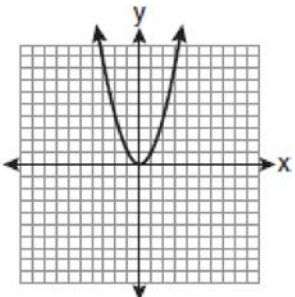
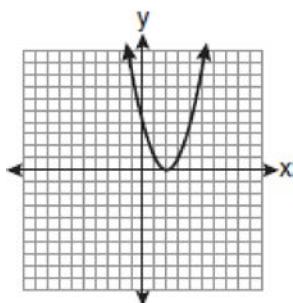


**A2.A.46: Transformations with Functions and Relations: Perform transformations with functions and relations:  $f(x + a)$ ,  $f(x) + a$ ,  $f(-x)$ ,  $af(x)$**

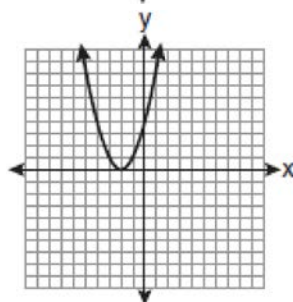
- 1 What is the translation that maps the function  $f(x) = x^2 - 1$  onto the function  $g(x) = x^2 + 1$ ?
  - 1)  $T_{0,2}$
  - 2)  $T_{0,1}$
  - 3)  $T_{1,-1}$
  - 4)  $T_{-1,1}$
- 2 The minimum point on the graph of the equation  $y = f(x)$  is  $(-1, -3)$ . What is the minimum point on the graph of the equation  $y = f(x) + 5$ ?
  - 1)  $(-1, 2)$
  - 2)  $(-1, -8)$
  - 3)  $(4, -3)$
  - 4)  $(-6, -3)$
- 3 If the graph of the equation  $y = 3^x$  is reflected in the  $x$ -axis, the equation of the reflection is
  - 1)  $y = 3^{-x}$
  - 2)  $y = -(3^x)$
  - 3)  $y = \log_x 3$
  - 4)  $y = x^3$
- 4 Which transformation of  $y = f(x)$  moves the graph 7 units to the left and 3 units down?
  - 1)  $y = f(x + 7) - 3$
  - 2)  $y = f(x + 7) + 3$
  - 3)  $y = f(x - 7) - 3$
  - 4)  $y = f(x - 7) + 3$
- 5 If  $a > 0$ , which function represents the reflection of  $y = a^x$  in the  $y$ -axis?
  - 1)  $y = -a^x$
  - 2)  $y = \left(\frac{1}{a}\right)^x$
  - 3)  $y = \left(\frac{1}{a}\right)^{-x}$
  - 4)  $x = a^y$
- 6 Which transformation best describes the relationship between the functions  $f(x) = 2^x$  and  $g(x) = \left(\frac{1}{2}\right)^x$ ?
  - 1) reflection in the line  $y = x$
  - 2) reflection in the origin
  - 3) reflection in the  $x$ -axis
  - 4) reflection in the  $y$ -axis
- 7 The graph below shows the function  $f(x)$ .
 



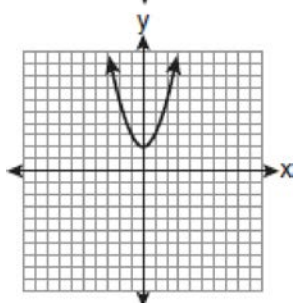
Which graph represents the function  $f(x + 2)$ ?



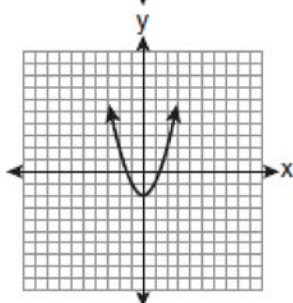
1)



2)

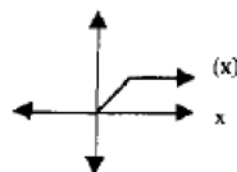


3)

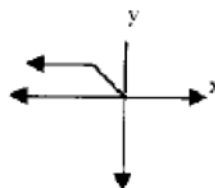


4)

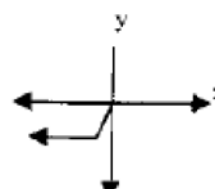
8 The graph below represents  $f(x)$ .



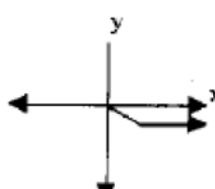
Which of the following is the graph of  $-f(x)$ ?



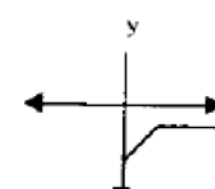
1)



2)

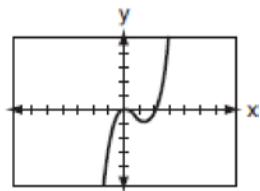


3)

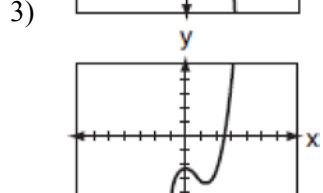
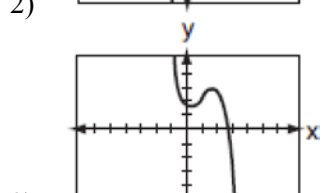
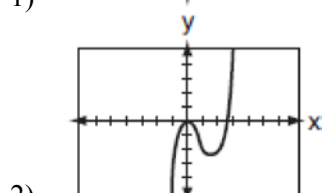
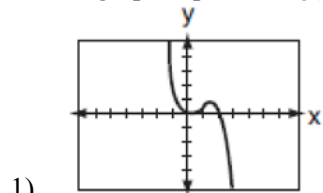


4)

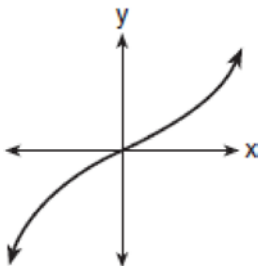
- 9 The accompanying graph represents the equation  $y = f(x)$ .



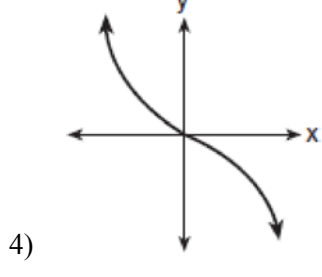
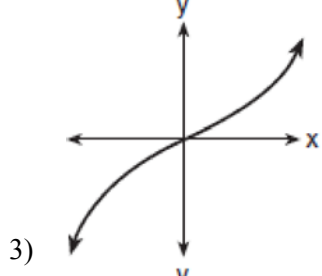
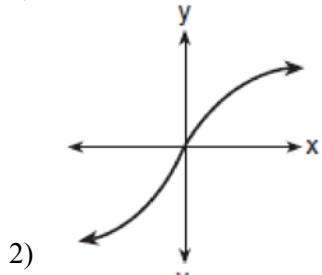
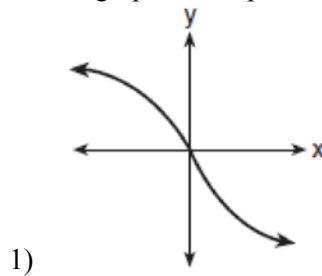
Which graph represents  $g(x)$  if  $g(x) = -f(x)$ ?



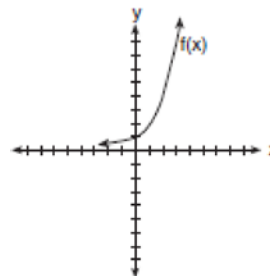
- 10 The graph below represents  $f(x)$ .



Which graph best represents  $f(-x)$ ?

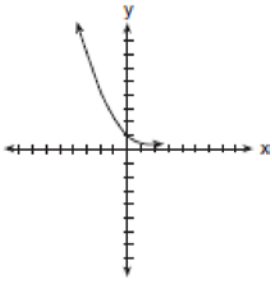


- 11 The graph of  $f(x)$  is shown in the accompanying diagram

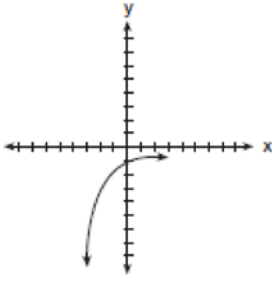


Which graph represents  $f(x)$  reflected across the  $x$ -axis?

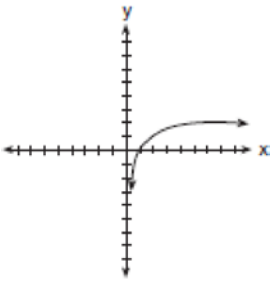
1)



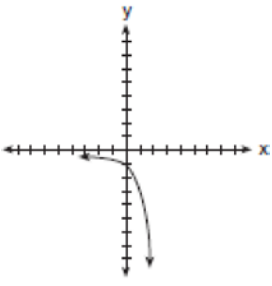
2)



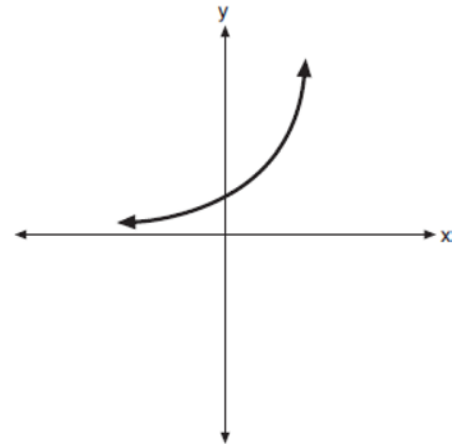
3)



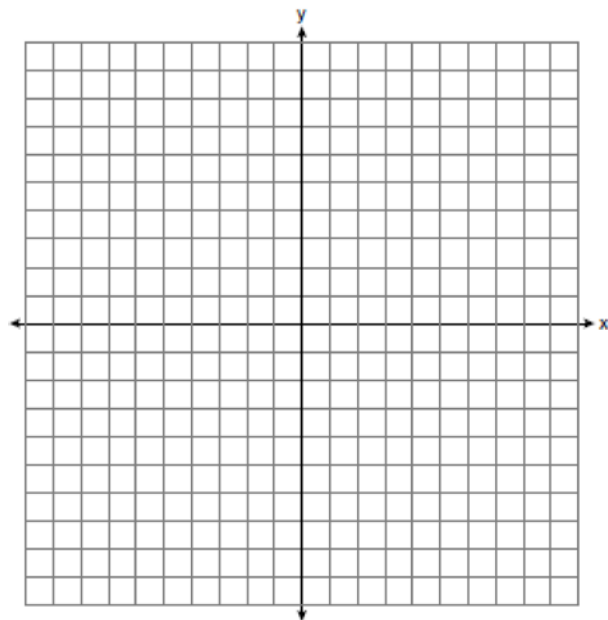
4)



- 12 The graph of the function  $f(x) = a^x$  is shown on the accompanying set of axes. On the same set of axes, sketch the reflection of  $f(x)$  in the  $y$ -axis. State the coordinates of the point where the graphs intersect.



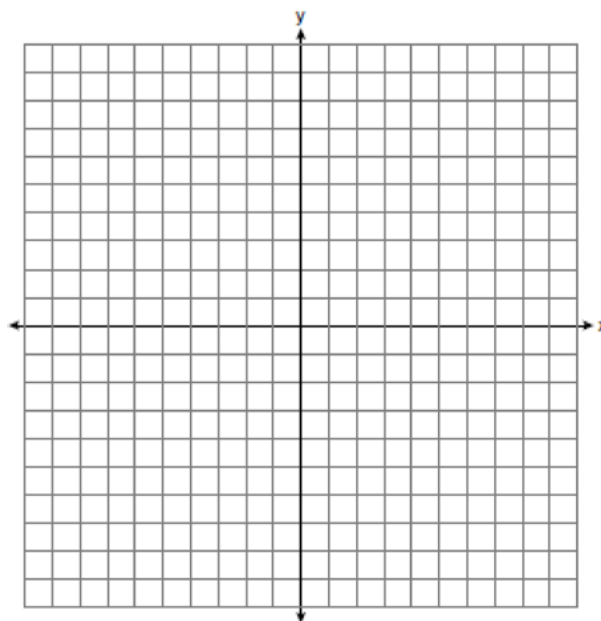
- 13 Sketch and label the graph of  $y = 3^x$ . The graph of the equation  $y = 3^x$  is reflected in the  $y$ -axis. On the same graph, sketch this reflection.



Which is an equation of the reflection?

- (1)  $y = -(3)^x$
- (2)  $y = 3^{-x}$
- (3)  $y = \log_3 x$
- (4)  $x = 3^y$

- 14 Sketch and label the graph of  $y = 2^x$ .



The graph of  $y = 2^x$  is subject to each of these transformations:

- (1) reflection in the  $y$ -axis
- (2) reflection in the line  $y = x$
- (3) translation:  $(x, y) \rightarrow (x, y + 1)$

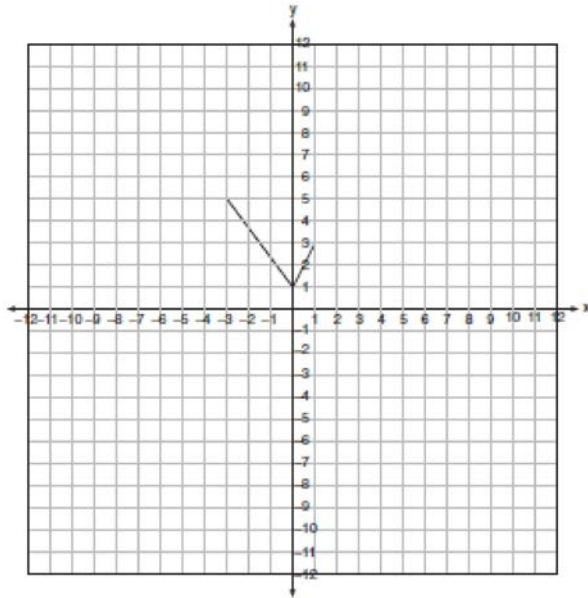
Next to the appropriate numeral below, write the letter of the equation, chosen from the list below, that best described the image of  $y = 2^x$  under each of the numbered transformations.

*Equations*

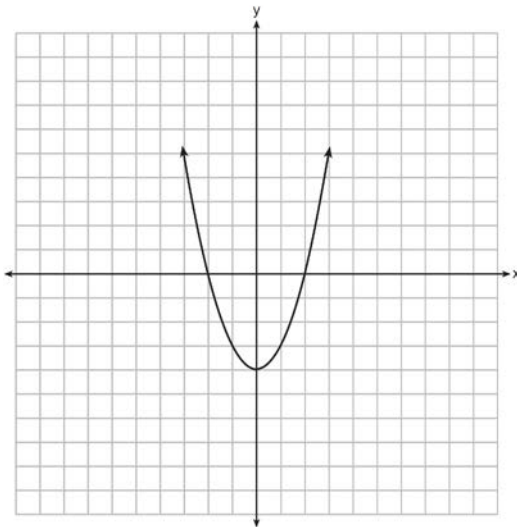
- (a)  $y = \log_2 x$
- (b)  $y = -2^x$
- (c)  $y = 2^{-x}$
- (d)  $y = 2^x + 1$

- (1)
- (2)
- (3)

- 15 The graph of the function  $g(x)$  is shown on the accompanying set of axes. On the same set of axes, sketch the image of  $g(x)$  under the transformation  $D_2$ .



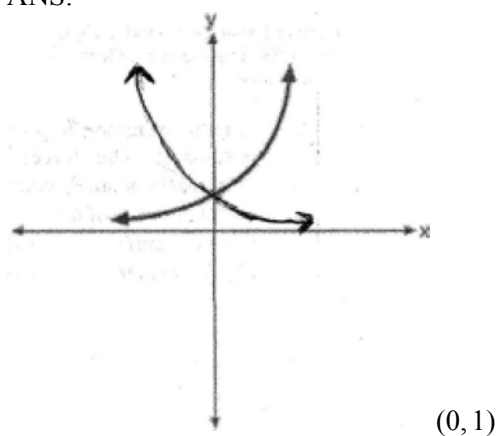
- 16 The function  $f(x)$  is graphed on the set of axes below. On the same set of axes, graph  $f(x + 1) + 2$ .



**A2.A.46: Transformations with Functions and Relations: Perform transformations with functions and relations:  $f(x + a)$ ,  $f(x) + a$ ,  $f(-x)$ ,  $af(x)$**

**Answer Section**

- 1 ANS: 1 REF: 010906b  
 2 ANS: 1 REF: 081022a2  
 3 ANS: 2 REF: 018925siii  
 4 ANS: 1 REF: 061516a2  
 5 ANS: 2 REF: 080919b  
 6 ANS: 4 REF: 060613b  
 7 ANS: 2 REF: fall0926a2  
 8 ANS: 3 REF: fall9903b  
 9 ANS: 1 REF: 060701b  
 10 ANS: 4 REF: 080406b  
 11 ANS: 2 REF: 080115b  
 12 ANS:



REF: 080721b

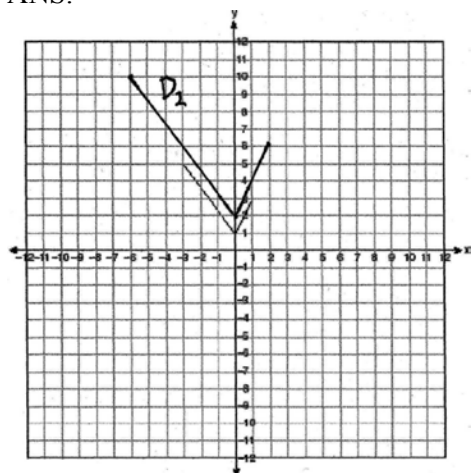
- 13 ANS:  
2

REF: 068637siii

- 14 ANS:  
c, a, d

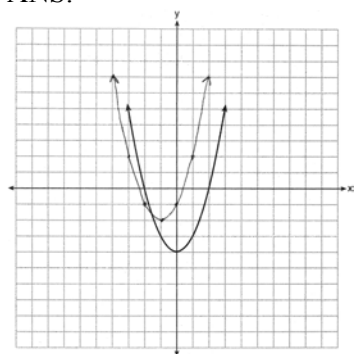
REF: 088539siii

15 ANS:



REF: 060521b

16 ANS:



REF: 061435a2