LESSON PRACTICE

Packet: 17, 18, 19

(17) Translating Functions Name _____

1 Which equation represents the translation of $f(x) = 5x + 3$ shifted down 4 units?

Ⓐ $g(x) = 5x - 4$

Ⓑ $g(x) = 5x - 1$

Ⓒ $g(x) = 5x + 4$

Ⓓ $g(x) = 5x + 7$

2 Which equation represents the translation of $f(x) = \left(\frac{2}{3}\right)^{x-1} + 1$ shifted left 5 units?

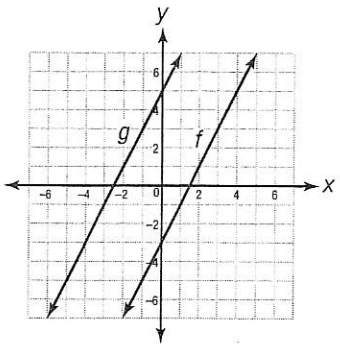
Ⓐ $g(x) = \left(\frac{2}{3}\right)^{x-6} + 1$

Ⓑ $g(x) = \left(\frac{2}{3}\right)^{x-5} + 1$

Ⓒ $g(x) = \left(\frac{2}{3}\right)^{x+4} + 1$

Ⓓ $g(x) = \left(\frac{2}{3}\right)^{x+5} + 1$

3 The graph of g is a translation of the graph of f. Which equation could represent g?



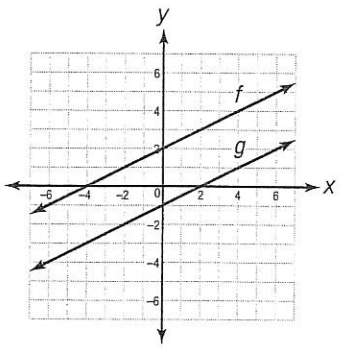
Ⓐ $g(x) = f(x) + 4$

Ⓑ $g(x) = f(x) - 4$

Ⓒ $g(x) = f(x + 4)$

Ⓓ $g(x) = f(x - 4)$

4 The graph of g is a translation of the graph of f. Which equation could represent g?



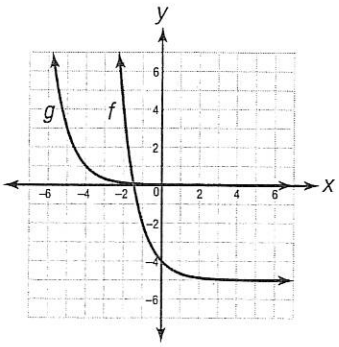
Ⓐ $g(x) = f(x) + 3$

Ⓑ $g(x) = f(x) - 3$

Ⓒ $g(x) = f(x + 3)$

Ⓓ $g(x) = f(x - 3)$

5 The graph of g is a translation of the graph of f. Which equation could represent g?



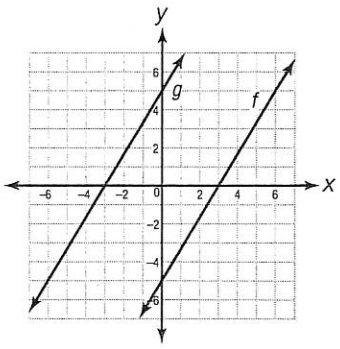
Ⓐ $g(x) = f(x - 4) - 5$

Ⓑ $g(x) = f(x + 4) - 5$

Ⓒ $g(x) = f(x - 4) + 5$

Ⓓ $g(x) = f(x + 4) + 5$

6 The graph of g is a translation of the graph of f. Which equations could represent g? Select all that apply.



- ☐ **A.** $g(x) = f(x) + 10$
- ☐ **B.** $g(x) = f(x) - 10$
- ☐ **C.** $g(x) = f(x + 6)$
- ☐ **D.** $g(x) = f(x - 6)$
- ☐ **E.** $g(x) = f(x + 3) + 5$
- ☐ **F.** $g(x) = f(x - 3) - 5$

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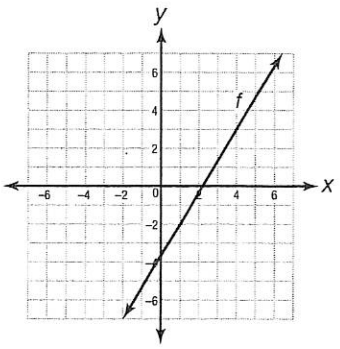
7 The graph of function g is a translation of the graph of $f(x) = \frac{5}{3}(x - 4) + 3$ shifted left 6 units and down 3 units.

Part A

Graph g.



Part B

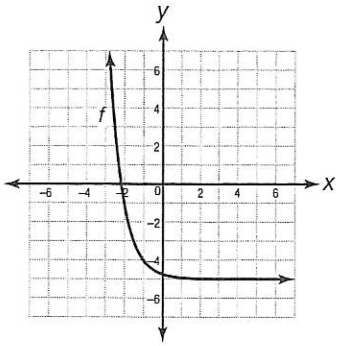
Write an equation for g.

$g(x) =$ _____

8 The graph of function g is a translation of the graph of $f(x) = \left(\frac{1}{4}\right)^{x+1} - 5$ shifted right 5 units and up 3 units.

Part A

Graph g.



Part B

Write an equation for g.

$g(x) =$ _____

9 The points $(-5, 0)$, $(-3, 4)$, $(0, 7)$, and $(1, 9)$ are on the graph of f. The graph of g is the translation of the graph of f shifted down 4 units and right 1 unit. Which points are on the graph of g?

Point	On the graph of g	Not on the graph of g
$(-9, 1)$	○	○
$(-4, -4)$	○	○
$(-3, 8)$	○	○
$(-2, 0)$	○	○
$(1, 3)$	○	○
$(2, 5)$	○	○

10 Let $f(x) = 6^x + 2$. Write an equation of g for each translation of f described in the table.

Translation of f	Equation of g
shift up 5 units	
shift down 3 units	
shift left 2 units	
shift right 4 units	
shift up 8 units and left 3 units	
shift down 4 units and right 7 units	

11 Let $(3, -4)$ be a point on the graph of f and let $g(x) = f(x - 3) + 5$. What is a point on the graph of g? Explain how you found your answer.

12 Let $f(x) = 4^x$. Explain why the graphs of the functions $g(x) = \frac{1}{4} \cdot 4^x$ and $g(x) = 16 \cdot 4^x$ are translations of the graph of f.

13 Let $f(x) = \frac{1}{2}x$.

Part A

How does the graph of f compare to the graph of $g(x) = f(x - 4) + 2$?

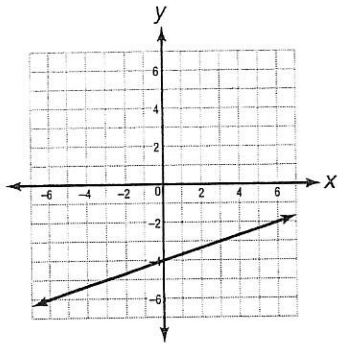
Part B

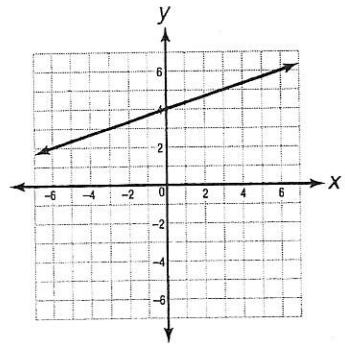
What must be true for the graph of $g(x) = f(x + a) + b$ to be the same as the graph of f? Explain how you know.

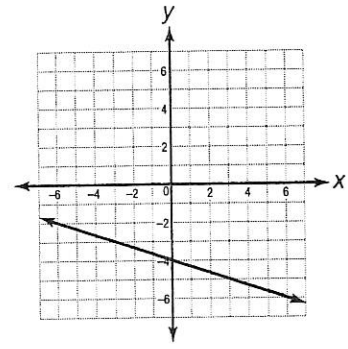
3 LESSON PRACTICE

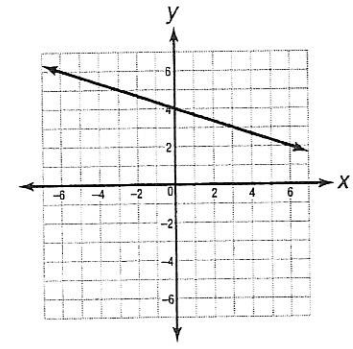
(18) Reflecting Functions

1 Which graph shows the reflection of the graph of $f(x) = \frac{1}{3}x - 4$ across the y-axis?

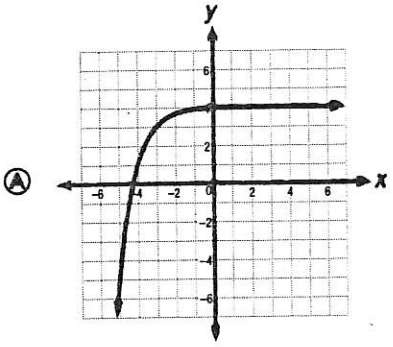
Ⓐ 

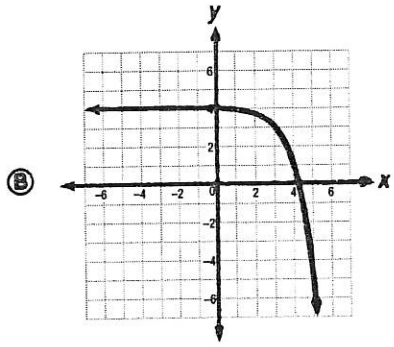
Ⓑ 

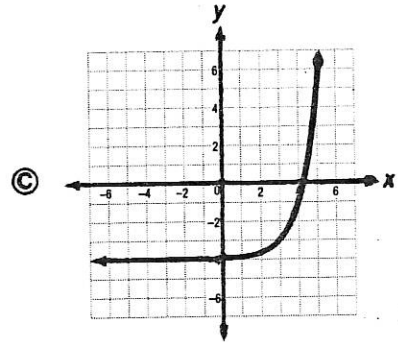
Ⓒ 

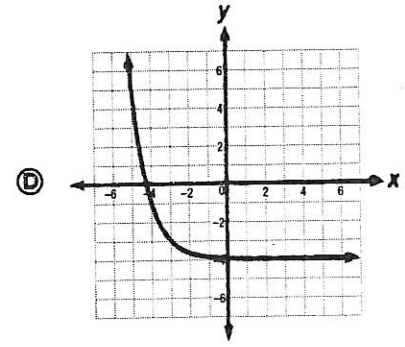
Ⓓ 

2 Which graph shows the reflection of the graph of $f(x) = -\left(\frac{1}{3}\right)^{x+3} + 4$ across the x-axis?

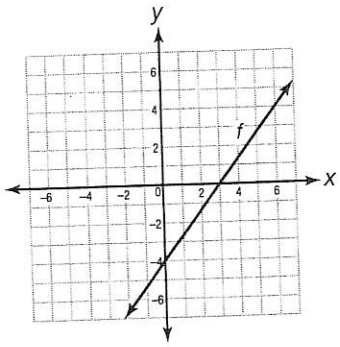
Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

3 The linear function f is graphed on the coordinate plane. Let the graph of g be the reflection of the graph of f across the x-axis. Which equation could represent g?



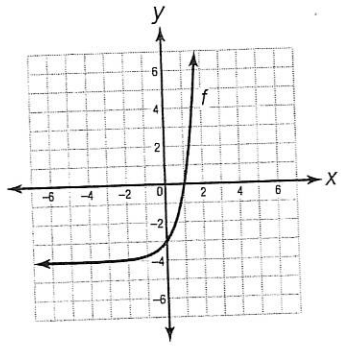
Ⓐ $g(x) = -\frac{4}{3}x + 4$

Ⓑ $g(x) = -\frac{4}{3}x - 4$

Ⓒ $g(x) = \frac{4}{3}x + 4$

Ⓓ $g(x) = \frac{4}{3}x - 4$

4 The exponential function f is graphed on the coordinate plane. Let the graph of g be the reflection of the graph of f across the y-axis. Which equation could represent g?



Ⓐ $g(x) = 4^{-x} - 4$

Ⓑ $g(x) = 4^{-x} + 4$

Ⓒ $g(x) = -4^{-x} - 4$

Ⓓ $g(x) = -4^{-x} + 4$

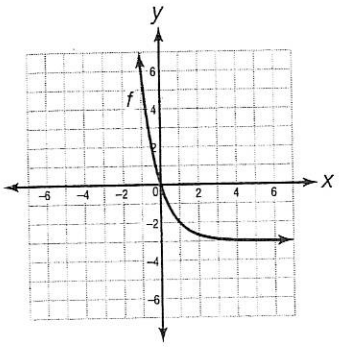
5 The points $\left(-3, -2\frac{1}{2}\right)$, $(-1, -1)$, $(0, 1)$, and $(2, 13)$ are on the graph of f. Which points are on the graph of the reflection of the graph f across the x-axis and which points are on the graph of the reflection of the graph f across the y-axis?

Point	Across the x-axis	Across the y-axis	Neither
$\left(-3, 2\frac{1}{2}\right)$	○	○	○
$(-2, -13)$	○	○	○
$(-2, 13)$	○	○	○
$(0, -1)$	○	○	○
$(0, 1)$	○	○	○
$(1, -1)$	○	○	○
$(1, 1)$	○	○	○
$(2, -13)$	○	○	○

6 The graph of function g is a reflection of the graph of $f(x) = \left(\frac{1}{3}\right)^{x-1} - 3$ across the y-axis.

Part A

Graph g.



Part B

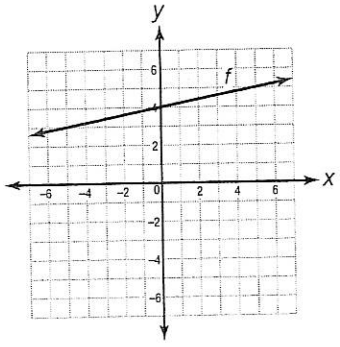
Write an equation for g.

$g(x) =$ _____

7 The graph of function g is a reflection of the graph of $f(x) = \frac{1}{5}x + 4$ across the y-axis.

Part A

Graph g.



Part B

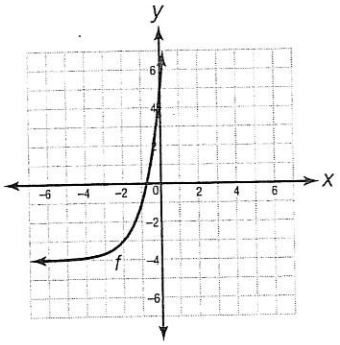
Write an equation for g.

$g(x) =$ _____

8 The graph of function g is a reflection of the graph of $f(x) = 3^{x+2} - 4$ across the x-axis.

Part A

Graph g.



Part B

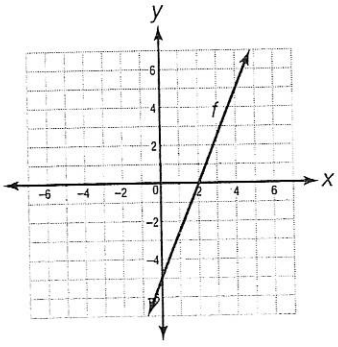
Write an equation for g.

$g(x) =$ _____

9 The graph of function g is a reflection of the graph of $f(x) = \frac{5}{2}x - 5$ across the x-axis.

Part A

Graph g.



Part B

Write an equation for g.

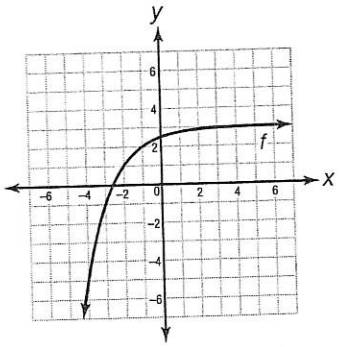
$g(x) =$ _____

10 Let $f(x) = \left(\frac{1}{4}\right)^x$. Explain why the graph of the function $g(x) = 4^x$ is the reflection of the graph of f across the y-axis.

11 The graph of function g is a reflection of the graph of $f(x) = -\left(\frac{1}{2}\right)^{x+1} + 3$ across the x-axis and across the y-axis.

Part A

Graph g.



Part B

Write an equation for g.

$g(x) =$ _____

Part C

If a point (a, b) is on the graph of f, what point is on the graph of g? Explain how you found your answer.

3 LESSON PRACTICE

(19) Stretching / Shrinking Functions

1 Which equation represents the vertical shrink of $f(x) = 4x + 1$ by a factor of $\frac{1}{2}$?

Ⓐ $g(x) = 2x + 1$

Ⓑ $g(x) = 2x + \frac{1}{2}$

Ⓒ $g(x) = 4x + 2$

Ⓓ $g(x) = 4x + 1$

2 Which equation represents the vertical stretch of $f(x) = 3x + 6$ by a factor of 3?

Ⓐ $g(x) = 9x + 6$

Ⓑ $g(x) = 9x + 18$

Ⓒ $g(x) = x + 2$

Ⓓ $g(x) = x + 6$

3 Which equation represents the vertical stretch of $f(x) = 3^x + 2$ by a factor of 2?

Ⓐ $g(x) = 3^{\frac{x}{2}} + 2$

Ⓑ $g(x) = 3^{2x} + 2$

Ⓒ $g(x) = 2 \cdot 3^x + 4$

Ⓓ $g(x) = \frac{1}{2} \cdot 3^x + 1$

4 Which equation represents the vertical shrink of $f(x) = \left(\frac{1}{3}\right)^x - 4$ by a factor of $\frac{1}{4}$?

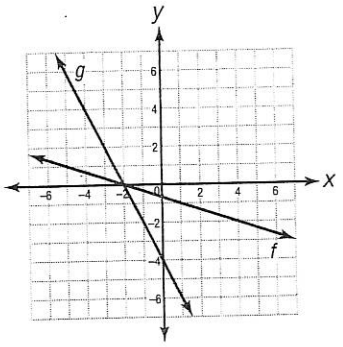
Ⓐ $g(x) = \frac{1}{4} \cdot \left(\frac{1}{3}\right)^x - 1$

Ⓑ $g(x) = 4 \cdot \left(\frac{1}{3}\right)^x - 16$

Ⓒ $g(x) = \left(\frac{1}{3}\right)^{\frac{x}{4}} - 4$

Ⓓ $g(x) = \left(\frac{1}{3}\right)^{4x} - 4$

5 The graph of g is a shrink or stretch of the graph of f. Which equation could represent g?



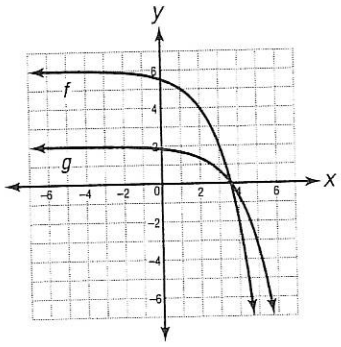
Ⓐ $g(x) = 6\,f(x)$

Ⓑ $g(x) = \frac{1}{6} f(x)$

Ⓒ $g(x) = f(6x)$

Ⓓ $g(x) = f\left(\frac{1}{6}x\right)$

6 The graph of g is a shrink or stretch of the graph of f. Which equation could represent g?



Ⓐ $g(x) = 3\,f(x)$

Ⓑ $g(x) = \frac{1}{3} f(x)$

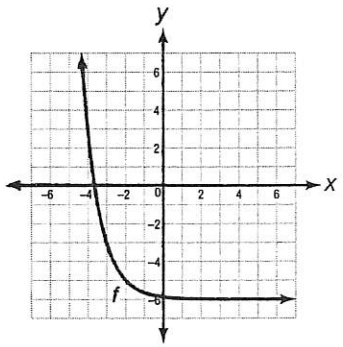
Ⓒ $g(x) = f(3x)$

Ⓓ $g(x) = f\left(\frac{1}{3}x\right)$

7 The graph of function g is a vertical shrink of the graph of $f(x) = \left(\frac{1}{3}\right)^{x+2} - 6$ by a factor of $\frac{2}{3}$.

Part A

Graph g.



Part B

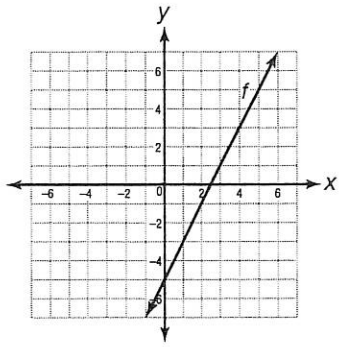
Write an equation for g.

$g(x) =$ _____

8 The graph of function g is a vertical shrink of the graph of $f(x) = 2x - 5$ by a factor of $\frac{2}{5}$.

Part A

Graph g.



Part B

Write an equation for g.

$g(x) =$ _____

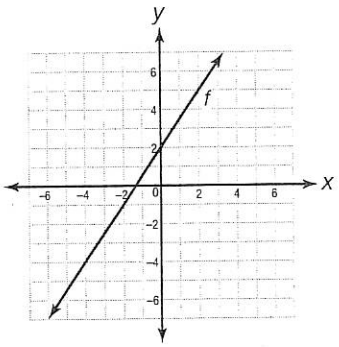
9 The points $(-6, 2)$, $(-3, 4)$, $(0, 6)$, $(3, 4)$, and $(9, 0)$ are on the graph of f. The graph of g is the vertical shrink of the graph of f by a factor of $\frac{1}{2}$. The graph of h is the vertical stretch of the graph of f by a factor of 2. Identify which points are on the graph of g or h.

Point	On the graph of g	On the graph of h	Neither
$(-12, 2)$	○	○	○
$(-6, 4)$	○	○	○
$(-3, 2)$	○	○	○
$(0, 6)$	○	○	○
$(3, 2)$	○	○	○
$(3, 8)$	○	○	○
$(6, 4)$	○	○	○
$(9, 0)$	○	○	○

10 Let $f(x) = \frac{3}{2}x + 2$.

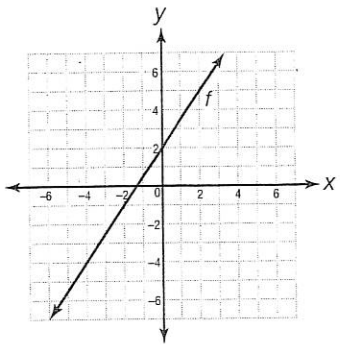
Part A

Graph $g(x) = 2f(x)$.



Part B

Graph $h(x) = \frac{1}{2}f(x)$.



Part C

How does the slope of the graph of g compare to the slope of the graph of h?

Part D

In general, if f is a linear function, how would the slope of the graph of $g(x) = kf(x)$ compare to the slope of the graph of $h(x) = \frac{1}{k}f(x)$? If the slope of f is m, what are the slopes of g and h? Explain how you got your answers.