Name _____ Date _____

# Take Some Time to Reflect

## Reflections of Linear and Exponential Functions

### Vocabulary

Define each term in your own words.

1. reflection

2. line of reflection

### Problem Set

Rewrite each function $g(x)$ in terms of the basic function $f(x)$.

1. $f(x) = 3^x$
   $g(x) = -(3^x)$
   $g(x) = -f(x)$

2. $f(x) = 3^x$
   $g(x) = 3^{-x}$

3. $f(x) = 4^x$
   $g(x) = -(4^x)$

4. $f(x) = 4^x$
   $g(x) = 4^{-x}$

5. $f(x) = 2^x + 4$
   $g(x) = 2^{-x} + 4$

6. $f(x) = 2^x - 1$
   $g(x) = -(2^x - 1)$

Represent each reflection using coordinate notation. Identify whether $g(x)$ is a reflection about a horizontal line of reflection or a vertical line of reflection.

**7.** $f(x) = 2^x$
$g(x) = -(2^x)$
$(x, y) \rightarrow (x, -y)$
$g(x)$ is a horizontal reflection about $y = 0$.

**8.** $f(x) = 2^x$
$g(x) = 2^{-x}$

**9.** $f(x) = 5x$
$g(x) = -(5x)$

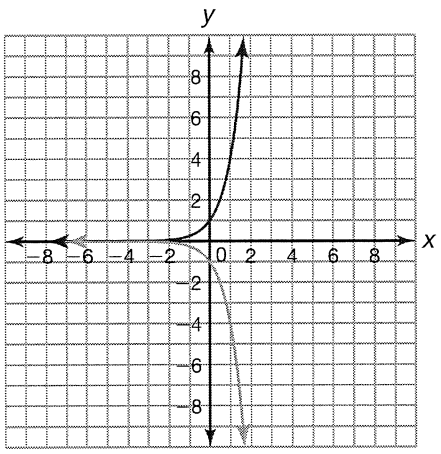
**10.** $f(x) = 5x$
$g(x) = 5(-x)$

**11.** $f(x) = 3^x + 7$
$g(x) = 3^{-x} + 7$

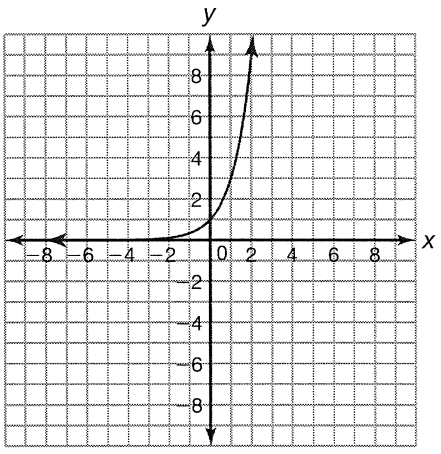
**12.** $f(x) = 4^x - 3$
$g(x) = -(4^x - 3)$

Each coordinate plane shows the graph of $f(x)$. Sketch the graph of $g(x)$.

**13.** $g(x) = -f(x)$




**14.** $g(x) = f(-x)$



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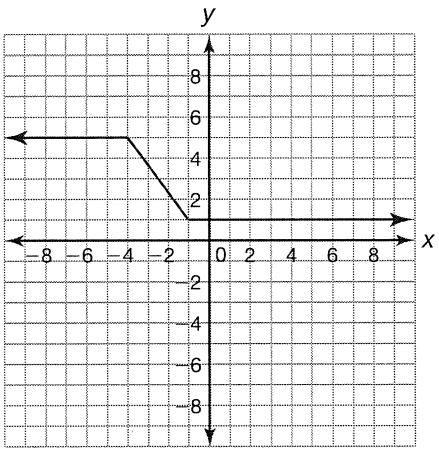
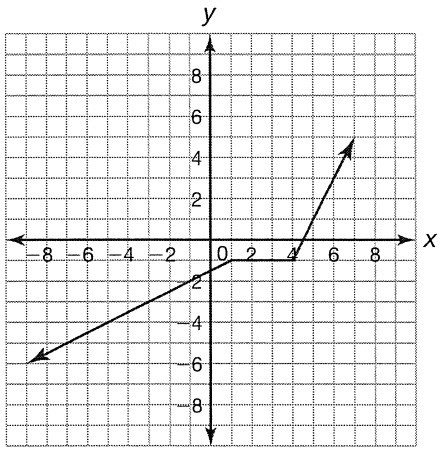
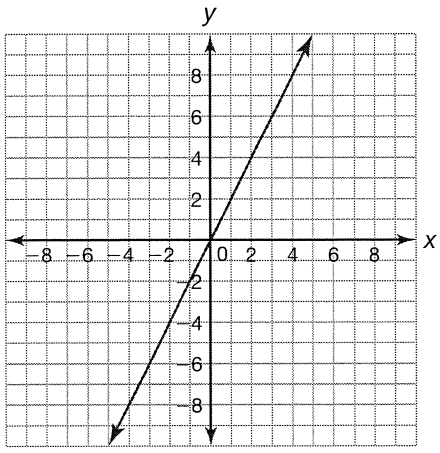
**15.** $g(x) = f(-x)$



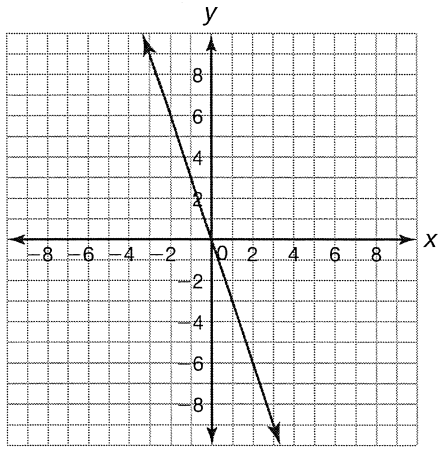

**16.** $g(x) = -f(x)$




**17.** $g(x) = -f(x)$




**18.** $g(x) = f(-x)$

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Write a function, $g(x)$, to describe each reflection of $f(x)$.

**19.** $f(x) = 3^x$

Reflection about the horizontal line $y = 0$.

$g(x) = -3^x$

**20.** $f(x) = 4^x$

Reflection about the vertical line $x = 0$.

**21.** $f(x) = -12x$

Reflection about the vertical line $x = 0$.

**22.** $f(x) = 7x$

Reflection about the horizontal line $y = 0$.

**23.** $f(x) = 2^x + 9$

Reflection about the horizontal line $y = 0$.

**24.** $f(x) = -8^x + 1$

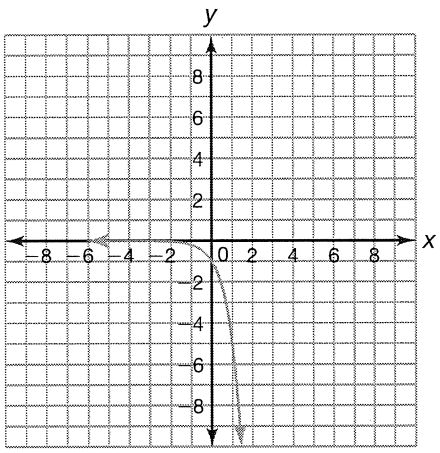
Reflection about the vertical line $x = 0$.

Write an equation for $g(x)$ given each transformation. Sketch the graph of $g(x)$.

**25.** $f(x) = 5^x$

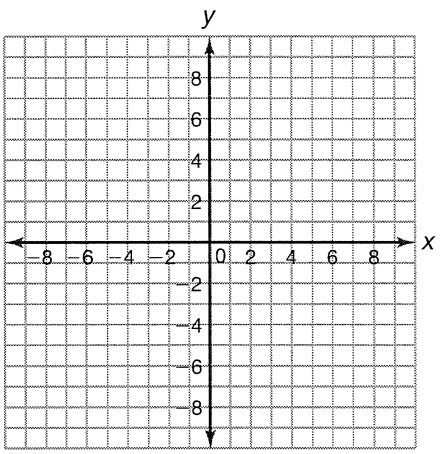
$g(x)$ is a reflection of $f(x)$ over the line $y = 0$.

$g(x) = -5^x$




**26.** $f(x) = 5^x$

$g(x)$ is a reflection of $f(x)$ over the line $x = 0$.



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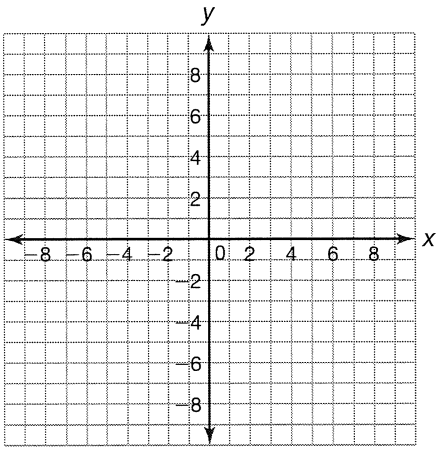
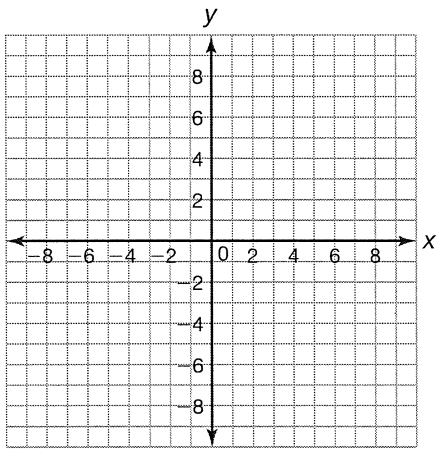
**27.** $f(x) = 3^x$

$g(x)$ is a translation of $f(x)$ up 2 units.



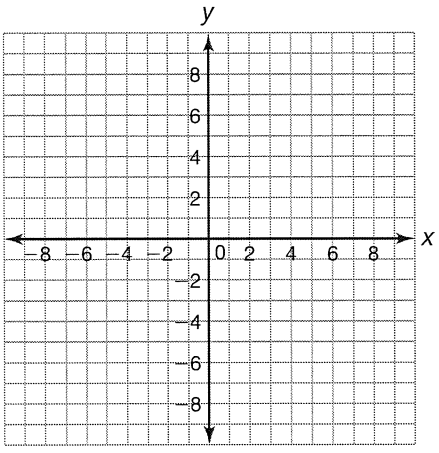

**28.** $f(x) = 4^x$

$g(x)$ is a translation of $f(x)$ right 3 units.



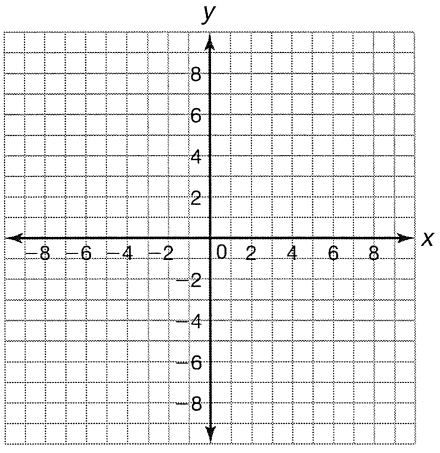

**29.** $f(x) = 4^x$

$g(x)$ is a translation of $f(x)$ down 4 units.



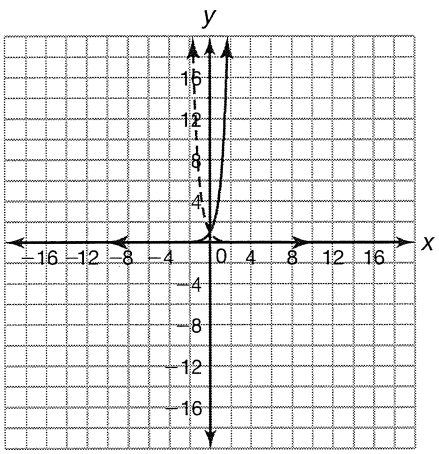

**30.** $f(x) = 3^x$

$g(x)$ is a translation of $f(x)$ left 5 units.



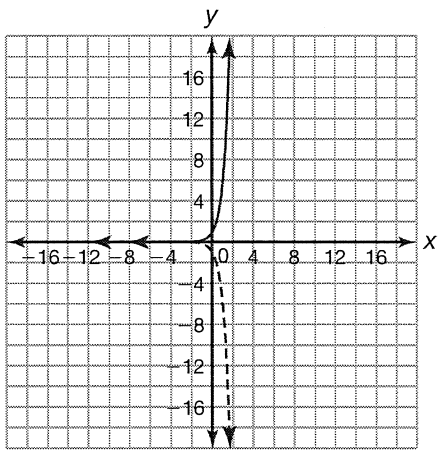
Identify the transformation required to transform $f(x)$ to $g(x)$ as shown in each graph.

**31.**

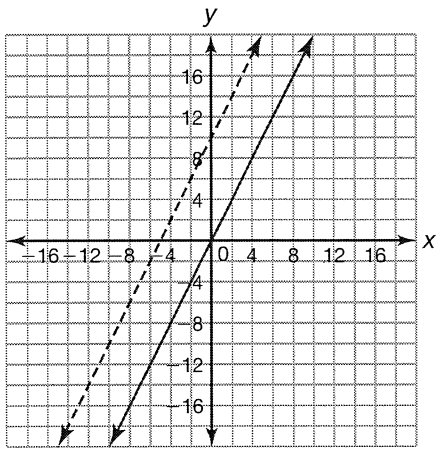



$g(x)$ is a reflection of $f(x)$ over the line $x = 0$.

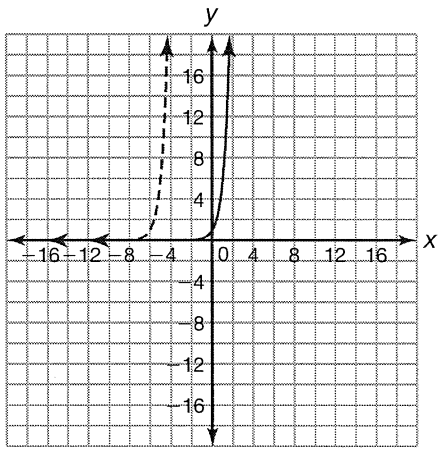
**32.**




**33.**




**34.**



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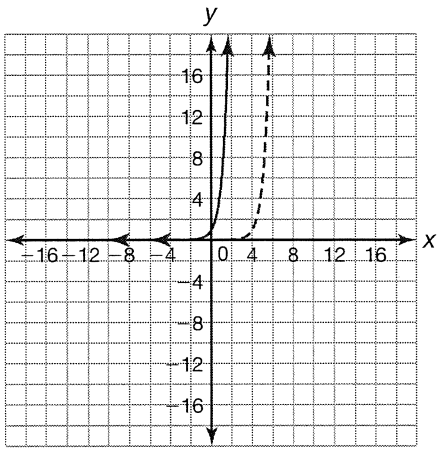
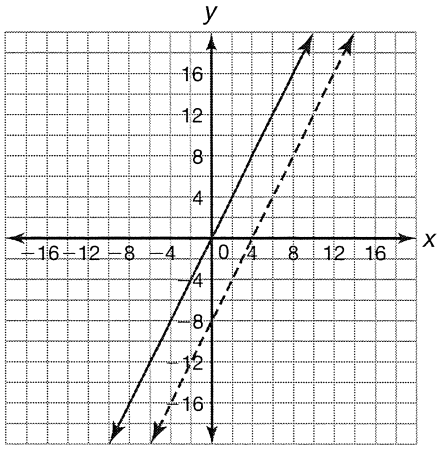
**35.**




**36.**




Identify the transformation required to transform each $f(x)$ to $g(x)$.

**37.** $f(x) = 8^x$

$g(x) = -(8^x)$

$g(x)$ is a reflection of $f(x)$ over the line $y = 0$.

**38.** $f(x) = 9^x$

$g(x) = 9^{-x}$

**39.** $f(x) = 8^x$

$g(x) = 8^x - 5$

**40.** $f(x) = 3^x$

$g(x) = 3^{x-1}$

**41.** $f(x) = 10x$

$g(x) = 10x + 2$

**42.** $f(x) = -12x$

$g(x) = -12(x + 1)$