**Section 4 – 4: Graphing a Line Given its Equation**

There are three different kinds of line graphs possible and each of the three different type of graphs corresponds to one of three different types of line equations.

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equations of the form $y = a \text{ constant}$</td>
<td>Equations of the form $x = a \text{ constant}$</td>
<td>Equations of the form $y = mx \pm b$</td>
</tr>
<tr>
<td>like $y = 2$</td>
<td>like $x = 4$</td>
<td>like $y = 3x - 1$ or $y = -2x + 1$</td>
</tr>
<tr>
<td><strong>have a zero slope</strong></td>
<td><strong>have an undefined slope</strong></td>
<td><strong>have a slope $m$ that is a non zero number</strong></td>
</tr>
<tr>
<td>and are graphed as a horizontal line through the $y$ axis at 2</td>
<td>and are graphed as a vertical line through the $x$ axis at 4</td>
<td>They are graphed as a line with a slope of $m$ through the $x$ and $y$ axis</td>
</tr>
</tbody>
</table>

$y = 2$

$y = 4$

$y = 3x - 1$ or $y = -2x + 1$

or $y = -2x + 1$
To Graph a Line given it’s Equation

\[ y = \text{constant} \]

**Case 1:** If the equation is of the form \( y = y_1 \) (where \( y_1 \) is the constant)

Graph a horizontal line crossing the y axis at \( y_1 \) (the constant)

**Example 1**
Graph \( y = -3 \)

\( y = -3 \)
is graphed as a horizontal line through the y axis at \(-3\)

**Example 2**
Graph \( y = 4 \)

\( y = 4 \)
is graphed as a horizontal line through the y axis at \(4\)
To Graph a Line given it’s Equation

\[ x = \text{constant} \]

**Case 2:** If the equation is of the form \( x = x_1 \) (where \( x_1 \) is the constant)

Graph a vertical line crossing the x axis at \( x_1 \) (the constant)

**Example 1**

Graph \( x = 2 \)

\( x = 2 \) is graphed as a vertical line through the x axis at 2

**Example 2**

Graph \( x = -4 \)

\( x = -4 \) is graphed as a vertical line through the x axis at -4
To Graph a Line given it’s Equation

\[ y = mx + b \]

**Case 3:** If the equation has \( x \) and \( y \) variables and can be written in the form \( y = mx \pm b \)

**Step 1.** Put the equation into the form \( y = mx \pm b \) Note the signs of \( m \) and \( b \).

**Step 2.** List the slope \( m \) and the y intercept \( b \)

**Step 3.** **Plot a point** on the graph on the y axis at \( b \).

**Step 4.** To get a second point, **start at the y intercept** and move in the \( x \) and \( y \) directions based on the slope.

**Step 5.** Draw a line through the two points.

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**Example 1.** Graph \( y = \frac{3}{2}x - 1 \)

**Step 2.** The slope is \( m = \frac{3}{2} \) up \( \frac{3}{2} \) right 2 and the y intercept \( b \) is \( -1 \)

**Step 3.** Plot \( (0, -1) \)

**Step 4.** go right 2 up 3 and plot a point

**Step 5.** Draw the line graph through the 2 points
Example 2. Graph \( y = \frac{-5}{3}x + 2 \)

**Step 2.** The slope is \( m = \frac{-5}{3} \) down 5 right 3 and the y intercept \( b \) is 2

**Step 3.** Plot (0, 2)

**Step 4.** Go right 3 down 5 and plot a point

**Step 5.** Draw the line graph through the 2 points
**Example 3.** Graph \( 5x - 2y = 0 \)

**Step 1.** Solve for \( y \):

\[
5x + 2y = 0 \\
-5x - 5x
\]

\[
2y = -5x
\]

\[
\frac{2y}{2} = \frac{-5x}{2}
\]

\[
y = \frac{-5}{2}x
\]

**Step 2.** The slope is \( m = \frac{5}{2} \) up 5 right 2 and the \( y \) intercept \( b \) is 0.

**Step 3.** Plot \((0, 0)\)

**Step 4.** go right 2 up 5 and plot a point

**Step 5.** Draw the line graph through the 2 points
**Example 4.** Graph $4x - 3y = -6$

**Step 1.** Solve for $y$:

$4x - 3y = 6$

$-4x -4x$

$-3y = -4x + 6$

$rac{-3y}{-3} = rac{-4x + 6}{-3}$

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

**Step 2.** The slope is $m = \frac{4}{3}$ up 4 right 3 and the y intercept $b$ is $-2$

**Step 3.** Plot $(0, -2)$

**Step 4.** go right 3 up 4 and plot a point

**Step 5.** Draw the line graph through the 2 points.