Practice Test: Transformations

PC 12 **Transformations Practice Test** Name: _____

Part I: Multiple Choice. [1 mark each]

1. The graph of $y = \frac{1}{5}f(2x)$ compared to the graph of $y = f(x)$ has a

   A. horizontal compression by a factor of $\frac{1}{2}$ and a vertical compression by a factor of $\frac{1}{5}$.
   B. horizontal stretch by a factor of 2 and a vertical compression by a factor of $\frac{1}{5}$.
   C. horizontal compression by a factor of $\frac{1}{2}$ and a vertical stretch by a factor of 5.
   D. horizontal stretch by a factor of 2 and a vertical stretch by a factor of 5.

2. The function $y = f(x)$ is transformed to $y = f(4x + 8)$. Identify an order of transformations illustrated:

   A. horizontal stretch by a factor of 4, then a translation of 8 units left
   B. horizontal compression by a factor or $\frac{1}{4}$, then a translation of 8 units right
   C. horizontal stretch by a factor of 4, then a translation of 2 units right
   D. horizontal compression by a factor or $\frac{1}{4}$, then a translation of 2 units left

3. If $(-6, 2)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = 3f(2x)$?

   A. $(-3, 6)$ B. $(-12, 6)$ C. $(-2, 4)$ D. $(-18, 1)$

4. If the graph of the function $y = \sqrt{x}$ is horizontally expanded by a factor of 2 and then translated 6 units to the right, determine the equation of this new function.

   A. $y = \sqrt{2x - 6}$ B. $y = \sqrt{\frac{1}{2}(x - 6)}$ C. $y = \sqrt{2(x - 6)}$ D. $y = \frac{1}{2}\sqrt{x - 6}$

5. Which of the following points must be on the graph of $y = -\frac{1}{2}f(2x + 4) + 1$ if the point $(-4, 4)$ is on $y = f(x)$?

   A. $(-10, 9)$ B. $(-12, 9)$ C. $(-4, -1)$ D. $(-2, -1)$

6. Consider the following transformations on the graph of $y = f(x)$ in the table below. Which transformations will have no effect on the zeros of the original graph of $y = f(x)$?

I	$y = -f(x+5)$
II	$y = 2f(-x)$
III	$y = 2f(x)$
IV	$y = -3f(x)$

A. I and II only

B. II and III only

C. II and IV only

D. III and IV only

7. Which equation represents the inverse of $y = \frac{1}{2}x + \frac{5}{6}$?

A. $y = 3x + 5$ B. $y = 6x - 5$ C. $y = 2x - \frac{6}{5}$ D. $y = 2x - \frac{5}{3}$

8. If the range of $y = f(x)$ is $-1 \le y \le 4$, what is the range of $y = -4f\left(\frac{1}{2}x - 3\right) - 5$?

A. $-21 \le y \le -1$ C. $-1 \le y \le 21$

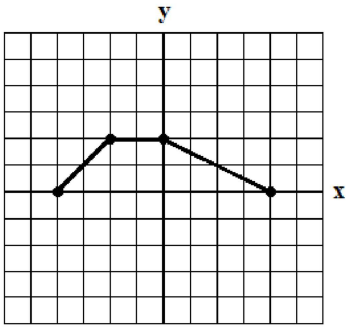
B. $1 \le y \le 11$ D. $-11 \le y \le 9$

9. If (a, b) is a point on the graph of $y = f(x)$, determine a point on the graph of $y = 3f(x-1) + 7$.

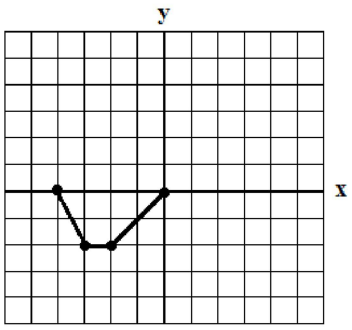
A. $(a+1, \frac{1}{3}b - 7)$ C. $(a-1, \frac{1}{3}b - 7)$

B. $(a+1, 3b+7)$ D. $(a-1, 3b+7)$

10. The graph $y = f(x)$ is shown on the left. Determine the equation of the new graph on the right.



LEFT GRAPH



RIGHT GRAPH

A. $y = -2f(x+4)$

B. $y = f\left(-\frac{1}{2}x + 4\right)$

C. $y = -f(2(x+2))$

D. $y = -\frac{1}{2}f(x+2)$

Part II: Open Ended.

11. What is the equation of $y = |x|$ after a vertical stretch by a factor of 3 and translation 4 units down?

$y = 3|x| - 4$

12. What is the equation of $y = f(x)$ after a vertical reflection, horizontal compression by a factor of $\frac{1}{2}$ and translation 7 units left?

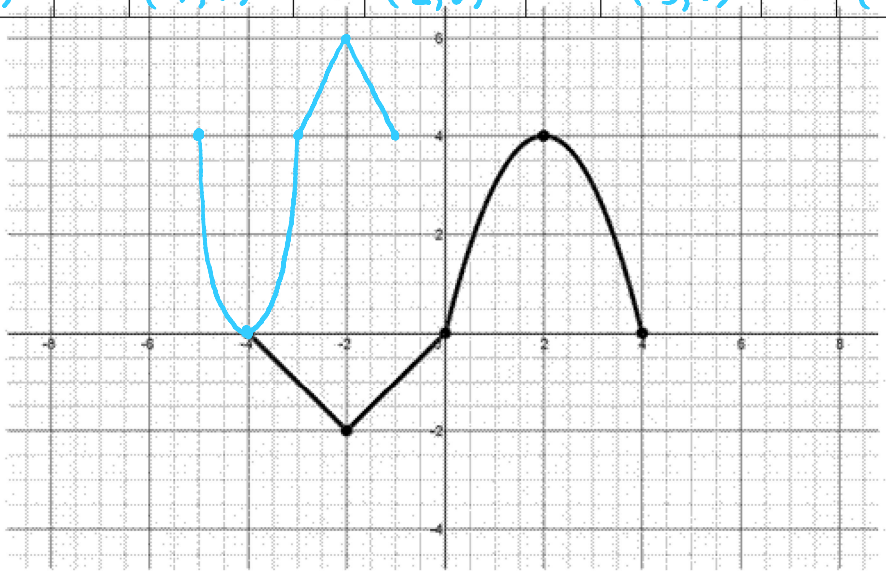
$y = -f(2(x+7))$

13. The graph of $y = -\frac{1}{3}f(2(x-1)) + 4$ is the image of the graph $y = f(x)$ after several transformations. State each transformation.

- vertical reflection
- vertical compression by a factor of $\frac{1}{3}$
- horizontal compression by a factor of $\frac{1}{2}$
- translation 1 unit right and 4 units up

14. The function $y = f(x)$ is shown on the graph below. Transformations are applied to the function, resulting in the equation $g(x) = -f(-2(x+3)) + 4$. Complete the chart below to determine the new coordinates of each key point on the graph. Then graph $g(x)$.

Key Points $y = f(x)$		Transformations $y \to -y$		$x \to -\frac{1}{2}x$		$x \to x-3$		$y \to y+4$	Key Points $g(x)$
(-4,0)	→	(-4,0)	→	(2,0)	→	(-1,0)	→		(-1,4)
(-2,-2)	→	(-2,2)	→	(1,2)	→	(-2,2)	→		(-2,6)
(0,0)	→	(0,0)	→	(0,0)	→	(-3,0)	→		(-3,4)
(2,4)	→	(2,-4)	→	(-1,-4)	→	(-4,-4)	→		(-4,0)
(4,0)	→	(4,0)	→	(-2,0)	→	(-5,0)	→		(-5,4)



15. What is the equation of the inverse of $y = \frac{2}{3}x - 2$?

$x = \frac{2}{3}y - 2$

$x + 2 = \frac{2}{3}y$

$\frac{3}{2}(x+2) = y$

$y = \frac{3}{2}(x+2)$ or $y = \frac{3}{2}x + 3$

16. The point (2, 9) lies on the graph of $y = f(x)$. What are the coordinates of a point on its inverse?

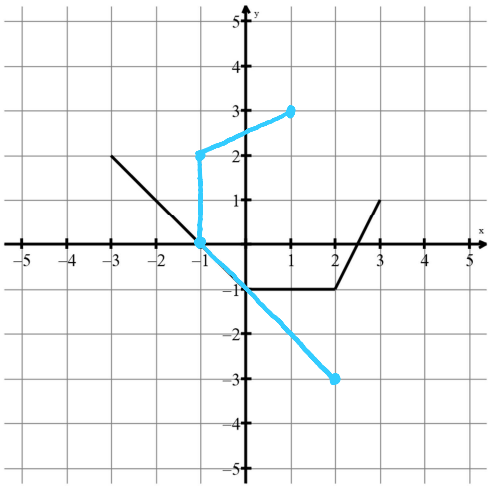
(9,2)

17. The domain and range of $y = f(x)$ are $1 \leq x \leq 3$ and $-2 \leq y \leq 5$, respectively. What are the domain and range of the inverse relation?

Domain: $-2 \leq x \leq 5$

Range: $1 \leq y \leq 3$

18. The graph of $y = f(x)$ is shown below. Draw the graph of $y = f^{-1}(x)$ on the same grid.



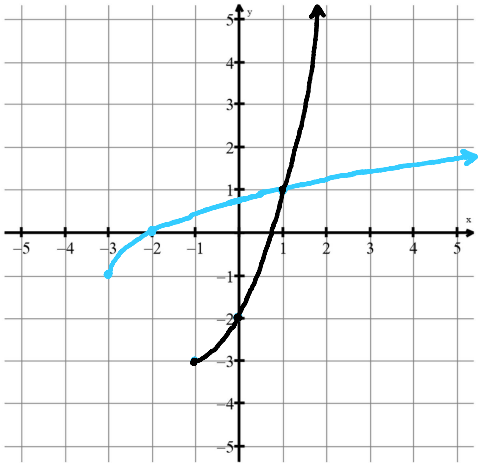
Is the inverse relation a function?

No, it fails the vertical line test.

19. Restrict the domain of $f(x) = (x + 1)^2 - 3$ so its inverse is a function. Graph the inverse below.

State the restriction: $x \geq -1$ (or $x \leq -1$)

Graph the restricted domain of $f(x)$ and its inverse.



Write the equation of the inverse function.

$x = (y+1)^2 - 3$

$x + 3 = (y+1)^2$

$\sqrt{x+3} = y+1$

* positive root since f(x) is restricted to $x \geq -1$

$\therefore y = \sqrt{x+3} - 1$

if f(x) is restricted to $x \leq -1$

(or $y = -\sqrt{x+3} - 1$)