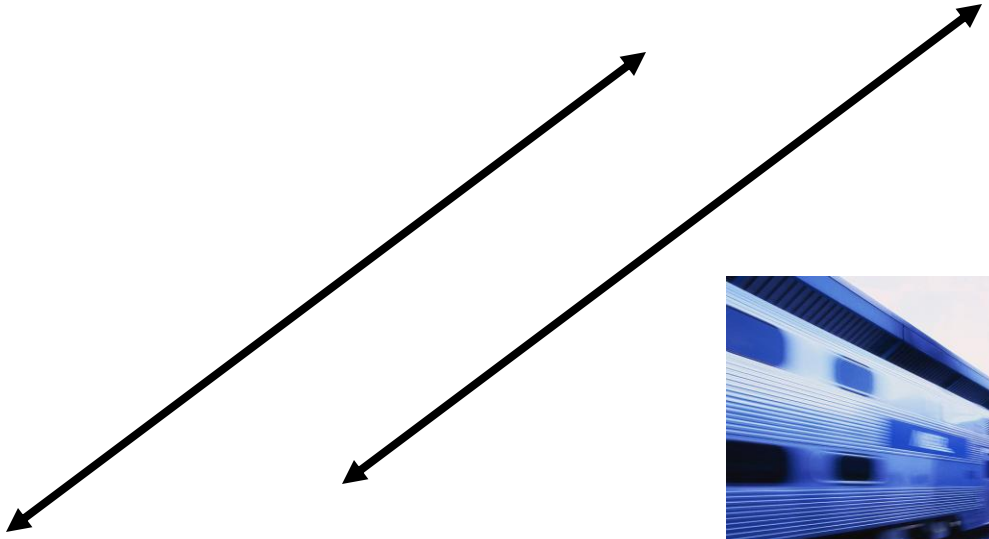


4.4 **Slope of Parallel Lines**

Parallel Lines in coord. Plane:

Never Intersect

If non-vertical, then **slopes are equal**



4.4 **Slope of Perpendicular Lines**

Perpendicular Lines in coord. Plane:

If product of slopes = -1 ==> lines ⊥

[Negative reciprocals]

If vertical & horizontal ==> lines ⊥

Ex: Decide if these lines are ||, ⊥, or neither: $3x - y = 4$

$x + 3y = 9$

Mini-Quiz 4.4 & Review

1) Which ordered pair is a solution of equation $3x - 2y = -6$?
a) $(-4, 3)$ b) $(1, 5)$ c) $(2, 0)$ d) $(0, 3)$

2) & 3) For the equation $7x - 2y = 14$, find the 2) x- and 3) y-intercepts. Write these as ordered pairs

4) & 5) Find the slope of line thru 4) (-5,-2) & (7,-5) and 5) (4,-1) & (-3,-1)

6) For the equation $-2x + 5y = -20$, determine the slope and the y-intercept. Then draw axes & graph the equation. on back for 7)

8) Write the slope of a line parallel to: $2x - y + 7 = 0$

9) Write the slope of a line perpendicular to that in 8)

10) Are $5x - 3y = 11$ & $3x + 5y = 8$ $\parallel$, $\perp$, or neither?