Pre-Calculus 30 – Unit 3 – Transforming
Practice Test

Name: ____________________
Date: ____________________

Unit 3 – Transforming Graphs of Functions – Practice Test

1. The function $y = f(x)$ has domain $-9 \le x \le 5$ and range $-7 \le y \le 11$. What are the domain and range of $y + 4 = f(x + 2)$?

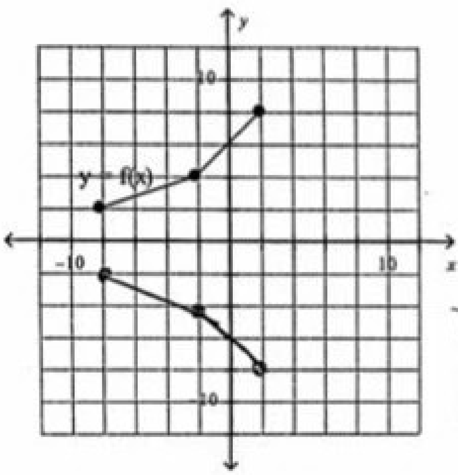
$(x-2, y-4)$

Vertical translation −4 (down)
Horizontal translation −2 (left)

$D: \{x \mid -9-2 \le x \le 5-2, x \in \mathbb{R}\}$ $R: \{y \mid -7-4 \le y \le 11-4, y \in \mathbb{R}\}$

$D: \{x \mid -11 \le x \le 3, x \in \mathbb{R}\}$ $R: \{y \mid -11 \le y \le 7, y \in \mathbb{R}\}$

2. Here is the graph of $y = f(x)$. On the same grid, sketch the graph of $y = -f(x)$.



f(x)

x	y
-8	2
-2	4
2	8

-f(x)

x	-y
-8	-2
-2	-4
2	-8

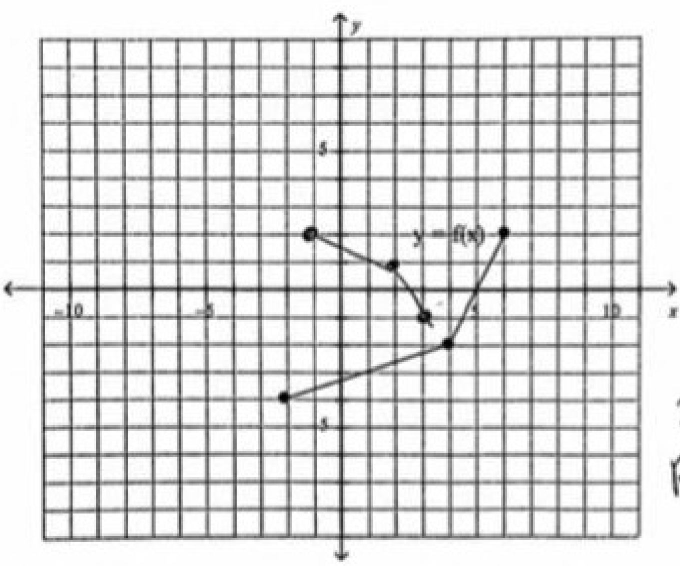
* Reflection in the x-axis

$D: \{x \mid -8 \le x \le 8, x \in \mathbb{R}\}$
$R: \{y \mid 2 \le y \le 8, y \in \mathbb{R}\}$

$D: \{x \mid -8 \le x \le 8, x \in \mathbb{R}\}$
$R: \{y \mid -8 \le y \le -2, y \in \mathbb{R}\}$

3. Here is the graph of $y = f(x)$. On the same grid, sketch the graph of $y = -\frac{1}{2} f(2x)$. State the domain and range of each function.

$a = -1/2$
$b = 2$



f(x)

x	y
-2	-4
4	-2
6	2

$D: \{x \mid -2 \le x \le 6, x \in \mathbb{R}\}$
$R: \{y \mid -4 \le y \le 2, y \in \mathbb{R}\}$

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

$\frac{1}{2}x$	$-\frac{1}{2}y$
-1	2
2	1
3	-1

$D: \{x \mid -1 \le x \le 3, x \in \mathbb{R}\}$
$R: \{y \mid -1 \le y \le 2, y \in \mathbb{R}\}$

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4. Determine the equation of the function $y = \frac{(x-2)^3}{x-4}$ after a vertical compression by a factor of $\frac{1}{2}$, a horizontal compression by a factor of $\frac{1}{2}$, a reflection in the y-axis, and a reflection in the x-axis.

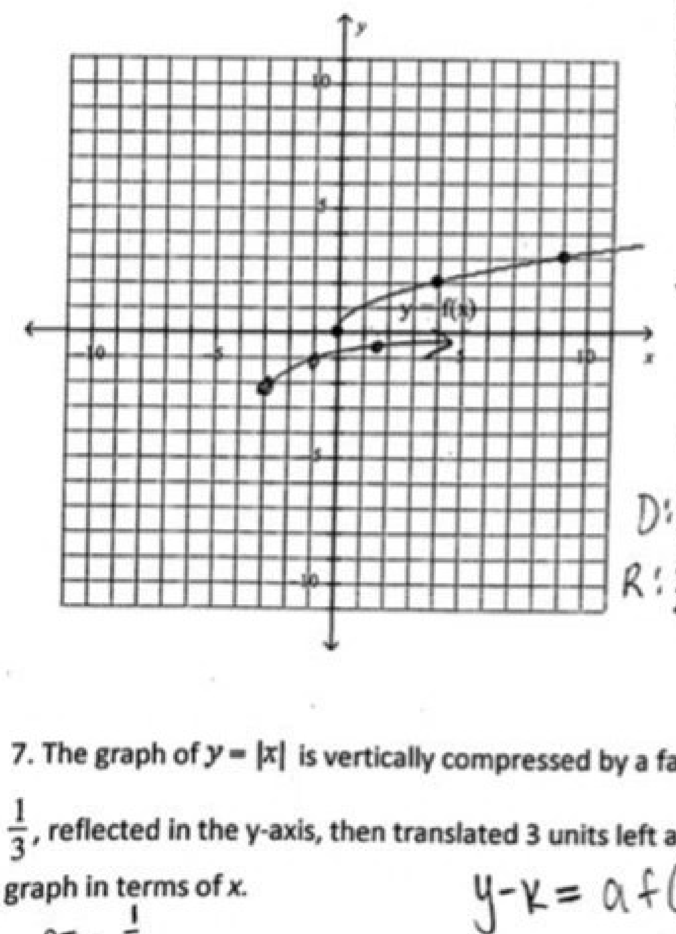
$a = \frac{1}{2} = -0.5$
$b = -2$
$h = 0$
$k = 0$

$$y = -0.5\left(\frac{(-2x-2)^3}{(-2x-4)}\right)$$

5. Describe how the graph of $y - 3 = \frac{1}{2}f(-2(x-3))$ is related to the graph of $y = f(x)$.

- Vertical Translation +3 (up)
- Horizontal Translation +3 (right)
- Vertical Compression by a factor of 1/2
- horizontal compression by a factor of 1/2
- reflected on y-axis

6. Here is the graph of $y = f(x)$. The graph of $y = f(x)$ is transformed by: a vertical compression by a factor of $\frac{1}{2}$, a horizontal compression by a factor of $\frac{1}{2}$, no reflection, and a translation of 2 units left and 2 units down. Write an equation of the image graph in terms of the function f. Sketch the image graph, then state its domain and range.



$a = 1/2 = 0.5$
$b = 2$
$h = -3$
$k = -2$

$y - k = af(b(x-h))$
$y + 2 = 0.5f(2(x+3))$

$f(x)$

x	y
0	0
4	2
9	3

D: $\{x \mid x \geq 0, x \in \mathbb{R}\}$
R: $\{y \mid y \geq 0, y \in \mathbb{R}\}$

$\frac{x}{b} + h$	$ay + k$
$\frac{x}{2} - 3$	$0.5y - 2$
-3	-2
-1	-1
1.5	-0.5

D: $\{x \mid x \geq -3, x \in \mathbb{R}\}$
R: $\{y \mid y \geq -2, y \in \mathbb{R}\}$

7. The graph of $y = |x|$ is vertically compressed by a factor of $\frac{1}{3}$, horizontally compressed by a factor of $\frac{1}{3}$, reflected in the y-axis, then translated 3 units left and 4 units down. Write an equation of the image graph in terms of x.

$a = \frac{1}{3}$
$b = -3$
$h = -3$
$k = -4$

$y - k = af(b(h-k))$
$y + 4 = \frac{1}{3}\left|-3(x+3)\right|$

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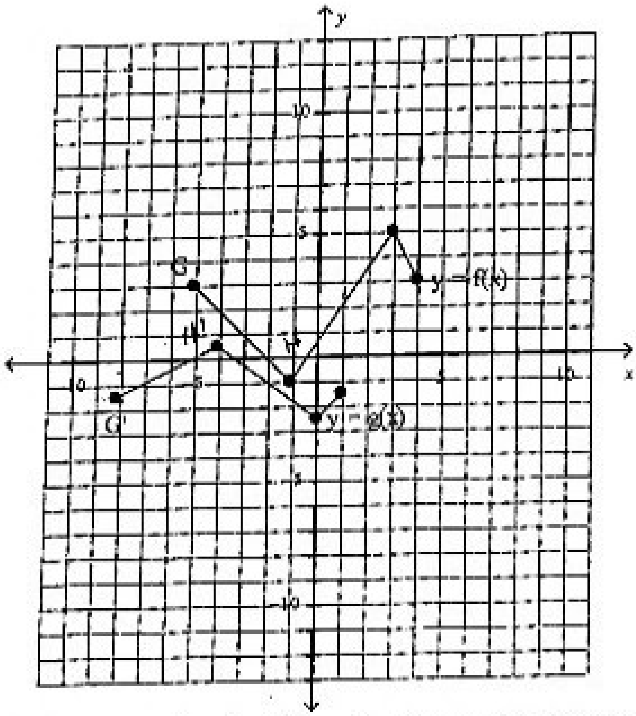
8. The graph of $y = g(x)$ is the image of the graph of $y = f(x)$ after a combination of transformations. Write an equation for the transformations.



$G(-5, 3) \rightarrow H(-1, -1)$

$G'(-8, -1.5) \rightarrow H'(4, 0.5)$

*reflection on x-axis → make a neg

Horizontal

$G \rightarrow H$

$|-5-(-1)| = 4$

$G' \rightarrow H'$

$|-8-(-4)| = 4$

$\frac{x}{b} = x'$

$\frac{4}{b} = 4$

$b = \frac{4}{4} = 1$

Vertical

$G \rightarrow H$

$|3-(-1)| = 4$

$G' \rightarrow H'$

$|-1.5 - 0.5| = 1$

$ay = y'$

$\frac{a(4)}{4} = \frac{1}{4}$

$a = -1/4$

*reflection on the axis

$x = -5 \quad x' = -1$

$y = 3 \quad y' = -1$

$x + h = x'$

$-5 + h = -8$
$+5 \qquad +5$

$h = -3$

$-\frac{1}{4}y + K = y'$

$-\frac{1}{4}(3) + K = -1.5$

$-0.75 + K = -1.5$
$+0.75 \qquad +0.75$

$K = -0.75$

$y + 0.75 = -0.25(x + 3)$

9. Determine whether these functions are inverses of each other.

$y = \frac{7x+6}{2}$ $\qquad$ $y = \frac{2x+6}{7}$

$x \cdot 2 = \frac{7y+6}{2} \cdot 2$

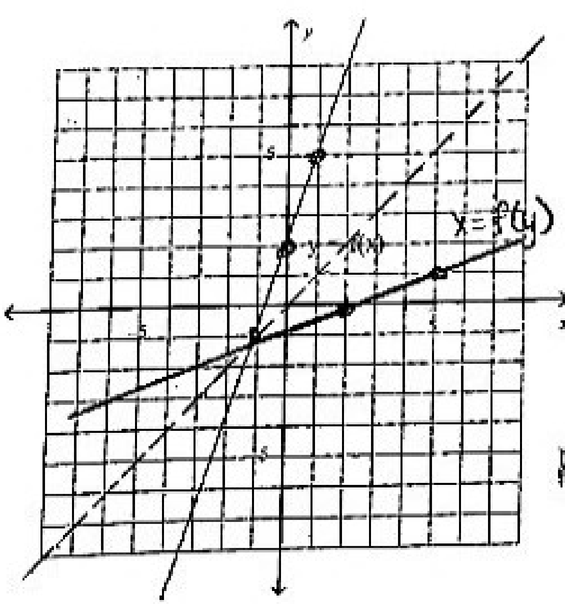
$2x - 6 = 7y + 6 - 6$

$\frac{2x-6}{7} = \frac{7y}{7}$

$\frac{2x-6}{7} = y$

These are not inverses of each other.

10. Here is the graph of $y = f(x)$. On the same grid, sketch the graph of its inverse.



f(x)

x	y
-1	-1
0	2
1	5

D: {x | x ∈ ℝ}

R: {y | y ∈ ℝ}

f(y)

x = y	y = x
-1	-1
2	0
5	1

D: {y | x ∈ ℝ}

R: {y | y ∈ ℝ}

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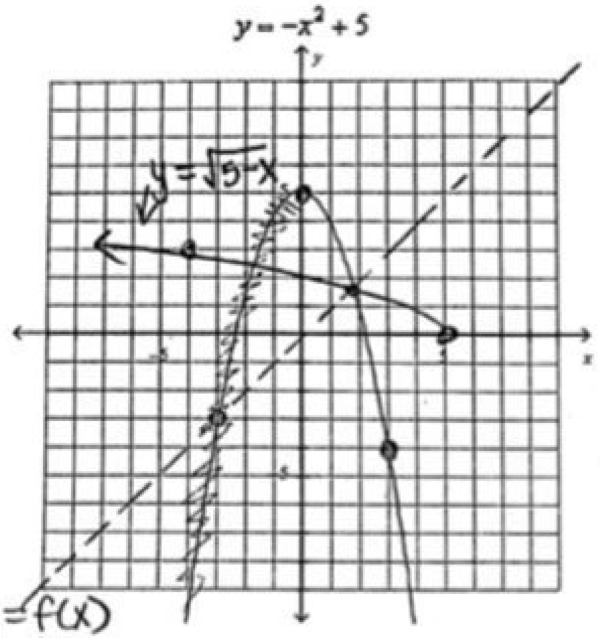
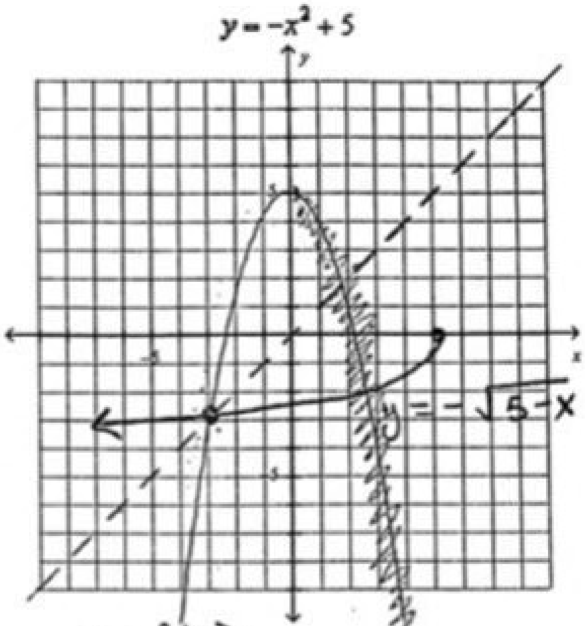
12. Determine two ways to restrict the domain of $y = -x^2 + 5$ so that its inverse is a function. Write the equation of the inverse each time. Use a graph to illustrate each way. State the domain of the restricted f(x), and state the domain of the inverse function.





$y = f(x)$
D: $\{x \mid y = -x^2 + 5, x \geq 0, x \in \mathbb{R}\}$
$x = f(y)$
D: $\{x \mid y = \sqrt{5-x}, x \leq 5, x \in \mathbb{R}\}$

$y = f(x)$
D: $\{x \mid y = -x^2 + 5, x \leq 0, x \in \mathbb{R}\}$
$x = f(y)$
D: $\{x \mid y = -\sqrt{5-x}, x \leq 5, x \in \mathbb{R}\}$

Equation

$$x \overset{-5}{=} -y^2 + 5^{-5}$$

$$\frac{x-5}{-1} = \frac{-y^2}{-1}$$

$$-x + 5 = y^2$$

$$\sqrt{y^2} = \sqrt{5+x}$$

$$y = \pm\sqrt{5+x}$$

not a function with ± for $x = f(y)$

f(x)

	x	y	
	-3	-3	x≤0
	0	5	
x≥0	3	-4	

f(y)

	x=y	y=x	
	-3	-3	x≤0
	5	0	
x≥0	-4	3	