Guided Practice 3.1.2

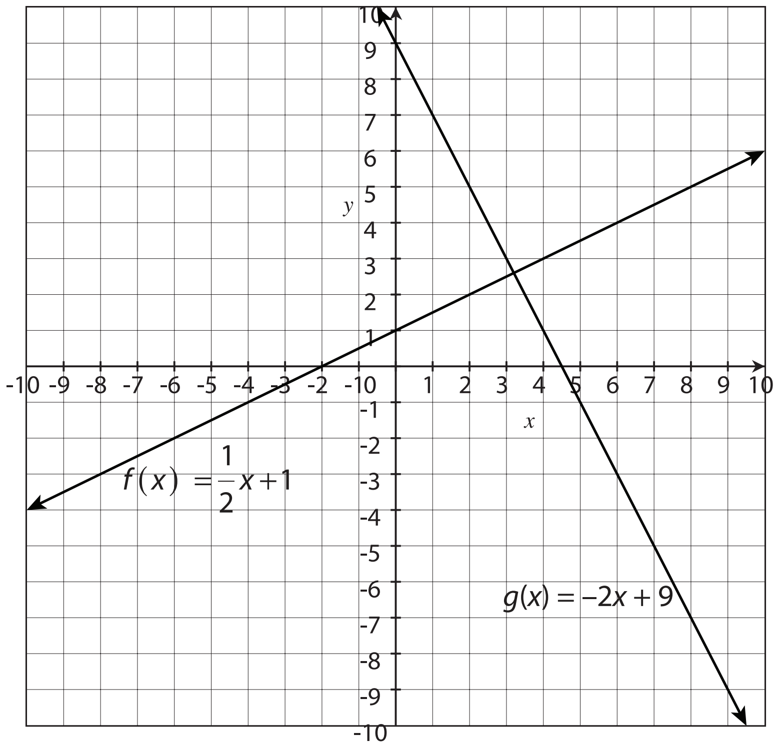
Example 1

Use a graph to approximate the solutions for the following system of equations. Find the difference in outputs, $f(x) - g(x)$, for your estimates.

$$f(x) = \frac{1}{2}x + 1$$

$$g(x) = -2x + 9$$

1. Graph $f(x) = \frac{1}{2}x + 1$ and $g(x) = -2x + 9$ on the same coordinate plane.



2. Approximate the values for x where $f(x) = g(x)$.

   From the graph, $x = 3$ should be a good estimate.

3. Evaluate $f(x)=\frac{1}{2}x+1$ for $x = 3$.

$y=\frac{1}{2}x+1$	Change "$f(x)$ =" to "y =."
$y=\frac{1}{2}(3)+1$	Substitute 3 for x.
$y = 1.5 + 1 = 2.5$	Simplify.

4. Evaluate $g(x) = -2x + 9$ for $x = 3$.

$y = -2x + 9$	Change "$g(x)$ =" to "y =."
$y = -2(3) + 9$	Substitute 3 for x.
$-6 + 9 = 3$	Simplify.

5. Find the difference of the y-values of the equations.

$f(x) - g(x)$	Subtract $g(x)$ from $f(x)$.
$2.5 - 3 = -0.5$	Substitute the calculated values for $f(x)$ and $g(x)$ and subtract.

Since the difference is close to 0, we can say the functions intersect when x is approximately equal to 3.

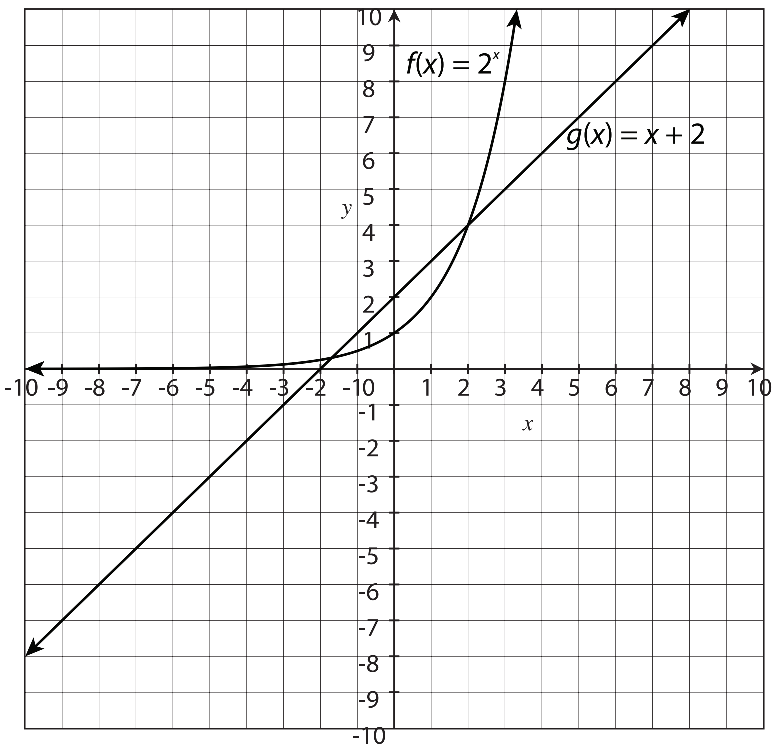
Example 2

Use a graph to approximate the solutions for the following system of equations. Find $f(x) - g(x)$ for your estimates.

$f(x) = 2^x$

$g(x) = x + 2$

1. Graph $f(x) = 2^x$ and $g(x) = x + 2$ on the same coordinate plane.



2. Approximate the values for x where $f(x) = g(x)$.

   From the graph, –2 and 2 should be good estimates.

3. Evaluate $f(x) = 2^x$ and $g(x) = x + 2$ for $x = 2$.

   Change "$f(x) =$" and "$g(x) =$" to "$y =$" and substitute 2 for x.

   $y = 2^x = 2^{(2)} = 4$

   $y = x + 2 = (2) + 2 = 4$

4. Find the difference in the y-values for the equations.

   $4 - 4 = 0$; therefore, $x = 2$ satisfies $f(x) = g(x)$ and is a solution to the system.

   The point (2, 4) is a solution for both graphs.

5. Evaluate $f(x) = 2^x$ and $g(x) = x + 2$ for $x = -2$.

   Change "$f(x) =$" and "$g(x) =$" to "$y =$" and substitute –2 for x.

   $y = 2^x = 2^{(-2)} = 0.25$

   $y = x + 2 = (-2) + 2 = 0$

6. Find the difference in the y-values for the equations.

   $0.25 - 0 = 0.25$

   0.25 is very close to 0; therefore, $f(x) = g(x)$ when x is approximately equal to –2.

Example 3

Use a table of values to approximate the solutions for the following system of equations:

$f(x) = 3^x$

$g(x) = 2^x + 1$

1. Create a table of values.

x	$f(x) = 3^x$	$g(x) = 2^x + 1$	$f(x) - g(x)$
–1	$0.3\overline{3}$	1.5	–1.17
0	1	2	–1
1	3	3	0
2	9	5	4
3	27	9	18

2. In column $f(x) - g(x)$, look for sign changes.

   There is a sign change from $x = 0$ to $x = 2$, and at $x = 1$, $f(x) - g(x) = 0$. This tells us the curves f and g intersect at $x = 1$.