Guided Notes 4.6/4.7

VOCABULARY
1. The linear equation \( y = mx + b \) is written in **slope-intercept form**. The slope of the line is \( m \). The y-intercept is \( b \).
Find the slope and $y$-intercept of the graph of the equation

<table>
<thead>
<tr>
<th>Equation</th>
<th>Slope</th>
<th>$y$-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 2x + 1$</td>
<td>$2$</td>
<td>$1$</td>
</tr>
<tr>
<td>$y = -2x - 3$</td>
<td>$-2$</td>
<td>$-3$</td>
</tr>
<tr>
<td>$y = x + 4$</td>
<td>$1$</td>
<td>$4$</td>
</tr>
<tr>
<td>$y = 0.5x - 2.5$</td>
<td>$0.5$</td>
<td>$-2.5$</td>
</tr>
</tbody>
</table>
Writing equations in Slope-Intercept Form

To write an equation in slope-intercept form we want to have one side be \( y \) and everything else on the other side, \( y = \text{stuff} \).

Write the following equations in slope-intercept form, identify the slope and the \( y \)-intercept.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Slope-Intercept form</th>
<th>Slope</th>
<th>( y )-Intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = -x + 2 )</td>
<td>( y = -x + 2 )</td>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>( y = \frac{x + 3}{2} )</td>
<td>( y = \frac{1}{2}x + \frac{3}{2} )</td>
<td>( \frac{1}{2} )</td>
<td>( \frac{3}{2} )</td>
</tr>
<tr>
<td>( y = -4 )</td>
<td>( y = \frac{1}{2}x - 4 )</td>
<td>0</td>
<td>-4</td>
</tr>
<tr>
<td>( 2x - 4y = 16 )</td>
<td>( y = \frac{1}{2}x - 4 )</td>
<td>( \frac{1}{2} )</td>
<td>-4</td>
</tr>
</tbody>
</table>
Graphing Using Slope and Intercept

To graph a linear equation using the slope and the intercept we:

1. _______ the equation in slope-intercept form.
2. _______ the slope and the y-intercept.
3. _______ plot the point (0, b)
4. _______ draw a slope triangle to locate a second point
5. _______ draw a line through the two points
Example 1: Graph the equation $3x + y = 2$.

- Slope: $-\frac{3}{1}$
- Y-intercept: 2
VOCABULARY:

Two different lines are **parallel** if they do not intersect.

Any two **vertical** lines are parallel. Any two non-vertical lines are parallel if and only if they have the **same** __________. 

Example 2: Which of the following lines are parallel?

A: \(-x + 2y = 6\) B: \(-x + 2y = -2\) C: \(x + 2y = 4\)

\[
\begin{align*}
\frac{2y}{2} &= \frac{x+b}{2} \quad &\frac{2y}{2} &= \frac{x-2}{2} \quad &\frac{2y}{2} &= \frac{-x+4}{2} \\
y &= \frac{x+b}{2} \quad &y &= \frac{x-2}{2} \quad &y &= \frac{-x+4}{2} \\
y &= \frac{1}{2}x + 3 \quad &y &= \frac{1}{2}x - 1 \quad &y &= \frac{1}{2}x + 2
\end{align*}
\]
Steps for solving a Linear Equation Graphically

1. Write the equation in the form \( \textit{mx} + \textit{b} = 0 \)

\[
2x - 3 = 4 \quad 2x - 7 = 0
\]

2. Write the related function \( y = \textit{mx} + \textit{b} \)

\[
y = 2x - 7
\]

3. Graph the equation \( y = \textit{mx} + \textit{b} \)

\[
\text{Slope: 2} \quad \text{y-int: 7}
\]

4. The solution of \( ax + b = 0 \) is the \( x \)-intercept of \( y = ax + b \)
Example 3: Solve $2x - 5 = 1$ algebraically. Check your solution graphically.

$2x - 5 = 1$

$2x = 6$

$x = 3$

$y = 2x - 6$

$\frac{2}{1} - 6$
Example 4: Solve the equation graphically then check your solution algebraically. $2x - 7 = -5$

Graph:

- Equation: $y = 2x - 2$
- Slope: $m = 2$
- y-intercept: $b = -2$
- Related function:
  - $x = 1$
  - $2(1) - 2 = 0$
  - $2 - 2 = 0$
  - $0 = 0$ (Check mark)

Point: $(1, 0)$