Name:_____   Date:_____

Notes
Algebra Section 4.5
Pages 244-250

Goal: "You will graph linear equations using slope-intercept form"

Slope-Intercept Form:

$$y = mx + b$$

m is the <u>slope.</u> It is the <u>coefficient</u> of x

b is the <u>y-intercept</u> It is always being <u>added</u>

or <u>subtracted.</u>

Writing equations in slope-intercept form:
Example:

$$2x + 4y = 8$$

Isolate y: -2x   -2x

$$\underline{4y=8\text{-}2x}$$ $$y = -\frac{1}{2}x + 2$$

Determine m and b 4   4

$$m=-\frac{1}{2}$$ $b=$ 2

Write the following equation in slope-intercept form if necessary.
Then identify the slope and the y-intercept.

Ex: $y = 3x + 4$

  $m = 3, b = 4$

Ex: $y = 5x - 3$

  $m = 5, b = -3$

Ex: $x + 4y = 6$

  $\underline{-x \qquad -x}$
  $\underline{4y = 6 - x}$
   4   4
  $y = \frac{3}{2} - \frac{x}{4}$
  $m = -\frac{1}{4}, b = \frac{3}{2}$

Ex: $3x + y = 2$

  $\underline{-3x \qquad -3x}$
  $y = 2 - 3x$
  $m = -3, b = 2$

Ex: $3x - 3y = 12$

  $\underline{-3x \qquad -3x}$
  $\underline{-3y = 12 - 3x}$
   $-3 \qquad -3$
  $y = -4 + x$
  $m = 1, b = -4$

Ex: $x + 3y = 9$

  $\underline{-x \qquad -x}$
  $\underline{3y = 9 - x}$
   3   3
  $y = 3 - \frac{1}{3}x$
  $m = -\frac{1}{3}, b = 3$

To Graph a Line in Slope-Intercept Form:

1) Make sure the equation is written in slope intercept form.

2) Identify *m* and *b.* Be sure slope is written as a fraction so you can identify the rise and run. Notice if the slope is positive or negative.

3) Plot the *y*-intercept. Always rise.

4) Run to the right if the slope is positive. Run to the left if the slope is negative.

5) Plot several points and connect with a ruler.

Graph using slope – intercept form:
Example:

Step 1: Put in slope-intercept form:

Step 2: Identify the *m* and *b*.
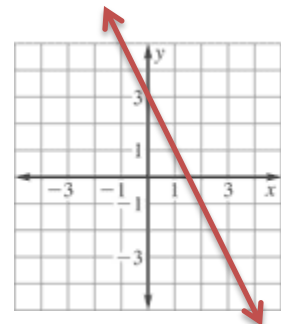
Step 3: Plot the *y*-intercept and rise.

Step 4: Run right if + and left if -.

Step 5: Plot several points and connect.
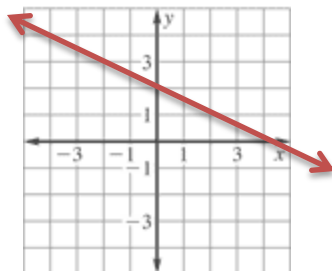
$2x + y = 3$
$y = -2x + 3$
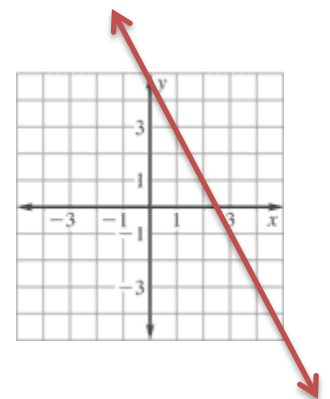
$m = -2 \ \ b = 3$

Try These:

Ex: $x + 2y = 4$
$\underline{-x \qquad -x}$
$\dfrac{2y}{2} = \dfrac{4 - x}{2}$

$y = 2 - \tfrac{1}{2}\,x$
$m = -\tfrac{1}{2}, b = 2$

Ex: $y = -2x + 5$

$m = -2, b = 5$

Word Problem:

1) A violin teacher charges a one-time sheet-music fee of $20 for adults and no fee for children. The charge per hour for both is $20.

a) Write two equations to represent each situation.
x: Number of hours   Adults: $y = 20 + 20x$
y: Total cost   Children: $y = 20x$

b) How will these two graphs be related?
They will be parallel because they have the same slope.

Special Slopes:

Parallel Lines: They have the same <u>slope.</u> If two lines are <u>parallel</u> they are <u>increasing</u> or <u>decreasing</u> at the same <u>rate</u> and therefore will never <u>intercect</u> making them <u>parallel lines.</u>

To determine if two lines are parallel: Find the slope of each line using the formula $\frac{y_2 - y_1}{x_2 - x_1}$.

Line A passes through the points $(-1, -1)$ and $(2, 0)$
     Line B passes through the points $(0, -3)$ and $(5, -1)$
     Line C passes through the points $(-2, -5)$ and $(4, -3)$

     Which two lines, if any, are parallel?
To decide which lines are parallel, find the slope of each line using the formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$ to determine their slopes. If two lines have the same slope then they are parallel.

Line A: Line B: Line C:

$m = \frac{0 - (-1)}{2 - (-1)}$ $m = \frac{-1 - (-3)}{5 - (0)}$ $m = \frac{-3 - (-5)}{4 - (-2)}$

$m = \frac{1}{3}$ $m = \frac{2}{5}$ $m = \frac{2}{6} = \frac{1}{3}$

Lines A and C are parallel because they have the same slope.

Decide if the given lines are parallel. State why or why not.

Ex: $y = 3x + 7$ **Ex:** $y = \frac{1}{2}x + 4$
      $2y - 6x = 8$ $2x - 4y = 16$

*Identify the slope of each line by putting them in slope-intercept form first. Then decide if they are parallel.

1st Line: $y = 3x + 7$ 1st Line: $y = \frac{1}{2}x + 4$

2nd Line: $2y = 8 + 6x$ 2nd Line: $-4y = 16 - 2x$
               $y = 4 + 3x$ $y = -4 + \frac{1}{2}x$

Both lines have a slope of 3 so they are parallel   Yes, both lines have a slope of ½