

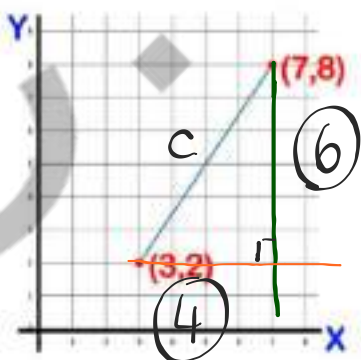
Homework  
 Page 124 #5  
 &  
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 Word Problems on GIF

### Chapter 5: Analytic Geometry

5.1

pg 133

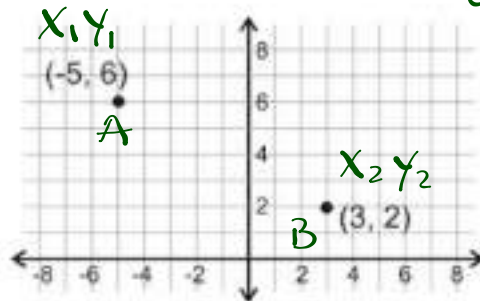
How would you find the distance of the segment drawn? (Pyth.)



pythagorean  
 Theorem  
 $a^2 + b^2 = c^2$   
 $4^2 + 6^2 = c^2$   
 $\sqrt{52} = \sqrt{c^2}$   
 $c = \sqrt{52}$

The distance between points A and B:

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



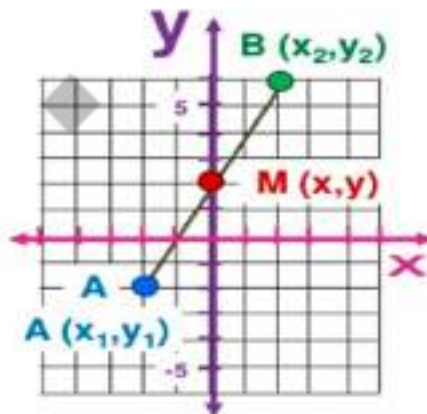
$$\begin{aligned} d(A, B) &= \sqrt{(3+5)^2 + (2-6)^2} \\ &= \sqrt{(8)^2 + (-4)^2} \\ &= \sqrt{80} = 8.9 \\ &\text{units} \end{aligned}$$

Either point can be  $x_1, y_1$

5.2

pg 134

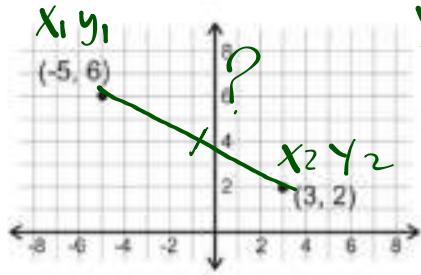
The coordinates of the midpoint of segment AB if  $A(x_1, y_1)$  and  $B(x_2, y_2)$  are



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

\* halfway

Find the midpoint  $M(x, y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$



$$M(x, y) = \left(\frac{-5+3}{2}, \frac{6+2}{2}\right) = (-1, 4)$$

$x_1y_1$  and  $x_2y_2$  can be interchanged

### Midpoint Backwards (Midpoint Given)

Given the end point of A(-2, 5) and midpoint of (4, 4), what is the other endpoint, B.

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

$$(4, 4) = \left(\frac{-2+x_B}{2}, \frac{5+y_B}{2}\right)$$

$$\frac{-2+x_B}{2} = 4$$

$$-2+x_B = 4(2)$$

$$x_B = 8+2$$

$$x_B = 10$$

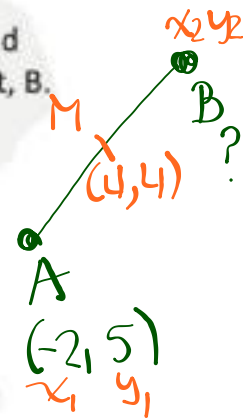
$$\frac{5+y_B}{2} = 4$$

$$5+y_B = 4(2)$$

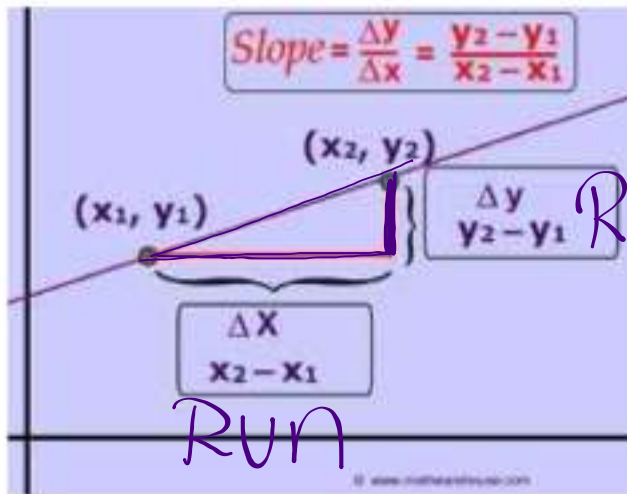
$$y_B = 8-5$$

$$y_B = 3$$

∴ The other end point is B (10, 3)

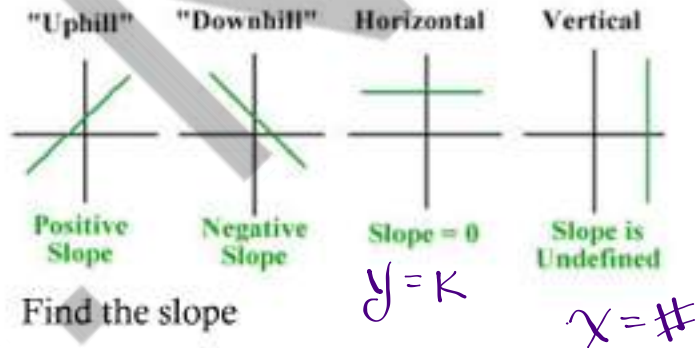


5.3 Slope of a line pg136-138



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

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



Down 8 units (Rise)

Right 4 units (Run)

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 + 3}{2 + 2} = \frac{8}{4} = 2$$

$$a = \frac{\text{rise}}{\text{run}} = \frac{-8}{4} = -2$$

Graph the line passing at (4, 1) and has a slope of -2

Down 2

Right 1 unit

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

put the 1

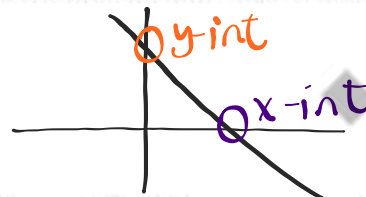
Graph the equation  $y = \frac{1}{4}x + 3$

3

### 5.4 Intercepts of a line pg140-141

**x-intercept**: the point where the line crosses the x axis, if exists.

Coordinates of x int (#,0)

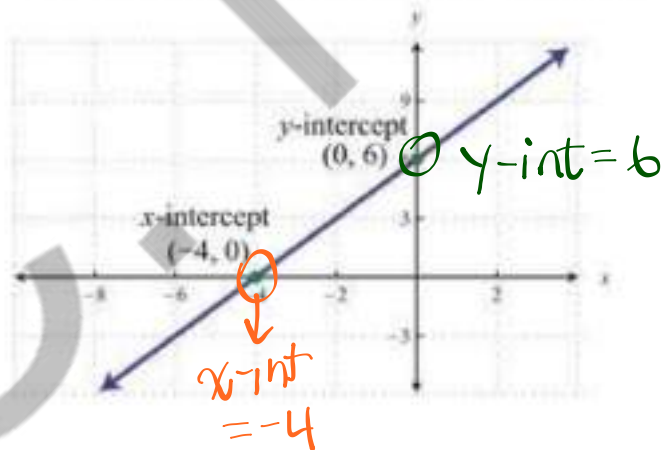


**y-intercept**: the point where the line crosses the y-axis, if exists.

Coordinates of y int (0, #)

Opposite  
variable  
is 0

Find the intercepts from a graph



Find the intercepts from a table of values

X	0	1	2	3
y	4	2.5	1	0

$(0, 4)$   
↑  
y-int

$(3, 0)$   
↑  
x-int

Find the intercepts from an equation

<p><b>x-intercept:</b> set y as 0 and solve for x</p> <p><math>-2x + 3y = 12</math></p> <p><math>-2x + 3(0) = 12</math></p> <p><math>x = -6</math></p> <p><math>(-6, 0)</math></p>	<p><b>y-intercept:</b> set x as 0 and solve for y</p> <p><math>-2x + 3y = 12</math></p> <p><math>-2(0) + 3y = 12</math></p> <p><math>y = 4</math></p> <p><math>(0, 4)</math></p>
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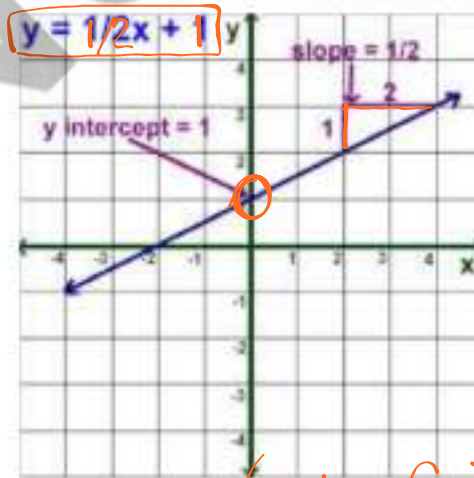
5.5 Functional form of the equation of a line  
(slope-intercept form) pg. 143

Functional form is

$$y = ax + b$$

Note:

- $y = 1y$

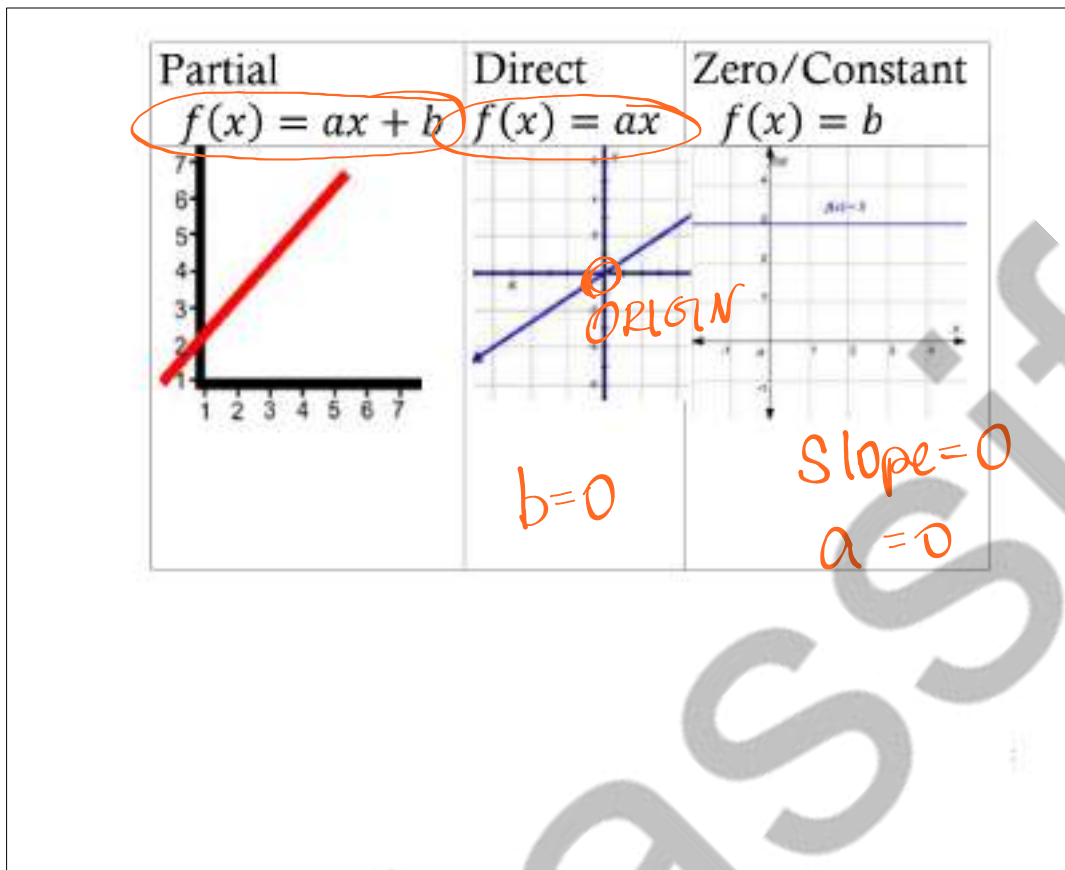


Where a is

Where b is

slope or ROC (rate of change)  
initial value or y-intercept

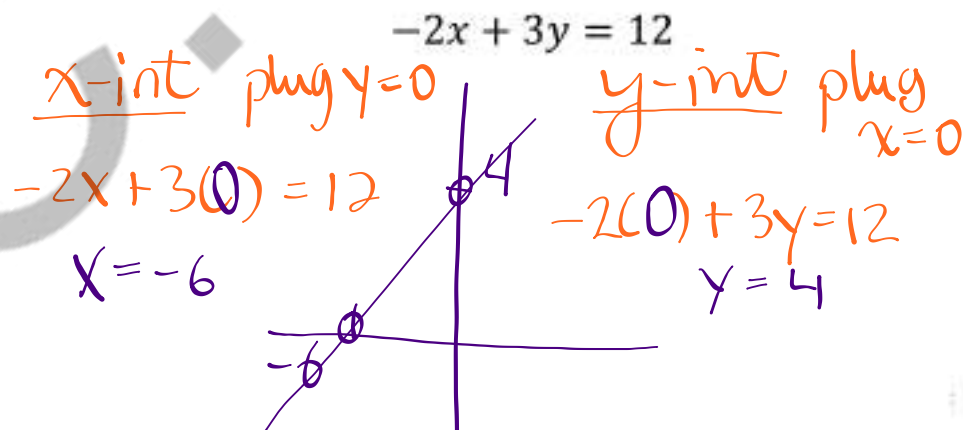




### GRAPH AN EQUATION:

Two methods

Method 1: By finding the x and y intercepts and graphing.



Method 2: By finding 2 or more points and graphing.

*Step 1* Isolate y

$$-2x + 3y = 12$$

$$\frac{3y}{3} = \frac{2x}{3} + \frac{12}{3}$$

*Step 2*

x	y
0	4
3	6
6	8

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

go by the denom.

RELATIVE POSITION OF TWO LINES PG. 144

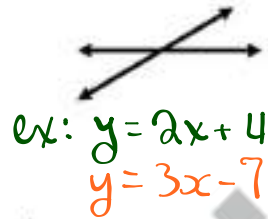
Given 2 lines with equations:

$$y_1 = a_1x + b \quad \text{and} \quad y_2 = a_2x + c$$

Intersecting/ Secant Lines	Coincident Lines	Parallel Lines	Perpend- icular Lines

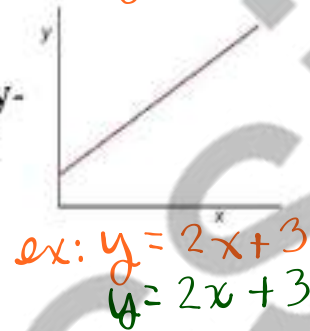
Case 1: Intersecting or Secant Lines

Slopes  $a_1$  and  $a_2$  are different



Case 2: Coincident Lines

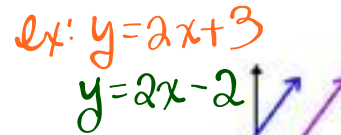
Slopes  $a_1$  and  $a_2$  are equal & y-intercepts  $b$  and  $c$  are equal



$a_1 = -\frac{1}{4}$      $a_2 = 4$   
 $-\frac{1}{4} \cdot 4 = -1 \checkmark$  proved!

Case 3: Parallel Lines

Slopes  $a_1$  and  $a_2$  are equal and y-intercepts are different



Case 4: Perpendicular Lines

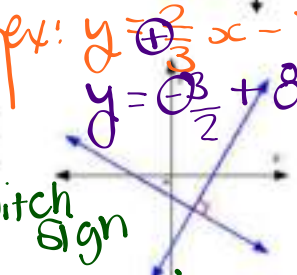
Slope  $a_1$  is negative reciprocal to  $a_2$ .

$$a_1 \times a_2 = -1$$

$$\frac{2}{3} \times -\frac{3}{2} = -1 \checkmark$$

① switch sign

② flip fraction



Negative Reciprocal:

1. Flip fraction
2. Switch sign

Ex:

$$\begin{aligned} -2 &\rightarrow \frac{1}{2} \\ \frac{1}{3} &\rightarrow -3 \\ -\frac{2}{3} &\rightarrow \frac{3}{2} \end{aligned}$$

Show that  $l_1$  and  $l_2$  are perpendicular lines.

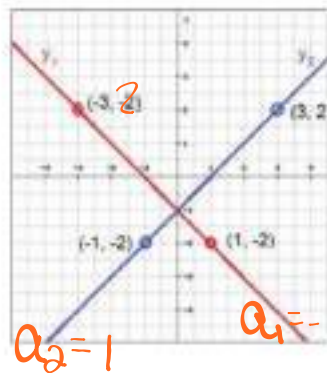
$$a_1 = -1 \quad a_2 = 1$$

$$a_1 \cdot a_2 = -1 ?$$

$$-1 \cdot 1 = -1 ?$$

$$-1 = -1 \checkmark$$

~~Therefore~~  $\therefore l_1 \perp l_2$



Find the equation of a line parallel to  $f(x) = 2x - 5$  and passing thru  $(4, -2)$ .

Step 1: Determine Slope Line 2

$$a_1 = 2$$

$$\therefore a_2 = 2$$

because its parallel

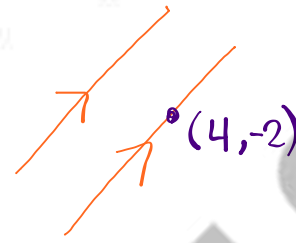
Step 2: Determine 'b'

$$y_2 = 2x + b$$

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

$$-2 = 8 + b$$

$$b = -10$$



Step 3: Rule is

$$y = 2x - 10$$

Find the equation of a line perpendicular to  $2x - 3y - 12 = 0$  and passing thru  $(-3, 6)$

Step 1 put eq in fctn form

$$\frac{-3y}{-3} = \frac{-2x + 12}{-3}$$

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

Step 2: Find Slope  $y_2$

$$\frac{2}{3} \rightarrow -\frac{3}{2}$$

Step 3: Find y-int

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

$$6 = -\frac{3}{2}(-3) + b$$

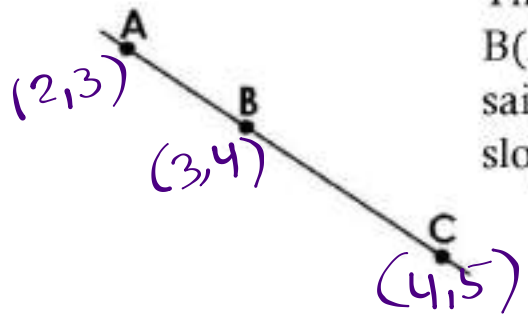
$$6 = \frac{9}{2} + b$$

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

Step 4 Rule

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

Note:



Three points  $A(x_1, y_1)$ ,  $B(x_2, y_2)$ ,  $C(x_3, y_3)$  are said to be collinear if  $\text{slope}(A, B) = \text{slope}(B, C)$ .

{ parallel  
or  
coincident

### 5.6 GENERAL FORM OF THE EQUATION OF A LINE: $ax + by + c = 0$ PG. 146-148

Note:

- $a$  is always positive

- Order is  $x, y, \#$

- No decimals or fractions

General $\rightarrow$ Functional	Functional $\rightarrow$ General
$12x - 30y - 120 = 0$ $\begin{array}{r} -30y = -12x + 120 \\ \hline -30 \quad -30 \quad -30 \\ \hline y = \frac{2x}{3} - 4 \end{array}$	$y = \frac{2}{3}x - 4$ $(3y) = 2x - 12$ $0 = 2x - 3y - 12$ $2x - 3y - 12 = 0$
$y = \frac{2x}{3} - 4$	

Determine if point (4, 0.4) is on the line  
 $3x - 5y - 10 = 0$ .

plug it in and say if left = Right side = Right side

$$3(4) - 5(0.4) - 10 = 0?$$

$$0 = 0 \checkmark$$

point (4, 0.4) is on the line