

Name: \_\_\_\_\_

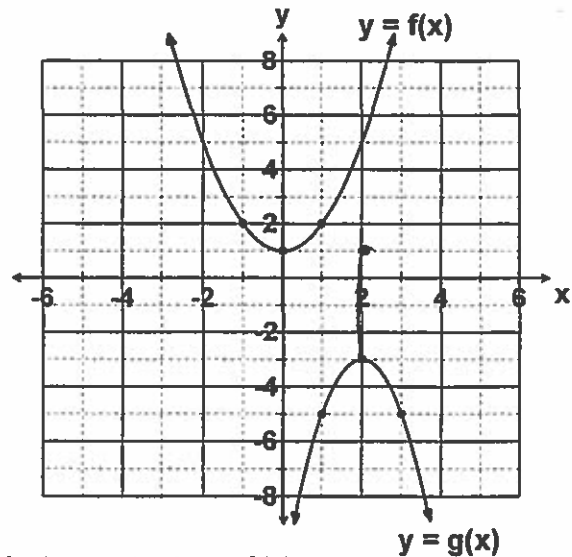
Date: Key**Part A: Multiple Choice (15 marks)**

D 1. The function  $y = f(x)$  is transformed to  $y = f(x + 3)$ . How is the image transformed?

- A) translated 3 units to the right of  $y = f(x)$   
 B) translated 3 units above  $y = f(x)$   
 C) translated 3 units below  $y = f(x)$   
 D) translated 3 units to the left of  $y = f(x)$

A 2. The graphs of  $y = f(x)$  and  $y = g(x)$  are shown below. Which mapping rule would map  $y = f(x)$  onto  $y = g(x)$ ?

- A)  $(x, y) \rightarrow (x + 2, -2y - 1)$   
~~B)  $(x, y) \rightarrow (x - 2, -2y - 1)$~~   
 C)  $(x, y) \rightarrow (x + 2, -2y + 2)$   
~~D)  $(x, y) \rightarrow (x - 2, -2y + 2)$~~



B 3. If  $y$  is replaced by  $\frac{1}{2}y$  in the equation  $y = f(x)$ , the graph of  $y = f(x)$  will be stretched

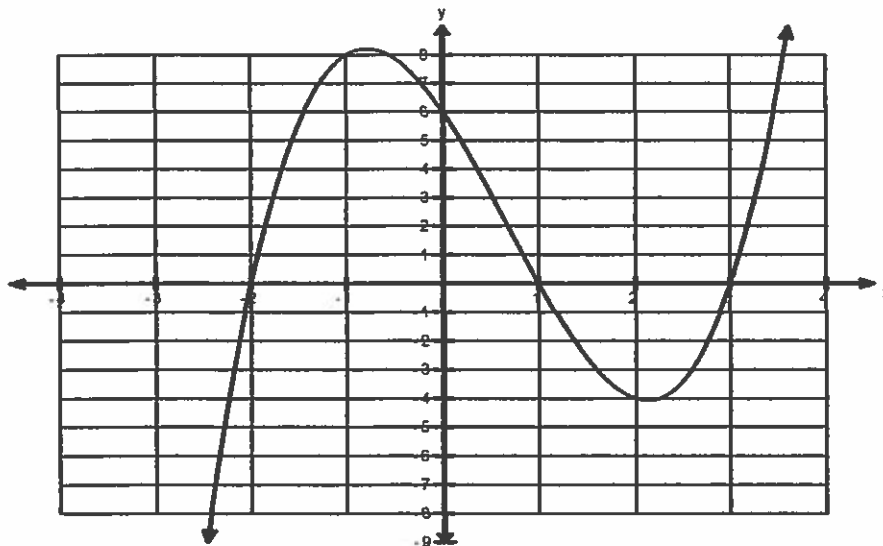
- A) horizontally by a factor  $\frac{1}{2}$   
 B) vertically by a factor of 2  
 C) horizontally by a factor of 2  
 D) vertically by a factor of  $\frac{1}{2}$

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

$$y = 2f(x)$$

A 4.

Given the graph of  $y = f(x)$  below, what would the image point of  $(3,0)$  be for the transformed graph  $y = f(-x)$ ?



A)  $(-3,0)$

B)  $(0,3)$

C)  $(3,0)$

D)  $(0,-3)$

B 5.

The graph of  $y = f(x)$  is reflected in the  $x$ -axis, horizontally stretch by a factor of 2, translated 3 units to the left, and 1 unit down. What is the equation of the transformed graph?

A)  $y = -f\left(\frac{1}{2}(x - 3)\right) - 1$

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

C)  $y = -f(2(x - 3)) - 1$

D)  $y = -f(2(x + 3)) - 1$

C 6.

What is the mapping rule when  $y = f(x)$  is transformed to  $y = 2f(-(x + 1)) - 4$ ?

A)  $(x, y) \rightarrow (x - 1, 2y - 4)$

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

C)  $(x, y) \rightarrow (-x - 1, 2y - 4)$

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

7. Which 2 functions are inverses of each other?

$$f(x) = \frac{x+6}{4}$$

$$g(x) = \frac{x-6}{4}$$

$$h(x) = 4x - 6$$

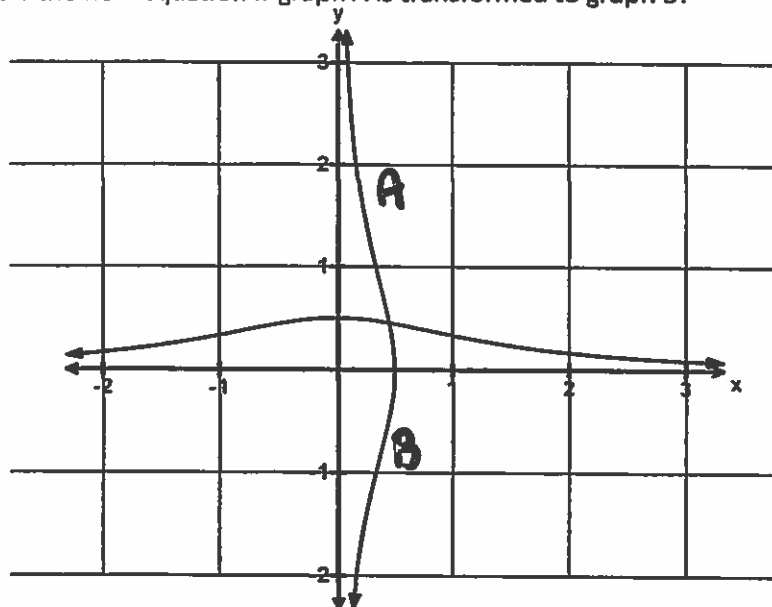
A)  $f$  and  $g$

B)  $f$  and  $h$

C)  $g$  and  $h$

D) none are inverses

8. What is the new equation if graph A is transformed to graph B?



A)  $x = f(y)$

B)  $x = -f(y)$

C)  $y = -f(x)$

D)  $y = f(-x)$

9. The graph of  $y = f(x)$  contains the point  $(3, 4)$ . Which of the following equations describe the transformations whereby  $(3, 4) \rightarrow (5, 5)$ ?

A)  $y + 1 = f(x + 2)$

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

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

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

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

A)  $y = f(x) + 2$

B)  $y = f(x + 2)$

C)  $y = f - (x)$

D)  $y = -f(x)$

C 11. What is the equation of the inverse function for  $y = x^2 + 1, x \geq 0$ ?

A)  $y = 1 + \sqrt{x}$

B)  $y = 1 - \sqrt{x}$

C)  $y = \sqrt{x-1}$

D)  $y = \sqrt{x+1}$

B 12. The function  $y = f(x)$  is transformed to  $y = 2f(x-3)$ . If the original domain is  $\{x/-4 \leq x \leq 2, x \in R\}$ , what is the domain of the transformed function?

A)  $\{x/-7 \leq x \leq 2, x \in R\}$

B)  $\{x/-1 \leq x \leq 5, x \in R\}$

C)  $\{x/-8 \leq x \leq 4, x \in R\}$

D)  $\{x/-2 \leq x \leq 1, x \in R\}$

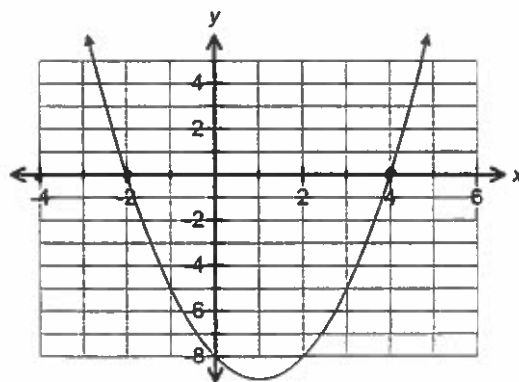
A 13. What are the zeros of the function  $y = f(x)$  after the transformation  $y = f(-\frac{1}{2}x)$ ?

(A)  $\{-8, 4\}$

(B)  $\{-4, 8\}$

(C)  $\{-2, 1\}$

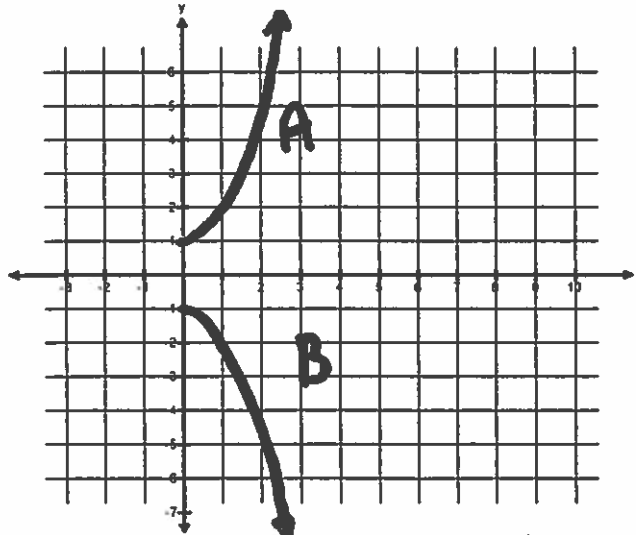
(D)  $\{-1, 2\}$



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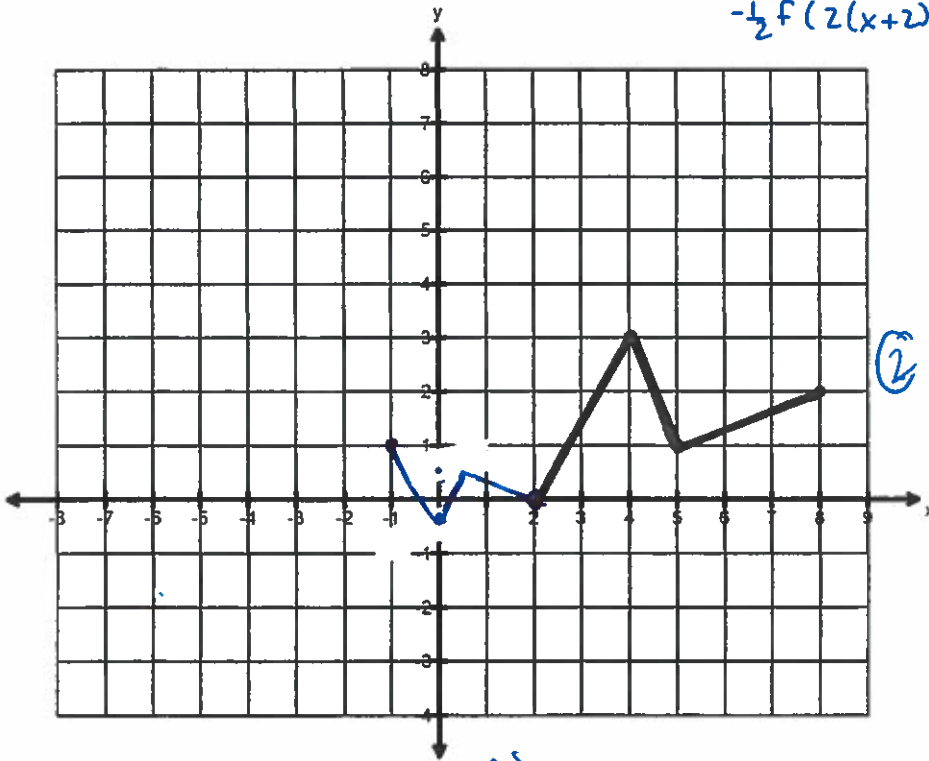
15. What is the line of reflection if graph A is transformed to graph B?

- A)  $y = x$
- B)  $y = 0$
- C)  $x = 0$
- D)  $y = -x$



Part B: Long answer questions. Show all workings to receive full marks. (14 marks)

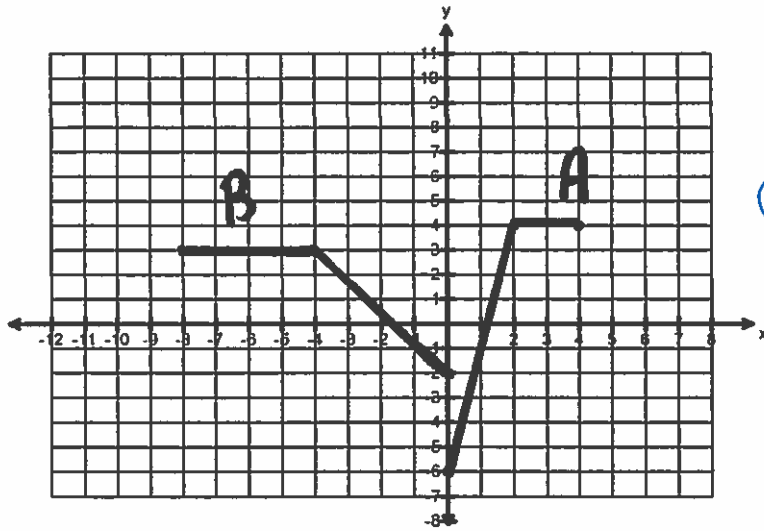
16. Given  $y = f(x)$ , state the mapping rule and sketch  $y = -\frac{1}{2}f(2x + 4) + 1$ . (4 marks)



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

$(2, 0) \rightarrow (-1, 1)$   
 $(4, 3) \rightarrow (0, -0.5)$   
 $(8, 2) \rightarrow (2, 0)$   
 $(5, 1) \rightarrow (0.5, 0.5)$

17. Graph B is a transformation of graph A. Determine the equation of graph B in the form  $y = af(b(x-h)) + k$ . (5 marks)



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

Form ①

18. Restrict the domain of the function  $f(x) = \frac{1}{2}(x+1)^2 + 4$  so that its inverse will also be a function. Find the inverse equation and state its domain. (5 marks)

$$x > -1$$

domain  $x > 4$  2.

Inverse

$$x = \frac{1}{2}(y+1)^2 + 4 \quad (5)$$

$$2(x-4) = (y+1)^2 \quad (1)$$

$$\pm \sqrt{2(x-4)} - 1 = y \quad (5)$$

$$f^{-1}(x) = \sqrt{2(x-4)} - 1$$