Mathematics 3200
Chapter 1 Test - Function Transformations
Version 1

$\overline{}$
38

NAME:____________________________________

SECTION A: Selected Response: Place the LETTER of your response in the ____ at the right. [17 points]

1. The function $y = f(x)$ is stretched vertically by a factor of 3 and is translated 4 units to the left. What is the equation of the transformed function? 1.________

A $\frac{1}{3}y = f(x-4)$ B $\frac{1}{3}y = f(x+4)$
C $3y = f(x-4)$ D $3y = f(x+4)$

2. The graph of $y = f(x)$ contains P(-2, 6). What are the coordinates of the image of this point on the function $y - 1 = -\frac{1}{3}f(2(x-1))$? 2.________

A $(0, -1)$ B $(-3, -1)$
C $(0, -17)$ D $(-3, -17)$

3. The mapping rule $(x, y) \rightarrow (2x - 1, y + 3)$ is applied to the function $y = f(x)$. What is the equation of the resulting function? 3.________

A $y = f\big(2(x-1)\big) + 3$ B $y = f\big(2(x+1)\big) - 3$
C $y = f\left(\frac{1}{2}(x-1)\right) - 3$ D $y = f\left(\frac{1}{2}(x+1)\right) + 3$

4. The point (a, b) is on the graph of the function $y = f(x)$. What are the coordinates of the image of this point on the graph of $y + b = f(x+1)$? 4.________

A $(a-1, 2b)$ B $(a+1, 2b)$
C $(a-1, 0)$ D $(a+1, 0)$

5. The function $y = f(x)$ is transformed to produce $y = \frac{1}{3}f(-x)$. Which describes the transformations that are required? 5.________

A A reflection in the x-axis and a vertical stretch by a factor of 3.
B A reflection in the y-axis and a vertical stretch by a factor of 3.
C A reflection in the x-axis and a vertical stretch by a factor of $\frac{1}{3}$
D A reflection in the y-axis and a vertical stretch by a factor of $\frac{1}{3}$

6. Which mapping rule would map the function $y = f(x)$ onto the function $y = f(-\frac{1}{3}x + 3)$? 6.________

A $(x, y) \rightarrow (-3x + 1, y)$ B $(x, y) \rightarrow (-3x + 9, y)$
C $(x, y) \rightarrow \left(-\frac{1}{3}x + 1, y\right)$ D $(x, y) \rightarrow \left(-\frac{1}{3}x + 9, y\right)$

7. Which would produce a graph with the same x-intercepts as the graph of $y = f(x)$? 7.________

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

8. The domain of $y = f(x)$ is $\{x/-6 \le x \le 12, x \in \mathbb{R}\}$. What is the domain of $y = f(2(x+1))$? 8.________

A $\{x/-4 \le x \le 5, x \in \mathbb{R}\}$
B $\{x/-13 \le x \le 23, x \in \mathbb{R}\}$
C $\{x/-2 \le x \le 7, x \in \mathbb{R}\}$
D $\{x/-11 \le x \le 25, x \in \mathbb{R}\}$

9. The function $y = f(x)$ is reflected in the x-axis and is translated 5 units down. What is the equation of the transformed function? 9.________

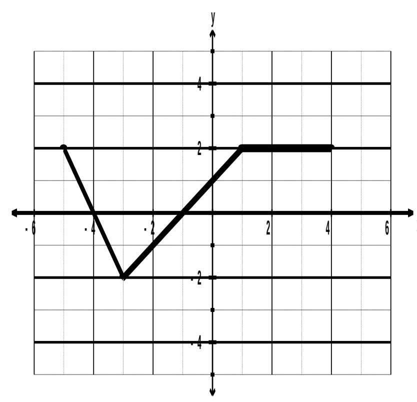
A $y = -f(x) + 5$
B $y = f(-x) + 5$
C $y = -f(x) - 5$
D $y = f(-x) - 5$

10. If $f(x) = x^2 + 4x - 12$, what are the zeroes of the function $y = -f\left(\frac{1}{2}x\right)$? 10.________

A -3 and 1
B 3 and -1
C -12 and 4
D 12 and -4

11. The graph of $y = f(x)$ is shown. Which is an invariant point under the transformation $-3y = f(x)$? 11.________

A $(-1, 0)$
B $(0, 1)$
C $(1, 2)$
D $(-3, -2)$



12. The function $y = f(x)$ contains the point $P(4, 2)$. It is transformed by applying the following transformations in the order listed. What is the resulting image of point P? 12.________

- Reflection in the x-axis
- Translated 2 units to the left and 3 units up
- Stretched vertically by a factor of 2
- Translated 1 unit right and 1 unit up
- Stretched horizontally by a factor of 3

A $(5, 6)$
B $(-15, 11)$
C $(3, 15)$
D $(9, 3)$

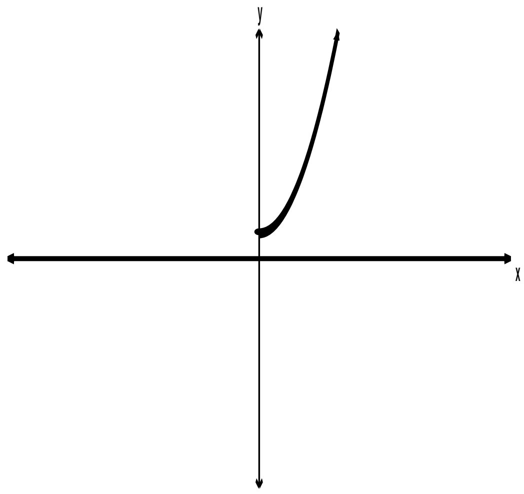
13. Which mapping rule would map $y = 2f(x-1)$ onto $y = f(x+3)$? 13.________

A $(x, y) \rightarrow \left(x + 4, \frac{1}{2}y\right)$
B $(x, y) \rightarrow \left(x - 4, \frac{1}{2}y\right)$
C $(x, y) \rightarrow (x + 4, 2y)$
D $(x, y) \rightarrow (x - 4, 2y)$

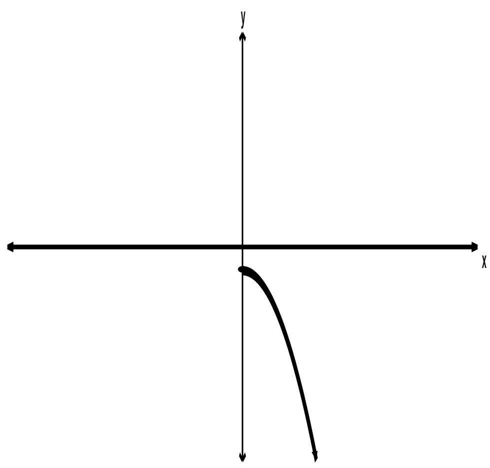
14. The mapping rule $(x, y) \rightarrow (4x - 3, -2y)$ is applied to $y = f(x)$ to produce a function of the form $y = af(b(x-h)) + k$. Which values are correct for a and b? 14.________

A $a = -\frac{1}{2}, \quad b = \frac{1}{4}$
B $a = -2, \quad b = 4$
C $a = -2, \quad b = \frac{1}{4}$
D $a = -\frac{1}{2}, \quad b = 4$

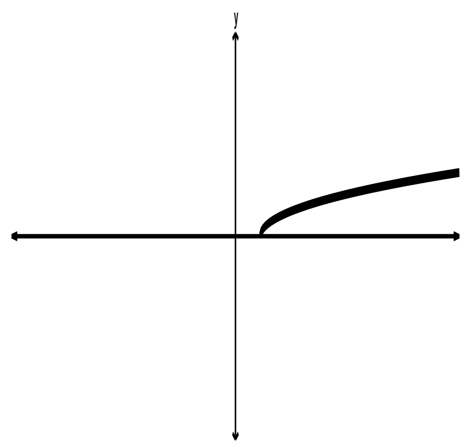
15. The graph of $y = f(x)$ is shown. Which represents the graph of $y = f^{-1}(x)$? 15.________



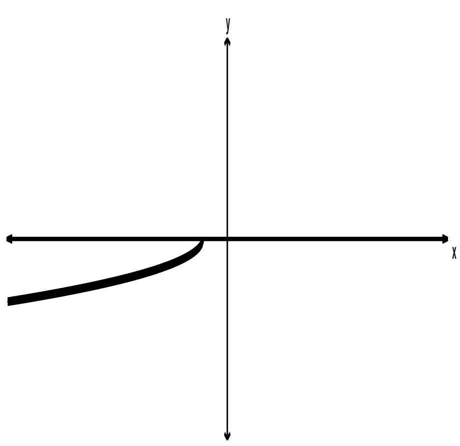
A



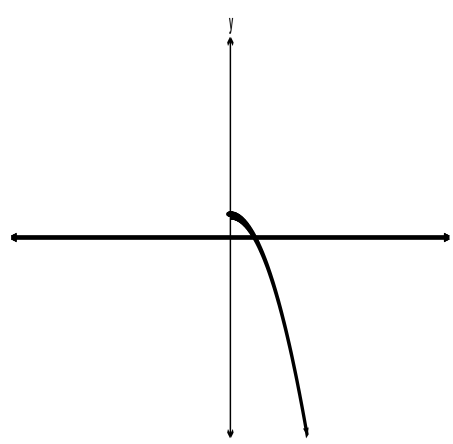
B



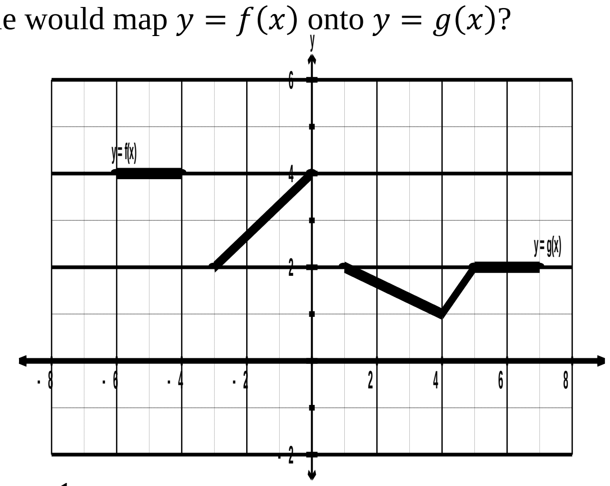
C



D



16. Which mapping rule would map $y = f(x)$ onto $y = g(x)$? 16.________



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

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

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

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

17. What is the inverse of $g(x) = -\frac{2}{3}x - 4$? 17.________

A $g^{-1}(x) = \frac{2}{3}x + 4$

B $g^{-1}(x) = -\frac{3}{2}x + 4$

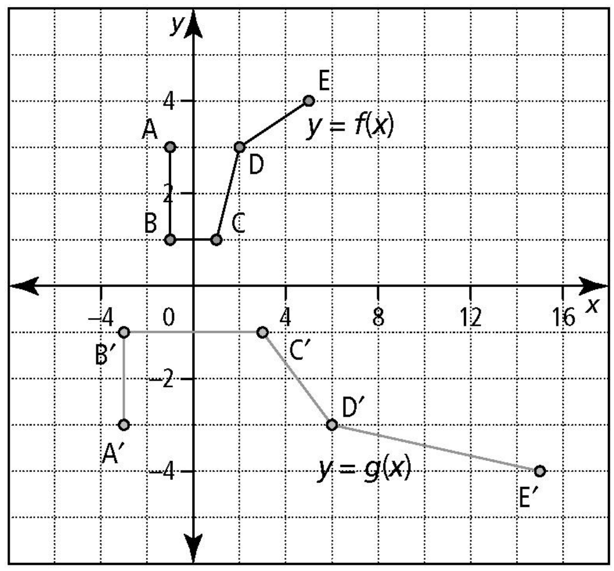
C $g^{-1}(x) = \frac{3}{2}x + 6$

D $g^{-1}(x) = -\frac{3}{2}x - 6$

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

1. The graph of $g(x)$ is a transformation of $f(x)$.

(a) List the transformations required to map $f(x)$ onto $g(x)$. [2 pts]

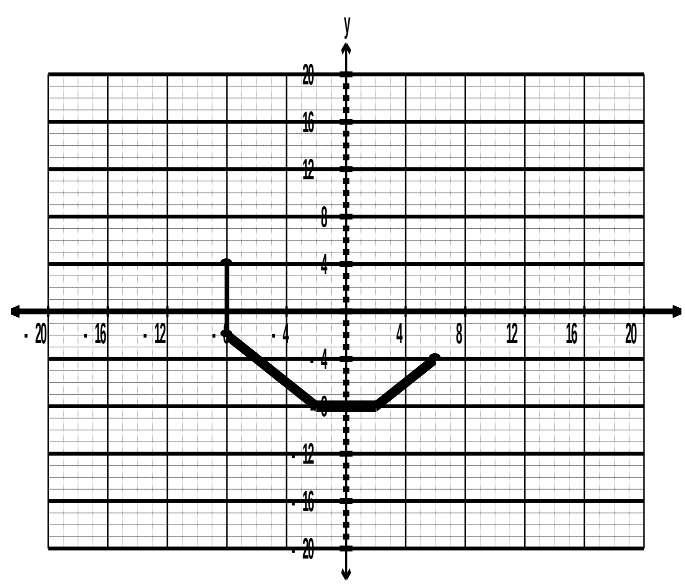


(b) Write the mapping rule. [1 pt]

(c) Determine the equation of $g(x)$ in the form $y = af\left(b(x-h)\right) + k$ [1 pt]

2. The graph of a function $y = f(x)$ is shown below.

(a) On the same grid, sketch the graph of the function that results when the mapping rule $(x, y) \rightarrow (-x + 3, 2y - 1)$ is applied to this function. [2 pts]

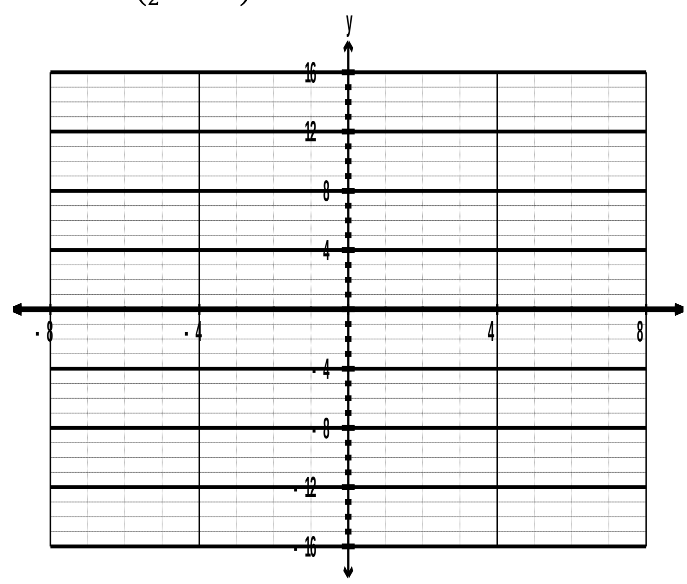


(b) Write the equation of the resulting function in the form $y = af\left(b(x-h)\right) + k$. [1 pt]

.

3. The function $f(x) = x^2$ is transformed to produce $g(x) = -f\left(\frac{1}{2}x + 1\right) + 3$.

(a) Write the mapping rule that maps $f(x)$ onto $g(x)$. [2 pts]



(b) Sketch the graphs of both functions on the grid provided, clearly showing at least 5 points on each function. [3 pts]

(c) Write the equation that represents $g(x)$. [2 pts]

.

4. (a) Algebraically determine the inverse of $f(x) = x^2 - 6x + 1$ [3 pts]

(b) Restrict the domain of $f(x)$ so that its inverse is also a function. [1 pt]

5. The function $y = f(x)$ is transformed to produce a function of the form$y = af\big(b(x-h)\big) + k$.
The list of transformations is given below.

- Reflected in the x-axis
- Stretched vertically by a factor of 4
- Stretched horizontally by a factor of $\frac{2}{3}$
- Translated 3 units right and 5 units down.

(a) Write the mapping rule that represents this set of transformations. [2 pts]

(b) Write the function in the form $y = af\big(b(x-h)\big) + k$. [1 pt]