Math 3200 **Chapter 1: Function Transformation** **Name:** Key

11 + 17

Part A: Multiple Choice (11 marks)

1. If the mapping rule $(x, y) \rightarrow \left(-\frac{1}{4}x - 1, y + 3\right)$ is applied to $y = f(x)$, what is the transformed equation?

A. $y = f(-4(x+1)) + 3$ B. $y = f(-4(x-1)) + 3$

C. $y = f\left(-\frac{1}{4}(x+1)\right) - 3$ D. $y = f\left(-\frac{1}{4}(x-1)\right) - 3$

2. What is the mapping rule that is applied to $y = f(x)$ to obtain $y - 5 = f(-2x - 6)$? $-2(x+3)$

A) $(x, y) \rightarrow \left(-\frac{1}{2}x + 6, y + 5\right)$ B) $(x, y) \rightarrow \left(-\frac{1}{2}x + 6, y - 5\right)$

C) $(x, y) \rightarrow \left(-\frac{1}{2}x - 3, y + 5\right)$ D) $(x, y) \rightarrow \left(-\frac{1}{2}x - 3, y - 5\right)$

3. If the point (3,7) lies on the graph of $y = g(x)$, which point lies on the graph of $y = 2g(-x)$?

A) $(-3, 14)$ B) $(-6, 7)$ C) $(3, -14)$ D) $(6, -7)$

4. If y is replaced by 3y in the equation $y = f(x)$, the graph of $y = f(x)$ will be stretched

A) horizontally by a factor $\frac{1}{3}$ B) vertically by a factor of 3

C) horizontally by a factor of 3 D) vertically by a factor of $\frac{1}{3}$

5. What is the inverse equation of $f(x) = \frac{3}{2}x - \frac{1}{2}$?

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

$x + \frac{1}{2} = \frac{3}{2}y$

$\frac{2}{3}x + \frac{1}{3} = y$

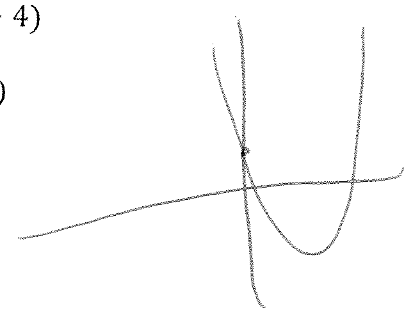
A) $f^{-1}(x) = \frac{2}{3}x - 2$ B) $f^{-1}(x) = \frac{2x+1}{3}$

C) $f^{-1}(x) = \frac{2}{3}x + 2$ D) $f^{-1}(x) = \frac{3x+1}{2}$

6. Which of the following transformations to the graph of $y = f(x)$ would have the y-intercepts as invariant points?

A) $y = f(-x)$ B) $y = f(x-4)$

C) $y = f(x) + 4$ D) $y = -f(x)$

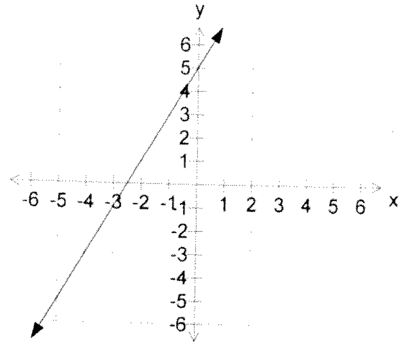


$x = 2y - 5$

$\frac{x+5}{2} =$

7. Given $y = 2x - 5$, which graph represents $f^{-1}(x)$?

A)



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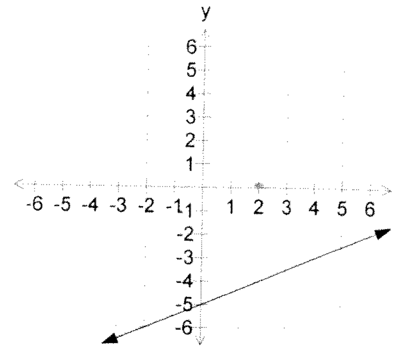

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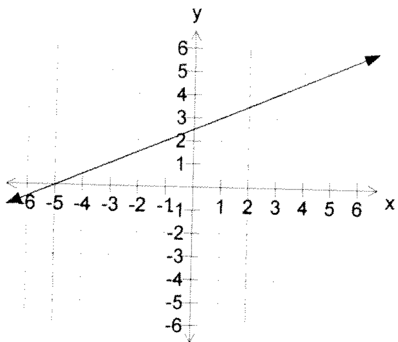

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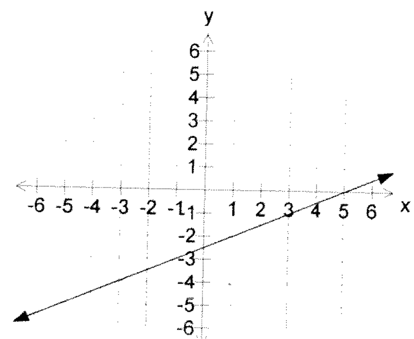


8. The function $y = f(x)$ is transformed to $y = 2f(x-3)$. If the original domain is $\{x| -4 \le x \le 2, x \in R\}$ what would the domain of the transformed graph?

A) $\{x/-7 \le x \le 2, x \in R\}$ B) $\{x/-1 \le x \le 5, x \in R\}$

C) $\{x/-8 \le x \le 4, x \in R\}$ D) $\{x/-2 \le x \le 1, x \in R\}$

$x = \frac{-b}{2a} = \frac{\pm 5}{2(1)}$

9. What is the restricted domain of $f(x) = x^2 - 5x + 1$, such that the inverse is a function?

b

A) $x \ge -\frac{5}{2}$ B) $x \ge \frac{5}{2}$ C) $x \ge -\frac{21}{4}$ D) $x \ge \frac{21}{4}$

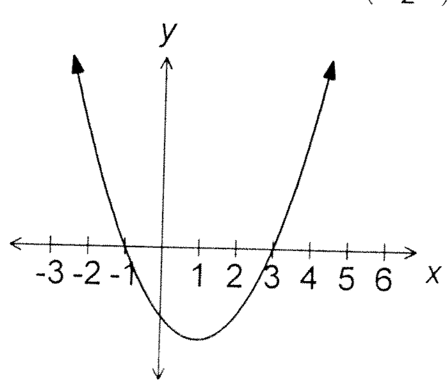
10. What are the zeros of the function $y = f(x)$ after the transformation $f\left(-\frac{1}{2}x\right)$?

(A) $\{-6 \text{ and } 2\}$

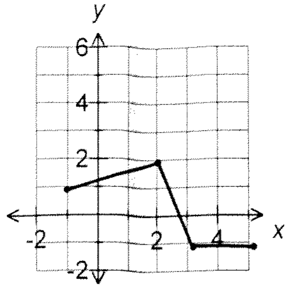
(B) $\{-2 \text{ and } 6\}$

(C) $\{-\frac{3}{2} \text{ and } \frac{1}{2}\}$

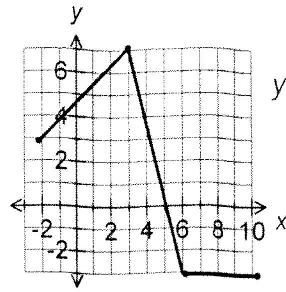
(D) $\{-\frac{1}{2} \text{ and } \frac{3}{2}\}$



11. What is the horizontal stretch of $y = af(bx)$ as compared to $y = f(x)$?



$y=f(x)$



$y=af(bx)$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 2 D) 3

SECTION B: Constructed Response: Answer ALL questions in the space provided. Full credit will only be awarded for correct **solutions** with necessary workings.

1. The graph of $g(x)$ is a transformation of $f(x)$. Write the equation of $g(x)$ in the form $y = af(b(x-h))+k$. (4 marks)

	NEW	OLD	
HS	5	10	1/2
VS	5	5	-1

HT

$(-4,1) \rightarrow (-3,-1)$

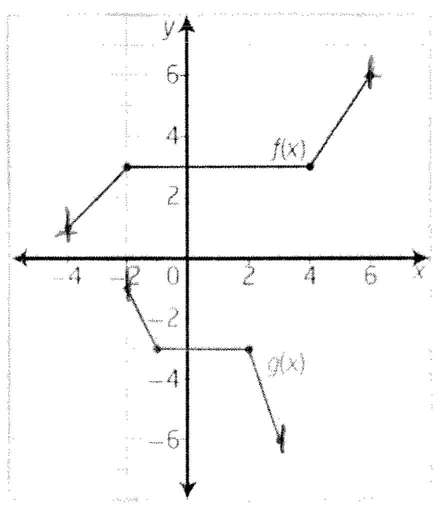
$-4(\frac{1}{2}) + ? = -2$ NO HT

VT

$(-4,1) \rightarrow (-2,-1)$

$1(-1) \rightarrow (-1)$

$y = -f(2x)$ 1 1



$(6,6)$ $(-3,-6)$

2. The graph of $y = f(x)$ undergoes the following transformations. (3 marks)
   - Vertical stretch 4
   - Vertical translation 2 down
   - Horizontal translation 1 right
   - Reflection about the y axis.

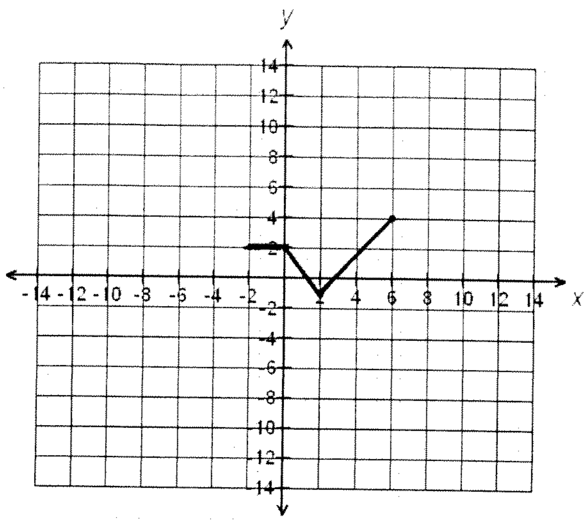
Write the new equation in the form $y = af(b(x-h))+k$

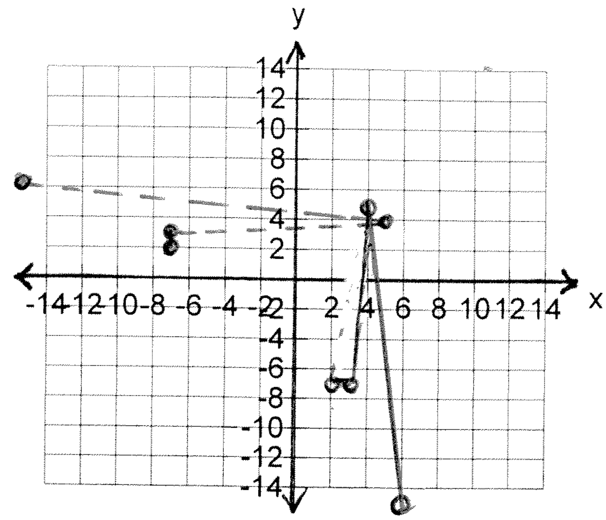
.5 1 1 .5

$y = 4f(-(x-1)) - 2$

3. Given the graph of the function $y = f(x)$ below, (6 marks)

a. Sketch the graph of $g(x) = -4f(2(x-3))+1$ and the graph of $y = g^{-1}(x)$ on the same grid below.





$(x, y) \rightarrow \left(\frac{1}{2}x + 3, -4y + 1\right)$

x	y	x	y
-2	2	2	-7
0	2	3	-7
2	-1	4	5
6	4	6	-15

$g^{-1}(x)$

x	y
-7	2
-7	3
5	4
-15	6

4. a. Algebraically determine the inverse of $y = 2(x-1)^2 + 3$. (2 marks)

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

$\frac{1}{2}(x-3) = (y-1)^2$

$\pm\sqrt{\frac{1}{2}(x-3)} = y - 1$ .5

$y = \pm\sqrt{\frac{1}{2}(x-3)} + 1$

0.5

b. Restrict the domain of $f(x)$ so that its inverse is also a function. State the new inverse under the restriction. (2 marks)

$x \geq 1$ 1

$f^{-1}(x) = \sqrt{\frac{1}{2}(x-3)} + 1$ 1