3-2 Study Guide and Intervention
Solving Linear Equations by Graphing

Solve by Graphing You can solve an equation by graphing the related function. The solution of the equation is the \(x\)-intercept of the function.

Example: Solve the equation \(2x - 2 = -4\) by graphing.
First set the equation equal to 0. Then replace 0 with \(f(x)\). Make a table of ordered pair solutions. Graph the function and locate the \(x\)-intercept.

\[
\begin{align*}
2x - 2 &= -4 & \text{Original equation} \\
2x - 2 + 4 &= -4 + 4 & \text{Add 4 to each side.} \\
2x + 2 &= 0 & \text{Simplify.} \\
f(x) &= 2x + 2 & \text{Replace 0 with } f(x).
\end{align*}
\]

To graph the function, make a table. Graph the ordered pairs.

<table>
<thead>
<tr>
<th>(x)</th>
<th>(f(x) = 2x + 2)</th>
<th>(f(x))</th>
<th>([x, f(x)])</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(f(1) = 2(1) + 2)</td>
<td>4</td>
<td>((1, 4))</td>
</tr>
<tr>
<td>-1</td>
<td>(f(-1) = 2(-1) + 2)</td>
<td>0</td>
<td>((-1, 0))</td>
</tr>
<tr>
<td>-2</td>
<td>(f(-2) = 2(-2) + 2)</td>
<td>-2</td>
<td>((-2, -2))</td>
</tr>
</tbody>
</table>

The graph intersects the \(x\)-axis at \((-1, 0)\).
The solution to the equation is \(x = -1\).

Exercises
Solve each equation by graphing.
1. \(3x - 3 = 0\)  
2. \(-2x + 1 = 5 - 2x\)  
3. \(-x + 4 = 0\)
4. \(0 = 4x - 1\)  
5. \(5x - 1 = 5x\)  
6. \(-3x + 1 = 0\)
3-2 Study Guide and Intervention (continued)

Solving Linear Equations by Graphing

**Estimate Solutions by Graphing** Sometimes graphing does not provide an exact solution, but only an estimate. In these cases, solve algebraically to find the exact solution.

**Example: WALKING** You and your cousin decide to walk the 7-mile trail at the state park to the ranger station. The function \( d = 7 - 3.2t \) represents your distance \( d \) from the ranger station after \( t \) hours. Find the zero of this function. Describe what this value means in this context.

Make a table of values to graph the function.

<table>
<thead>
<tr>
<th>( t )</th>
<th>( d = 7 - 3.2t )</th>
<th>( d )</th>
<th>( (t, d) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>( d = 7 - 3.2(0) )</td>
<td>7</td>
<td>( (0, 7) )</td>
</tr>
<tr>
<td>1</td>
<td>( d = 7 - 3.2(1) )</td>
<td>3.8</td>
<td>( (1, 3.8) )</td>
</tr>
<tr>
<td>2</td>
<td>( d = 7 - 3.2(2) )</td>
<td>0.6</td>
<td>( (2, 0.6) )</td>
</tr>
</tbody>
</table>

The graph intersects the \( t \)-axis between \( t = 2 \) and \( t = 3 \), but closer to \( t = 2 \). It will take you and your cousin just over two hours to reach the ranger station.

You can check your estimate by solving the equation algebraically.

**Exercises**

1. **MUSIC** Jessica wants to record her favorite songs to one CD. The function \( C = 80 - 3.22n \) represents the recording time \( C \) available after \( n \) songs are recorded. Find the zero of this function. Describe what this value means in this context.

2. **GIFT CARDS** Enrique uses a gift card to buy coffee at a coffee shop. The initial value of the gift card is $20. The function \( n = 20 - 2.75c \) represents the amount of money still left on the gift card \( n \) after purchasing \( c \) cups of coffee. Find the zero of this function. Describe what this value means in this context.