Day 1 Graphing Linear Equations

A \textbf{linear equation} is an equation that forms a straight line when graphed. We can also say that there is a \textbf{constant} slope or a \textbf{common} difference between the y and x values.

We can graph a linear equation by making a \underline{table} and also by using \underline{x} and \underline{y} intercepts.

Graphing by a table of values

1. Rewrite the equation in \underline{slope-intercept form} if necessary

2. Choose values for x that include \underline{positive} values, zero, and \underline{negative} values.

3. Substitute the x values to find the corresponding \underline{y-value}

4. Plot the points from the table of values on a coordinate plane
**Example 1** Use a table of values to graph the equation \( y + 2 = 3x \)

\[
\begin{array}{|c|c|c|}
\hline
x & y = 3x - 2 & (x, y) \\
\hline
-6 & y=3(-6)-2 & -20 (6,20) \\
-3 & y=3(-3)-2 & -11 (-3,-11) \\
-1 & y=3(-1)-2 & -5 (-1,-5) \\
0 & y=3(0)-2 & -2 (0,-2) \\
2 & y=3(2)-2 & 4 (2,4) \\
3 & & \\
\hline
\end{array}
\]

**Graphing by x and y intercepts**

The y coordinate where the graph crosses the y-axis is called the **y-intercept**. This is the y-value where \( x = 0 \).

The x coordinate where the graph crosses the x-axis is called the **x-intercept**. This is the x-value where y = 0.
Finding the intercepts

**Example 2:** Find the x-intercept and y-intercept of the equation \(2x + 3y = 6\)

Remember: x-intercept is where \(y = 0\) and y-intercept is where \(x = 0\)

\[
\frac{y\text{-int} \ (0,y)}{2(0)+3y=6} \quad \frac{2y=6}{\frac{2y}{2} = \frac{6}{2}} \\
\]

\[
x = 3 \\
(3,0)
\]

To graph using intercepts:

1. Find the **x-intercept** by plugging in 0 for \(y\) and solve for the x-value
2. Find the **y-intercept** by plugging in 0 for \(x\) and solve for the y-value
3. Plot these points on the coordinate plane
Example 3 Graph $2x+4y=16$ by using the x and y intercepts

\[ y = \text{int} \quad (0, y) \]
\[ 2(0) + 4y = 16 \]
\[ 4y = 16 \]
\[ y = 4 \]
\[ (0, 4) \]

\[ x = \text{int} \quad (x, 0) \]
\[ 2x + 4(0) = 16 \]
\[ 2x = 16 \]
\[ x = 8 \]
\[ (8, 0) \]

Example 4 Find the x and y intercepts and the slope of the following.

\[ y = \frac{3}{4}x - 2 \]
\[ 0 = \frac{3}{4}x - 2 \]
\[ x = \frac{8}{3} \]

x-intercept: \((\frac{8}{3}, 0)\)

y-intercept: \((0, -4)\)

Slope: \(-\frac{4}{2} = -2\)

x-intercept: \((0, -4)\)

y-intercept: \((0, -2)\)

Slope: \(\frac{3}{4}\)
Example 5 Find the x and y intercepts of the following and explain what they mean

<table>
<thead>
<tr>
<th>Position of a Scuba Diver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (s)</td>
</tr>
<tr>
<td>-0.00</td>
</tr>
<tr>
<td>-0.03</td>
</tr>
<tr>
<td>0.06</td>
</tr>
<tr>
<td>0.09</td>
</tr>
<tr>
<td>0.12</td>
</tr>
</tbody>
</table>

\[ \text{x-int} \left( x, 0 \right) \]
\[ \left( 12, 0 \right) \]

A scuba diver is at 0 ft.

\[ \text{y-int} \left( 0, y \right) \]
\[ \left( 0, -24 \right) \]

0 seconds 24 ft. underwater.

Example 6: Graph \( y = 2 \) by making a table of values. Name the x and y intercepts

\[
\begin{array}{ccc}
\text{x} & \text{y} & (x, y) \\
-4 & 2 & (-4, 2) \\
0 & 2 & (0, 2) \\
3 & 2 & (3, 2) \\
\end{array}
\]

\[ \text{x-int} \text{ N/A} \]
\[ \text{y-int} \left( 0, 2 \right) \]
**Example 7**: Graph $x = -3$ by making a table of values. Name the $x$ and $y$ intercepts

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>$(x,y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-4</td>
<td>(-3, -4)</td>
</tr>
<tr>
<td>-3</td>
<td>0</td>
<td>(-3, 0)</td>
</tr>
<tr>
<td>-3</td>
<td>2</td>
<td>(-3, 2)</td>
</tr>
<tr>
<td>-3</td>
<td>3</td>
<td>(-3, 3)</td>
</tr>
</tbody>
</table>

**Example 7**: Graph $x = -3$ by making a table of values. Name the $x$ and $y$ intercepts