**FINDING X- AND Y- INTERCEPTS**

The $x$-intercept is the point at which a graph crosses the $x$-axis. As the $y$ value is zero anywhere along the $x$-axis, the $x$-intercept is an ordered pair of numbers where the $y$ value is always zero. The points $(-3, 0), (1, 0), (4, 0)$ are all examples of points on the $x$-axis.

The $y$-intercept is the point at which a graph crosses the $y$-axis. As the $x$ value is zero anywhere along the $y$-axis, the $y$-intercept is an ordered pair of numbers where the $x$ value is always zero. The points $(0, 1), (0, -1), (0, 2)$ are all examples of points on the $y$-axis.

It is possible to graph the equation of a line by finding the $x$- and $y$-intercepts.
EXAMPLE: We will graph the equation $3x + 2y = 12$ by finding the $x$- and $y$-intercepts.

1. To find the $x$-intercept, let $y = 0$ and solve for $x$.
   \[
   \begin{align*}
   3x + 2y &= 12 \\
   3x + 2(0) &= 12 \\
   3x &= 12 \\
   x &= 4
   \end{align*}
   \]
   
   The $x$-intercept is the ordered pair $(4, 0)$.

2. To find the $y$-intercept, let $x = 0$ and solve for $y$.
   \[
   \begin{align*}
   3x + 2y &= 12 \\
   3(0) + 2y &= 12 \\
   2y &= 12 \\
   y &= 6
   \end{align*}
   \]
   
   The $y$-intercept is the ordered pair $(0, 6)$.

3. Graph the ordered pairs and draw the line.

EXAMPLE: Find the $x$- and $y$-intercepts of $y = 2x + 6$ and graph.

1. Find the $x$-intercept. ($y$ will be 0)
   \[
   \begin{align*}
   y &= 2x + 6 \\
   0 &= 2x + 6 \\
   -6 &= 2x \\
   -3 &= x
   \end{align*}
   \]
   
   The $x$-intercept is $(-3, 0)$.

2. Find the $y$-intercept. ($x$ will be 0)
   \[
   \begin{align*}
   y &= 2x + 6 \\
   y &= 2(0) + 6 \\
   y &= 6
   \end{align*}
   \]
   
   The $y$-intercept is $(0, 6)$.

3. Graph the intercepts and draw the line.
EXAMPLE: Find the \( x\)- and \( y\)-intercepts of \( 3x + 4y = 0 \) and graph.

1. Find the \( x\)-intercept (set \( y = 0 \))
   \[
   \begin{align*}
   3x + 4y &= 0 \\
   3x + 4(0) &= 0 \\
   3x &= 0 \\
   x &= 0
   \end{align*}
   \]
   The \( x\)-intercept is (0, 0).

2. Find the \( y\)-intercept (set \( x = 0 \))
   \[
   \begin{align*}
   3x + 4y &= 0 \\
   3(0) + 4y &= 0 \\
   4y &= 0 \\
   y &= 0
   \end{align*}
   \]
   The \( y\)-intercept is (0, 0).

**NOTE** that the \( x\)- and \( y\)-intercept are both at the point (0, 0). This means that the line goes through the origin. We will need to find another point in order to graph. Pick a value for \( x \) and solve for \( y \).

Let's see what happens if we let \( x = 4 \) after writing the equation in the \( y = mx + b \) form. (See handout #43)

Solve for \( y \):
   \[
   \begin{align*}
   3x + 4y &= 0 \\
   4y &= -3x + 0 \\
   \frac{4y}{4} &= -\frac{3x}{4} \\
   y &= -\frac{3}{4}x
   \end{align*}
   \]
   Now let \( x = 4 \):
   \[
   \begin{align*}
   y &= -\frac{3}{4}(4) \\
   y &= -3
   \end{align*}
   \]
   The point (4, -3) is a solution of \( 3x + 4y = 0 \)

3. Graph the \( x\)- and \( y\)-intercept and the point (4, -3), and then draw the line.
EXERCISES: Find the $x$- and $y$-intercepts of the following equations and graph the line of each equation.

\begin{align*}
a. \quad y &= 2x + 8 \\
b. \quad y &= 5x + 10 \\
c. \quad x - 3y &= 6 \\
d. \quad 3x - 4y &= 12 \\
e. \quad 2x - 4y &= 8 \\
f. \quad 2x + 3y &= 0
\end{align*}

KEY:

a. $x$-intercept: $(-4, 0)$  
   $y$-intercept: $(0, 8)$

b. $x$-intercept: $(-2, 0)$  
   $y$-intercept: $(0, 10)$

c. $x$-intercept: $(6, 0)$  
   $y$-intercept: $(0, -2)$

d. $x$-intercept: $(4, 0)$  
   $y$-intercept: $(0, -3)$

e. $x$-intercept: $(4, 0)$  
   $y$-intercept: $(0, -2)$

f. $x$-intercept: $(0, 0)$  
   $y$-intercept: $(0, 0)$  
   *You will need another point to complete the graph.*