

Unit 1 Review: Transformations (13 %)

1. A function  $y=f(x)$  is graphed. If  $g(x) = -f(x)$ , then the graph of  $y=g(x)$  is the same as the graph of

- A.  $y=f(x)$  reflected in the line  $y=x$
- B.  $y=f(x)$  reflected in the y-axis
- C.  $y=f(x)$  reflected in the x-axis
- D. the reciprocal of  $y=f(x)$

↑  
vertical reflection

2. The graph of a function  $f$  is a parabola opening upward, with its vertex on the x-axis. The graph of a new function  $g$ , where  $g(x) = 2f(x)$ , will have

- A. the same domain and the same range as  $f$
- B. the same domain but a different range than  $f$
- C. a different domain but the same range as  $f$
- D. a different domain and a different range than  $f$

vertical expansion by 2

3. As a result of the transformation of the graph of  $y=x^3$  into the graph of  $y-4 = (x-3)^3$ , the point  $(3, 27)$  becomes the point  $(6, y)$ . The value of  $y$  is

- A. 31
- B. 30
- C. 23
- D. 24

~~3, 27~~  
6, 31

3 right  
4 up

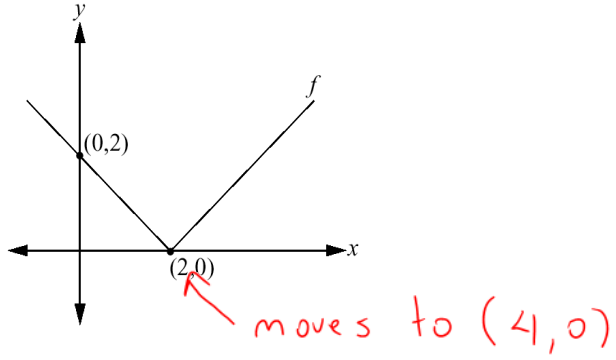
4. If  $y$  is replaced by  $y/2$  in the equation  $y=f(x)$ , then the graph of  $y=f(x)$  will be stretched

- A. horizontally about the y-axis by a factor of  $1/2$
- B. horizontally about the y-axis by a factor of 2
- C. vertically about the x-axis by a factor of  $1/2$
- D. vertically about the x-axis by a factor of 2

5.

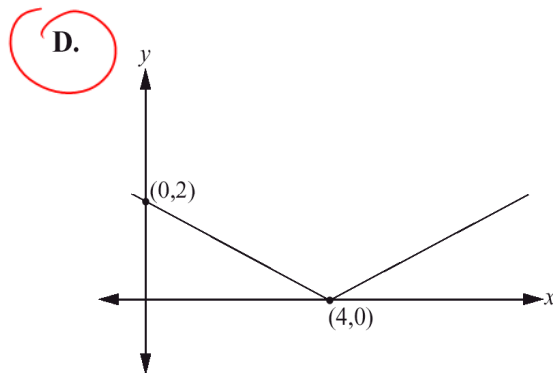
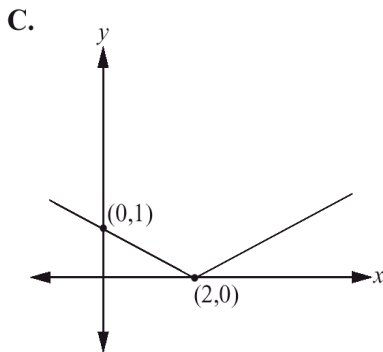
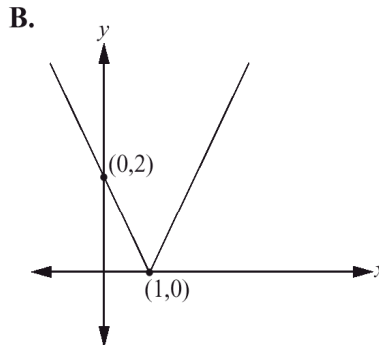
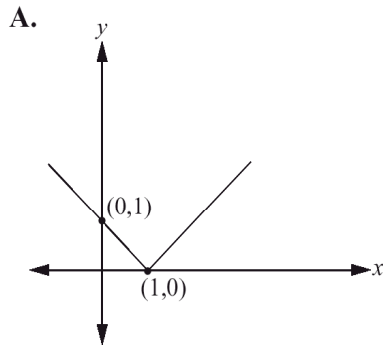
Use the following information to answer the next question.

The partial graph of  $y = f(x)$  is shown below.



Which of the following partial graphs represents the transformed function

$y = f\left(\frac{1}{2}x\right)$ ? *horizontal expansion by 2*



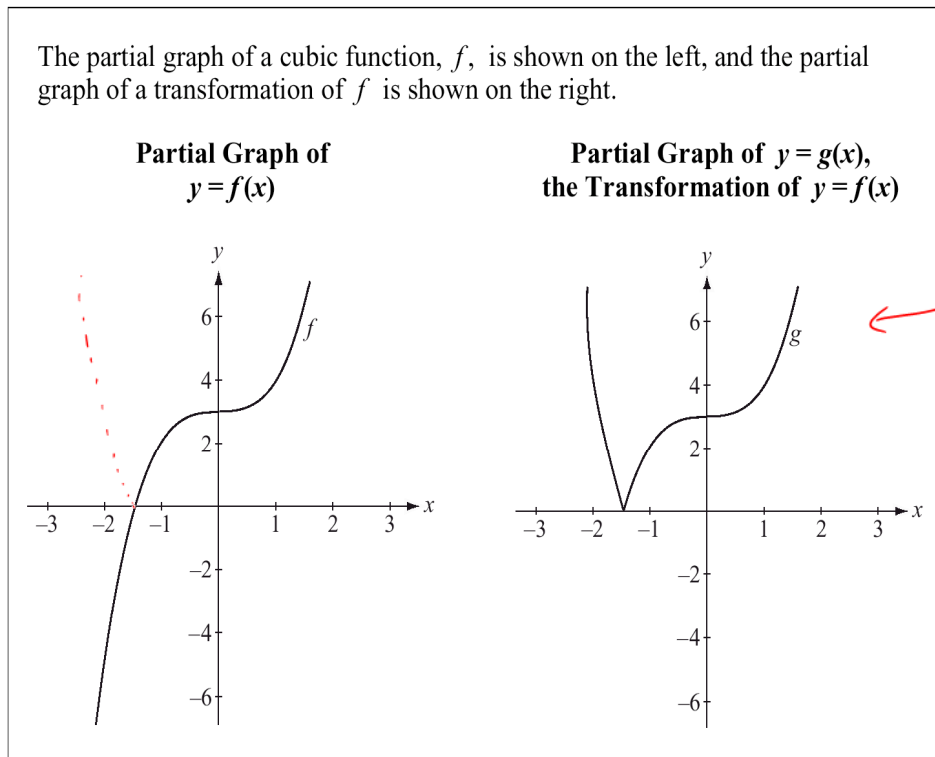
6. The graph of  $y=x^3$  was transformed to the graph of  $y=(x-3)^3+4$ . Which of the following statements describes the transformation?

3 R      4 U

- A. The graph of  $y=x^3$  has been translated 4 units to the right and 3 units upward.
- B. The graph of  $y=x^3$  has been translated 3 units to the left and 4 units downward.
- C.** The point  $(x,y)$  on the graph  $y=x^3$  has been translated to point  $(x+3, y+4)$
- D. The point  $(x,y)$  on the graph  $y=x^3$  has been translated to point  $(x-3, y-4)$

7.

Use the following information to answer the first question.



Which of the following transformations of  $f$  results in graph  $g$  shown on the right?

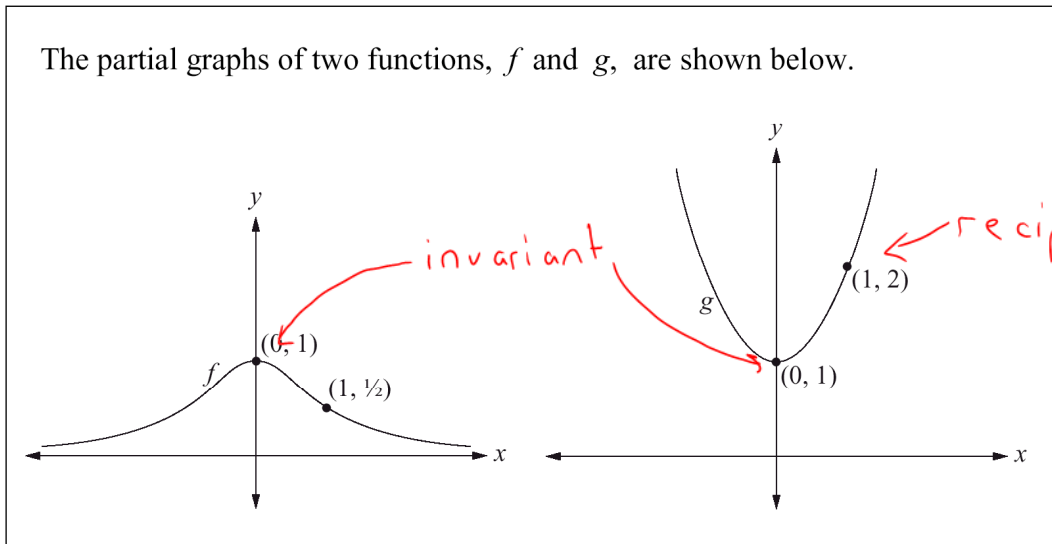
A.  $g(x) = \frac{1}{f(x)}$

**B.**  $g(x) = |f(x)|$

C.  $g(x) = \left| \frac{1}{f(x)} \right|$

D.  $g(x) = \left| \frac{1}{f(x)} \right|$

8.



If graph  $g$  is a transformation of graph  $f$ , then the equation that would generate graph  $g$  is

A.  $g(x) = f(-x)$

B.  $g(x) = f^{-1}(x)$

C.  $g(x) = -f(x)$

D.  $g(x) = \frac{1}{f(x)}$

9. If  $f(x) = 2x^2 - 3$ , where  $x \geq 0$ , then a function  $g$  that will have a domain and range that are **both** different from those of function  $f$  is

*orig graph:*

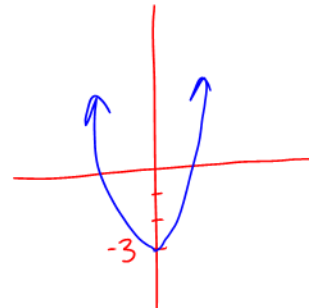
~~A.~~  $g(x) = f(-x)$

~~B.~~  $g(x) = -f(x)$

C.  $g(x) = f^{-1}(x)$

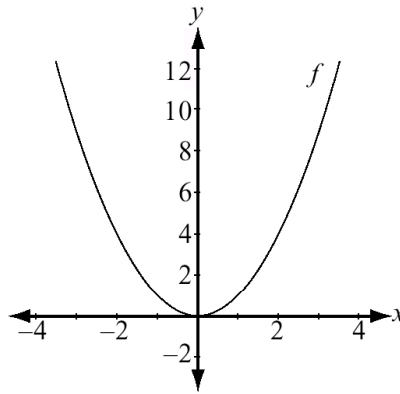
~~D.~~  $g(x) = kf(x)$ , where  $k > 0$

*inverse transformation*



10.

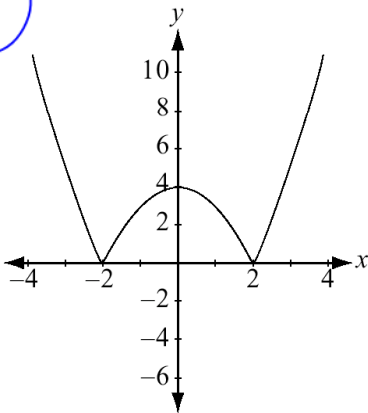
The graph of  $y = f(x)$  is shown below.



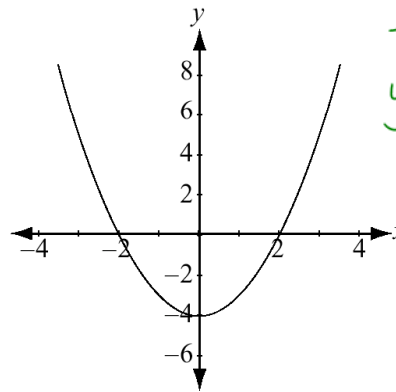
The graph of  $y = |f(x) - 4|$  is

4 Down, then absolute value

**A.**

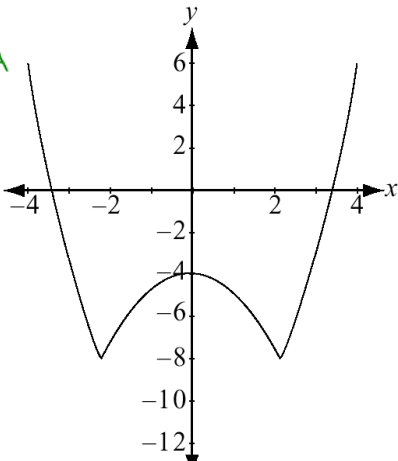


**B.**



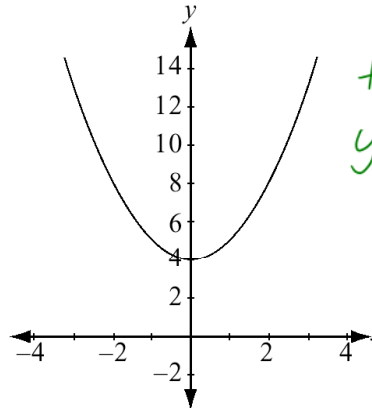
this is  
 $y = f(x) - 4$

**C.**



this is  
 $y = |f(x)| - 4$

**D.**



this is  
 $y = f(x) + 4$

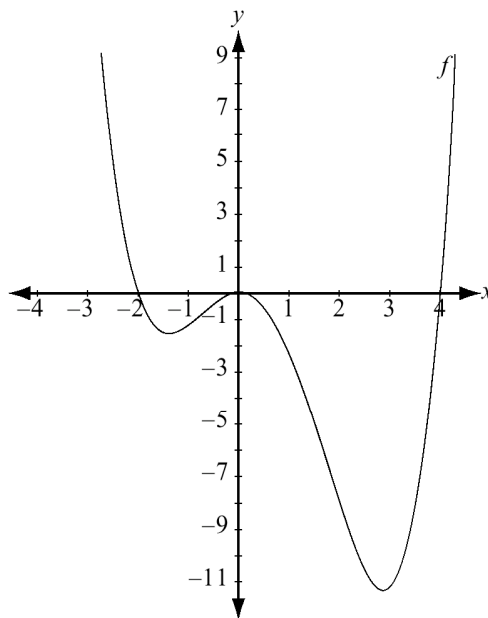
11. The graph of  $y=f(x)$ , where  $f(x) = |x + 4| + 1$ , is reflected in the  $y$ -axis. This produces the same results as would translating the graph of  $y= f(x)$  to the right by \_\_\_\_\_ units.

- A. 4 units
- B. 1 unit
- C. 8 units
- D. 5 units

*Draw the before and after graphs to see this better.*

12.

The partial graph of the function  $y=f(x)$  is shown below. The range of function  $f$  is  $f(x) \geq -11$ .



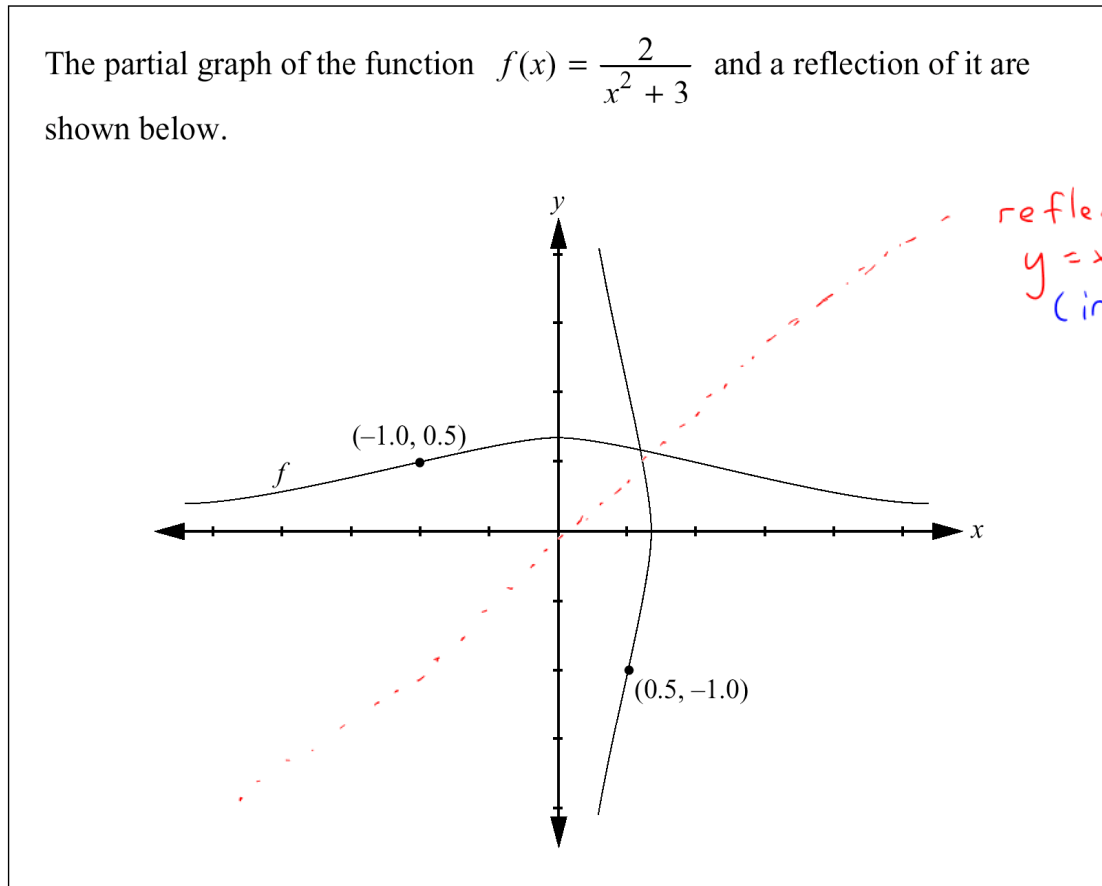
If function  $f$  is transformed to a new function  $g(x) = f(x - 3) + 2$ , then the range of function  $g$  will be

- A.  $g(x) \geq -11$
- B.  $g(x) \geq -9$
- C.  $g(x) \geq -8$
- D.  $g(x) \geq 0$

*2 up*

13.

Use the following information to answer the next question.



An expression for this reflection of graph  $f$  is

- A.  $x = y$
- B.  $x = f(y)$**
- C.  $y = f(-x)$
- D.  $y = -f(x)$

14. How is the graph of  $y = f(x) - 3$  related to the graph of  $y = f(x)$ ?

- A.  $y = f(x)$  has been translated 3 units up
- B.  $y = f(x)$  has been translated 3 units down**
- C.  $y = f(x)$  has been translated 3 units left
- D.  $y = f(x)$  has been translated 3 units right

15. Which equation represents the graph of  $y = f(x)$  after it is reflected in the line  $y = x$ ?

- A.  $x = f(y)$  or  $y = f^{-1}(x)$  inverse
- B.  $y = f(-x)$
- C.  $y = -f(x)$
- D.  $y = \frac{1}{f(x)}$

16.

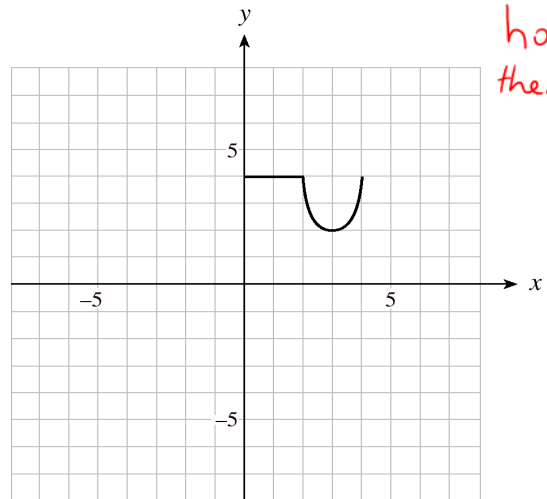
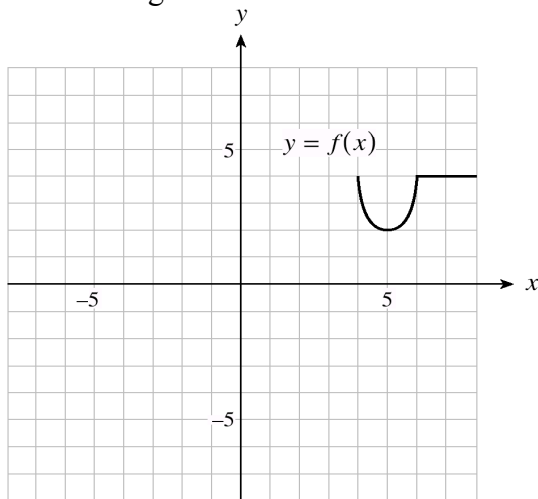
If the graph of the function  $y = \sqrt{x}$  is horizontally expanded by a factor of 3 and then translated 2 units to the right, determine the equation of this new function.

- A.  $y = \sqrt{3(x-2)}$  replace  $x \rightarrow \frac{1}{3}x$   $y = \sqrt{\frac{1}{3}x}$
- B.  $y = \sqrt{\frac{1}{3}(x-2)}$  replace  $x \rightarrow x-2$   $y = \sqrt{\frac{1}{3}(x-2)}$
- C.  $y = \sqrt{3x-2}$
- D.  $y = \sqrt{\frac{1}{3}x-2}$

17. If  $(4, 12)$  is a point on the graph of  $y = f(x)$ , what must be a point on the graph of  $y = -f(2x) + 3$ ?

- A.  $(4, -9)$  vert. refl  $\rightarrow (4, -12)$
- B.  $(4, -15)$  hori. comp by  $\frac{1}{2} \rightarrow (2, -12)$
- C.  $(2, -9)$  3 up  $\rightarrow (2, -9)$
- D.  $(2, -15)$

18. The graph of  $y = f(x)$  is shown below on the left. Which equation represents the graph shown on the right?

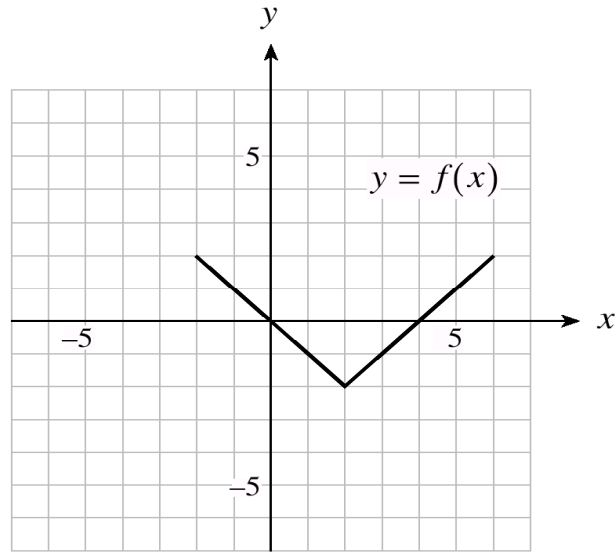


hori. reflection, then 8 right

- A.  $y = f(-(x+8))$
- B.  $y = f(-(x-8))$
- C.  $y = -f(x-8)$
- D.  $y = -f(x+8)$

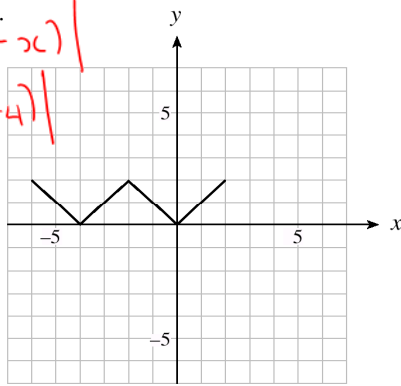


19. The graph of  $y = f(x)$  is shown below



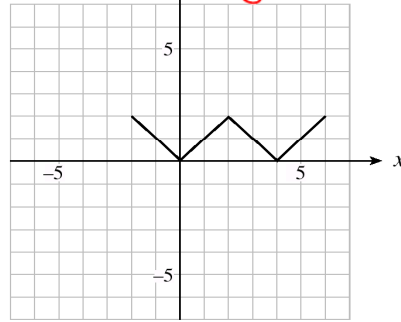
Each of the four graphs below is a transformation of  $y = f(x)$ .

A.  
 $y = |f(-x)|$   
 or  $y = |f(x+4)|$



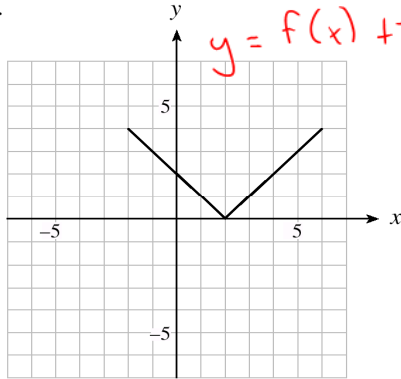
B.

$y = |f(x)|$



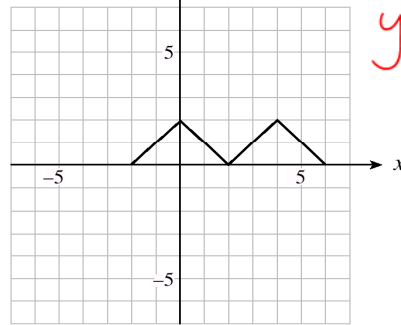
C.

$y = f(x) + 2$



D.

$y = -|f(x)| + 2$



Write an equation that would generate each graph.

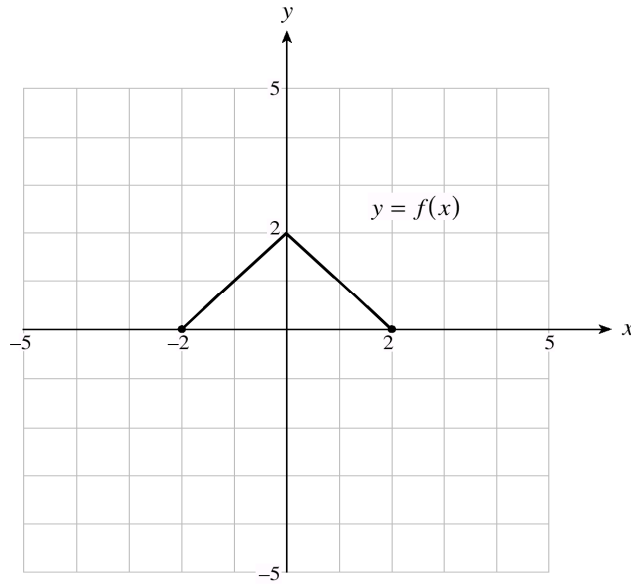
A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

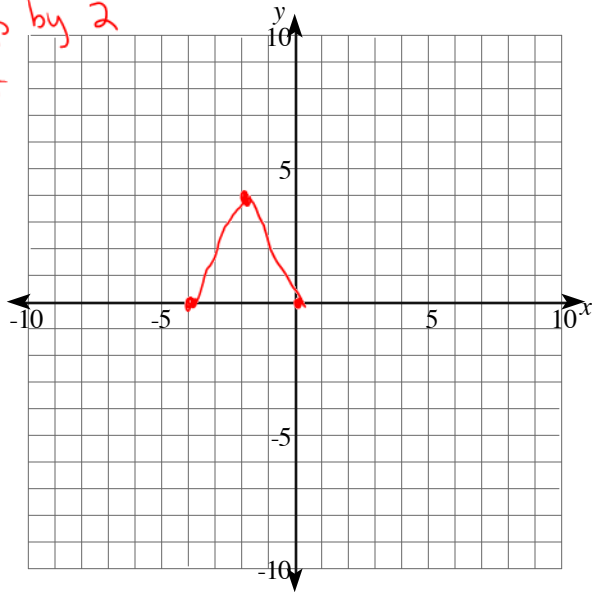
D. \_\_\_\_\_

20. The graph of  $y = f(x)$  is shown below:



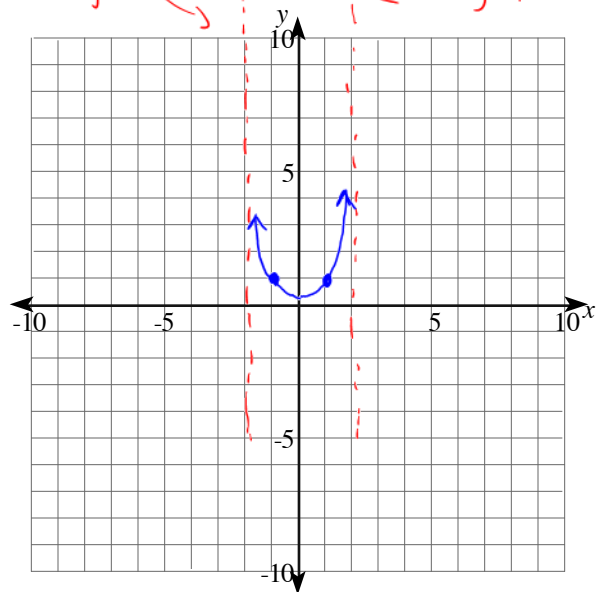
A. Sketch  $y = 2f(x + 2)$  on the grid below.

*vert exp by 2  
2 left*



B. Sketch  $y = \frac{1}{f(x)}$

*asym → ← asym*



21. Which equation represents the graph of  $y=f(x)$  after it is reflected in the x-axis?

replace  $y \rightarrow -y$

- A.  $y=f(-x)$
- B.  $y=-f(x)$**
- C.  $y=f^{-1}(x)$
- D.  $y=|f(x)|$

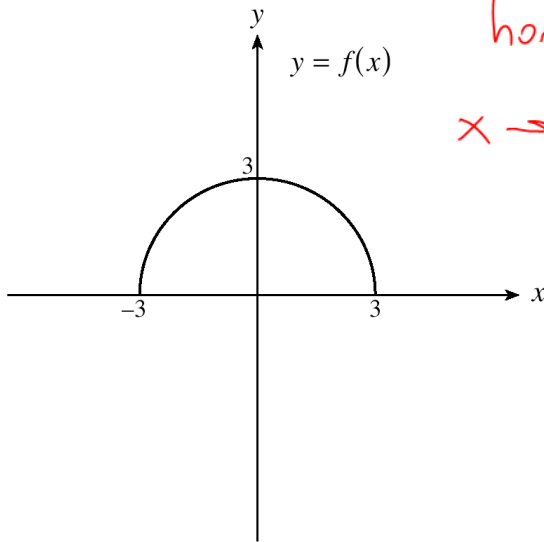
22. If  $f(x) = \frac{2x}{x-1}$ , determine the equation of  $f^{-1}(x)$ , the inverse of  $f(x)$ .

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

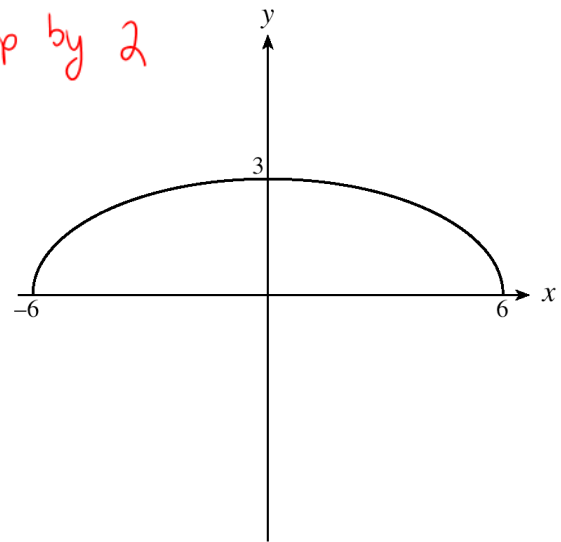
- A.  $f^{-1}(x) = \frac{2x}{x-1}$
- B.  $f^{-1}(x) = \frac{x}{x-2}$**
- C.  $f^{-1}(x) = \frac{x-1}{2x}$
- D.  $f^{-1}(x) = \frac{1}{x-2}$

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

23. The function  $y=f(x)$  is graphed below on the left. Determine the equation of the function shown on the right.



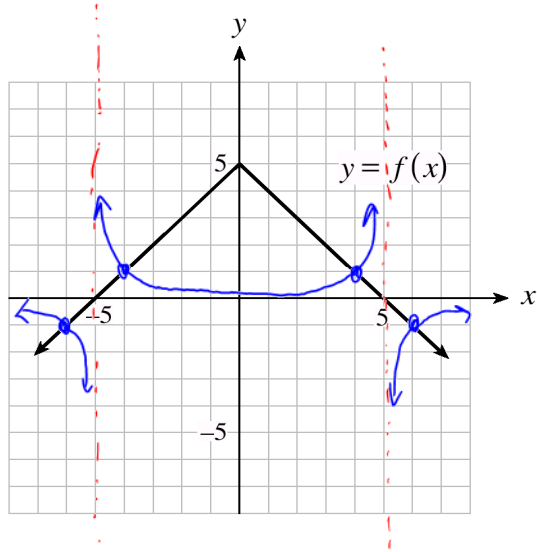
horiz. exp by 2  
 $x \rightarrow \frac{1}{2}x$



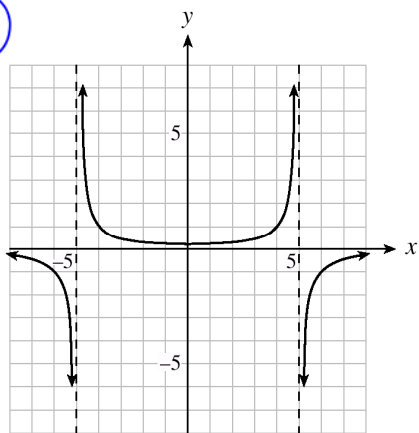
- A.  $y=f(\frac{1}{2}x)$**
- C.  $y = \frac{1}{2}f(x)$

- B.  $y=f(2x)$
- D.  $y=2f(x)$

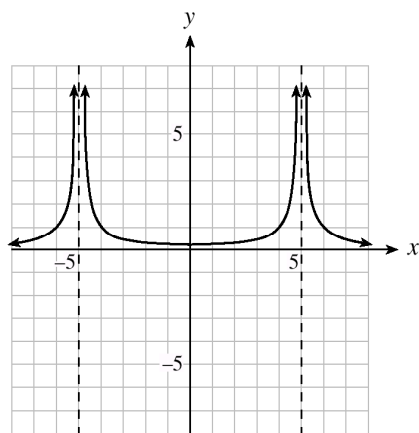
24. Given the graph of  $y=f(x)$ , which of the following best represents the graph of  $y = \frac{1}{f(x)}$ ?



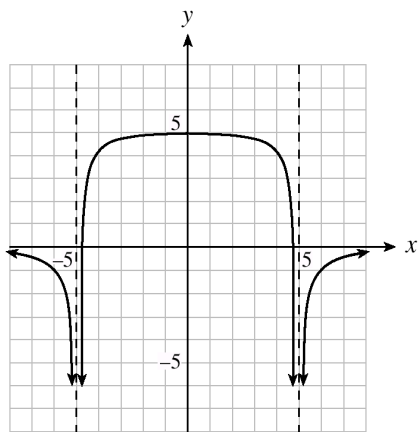
A.



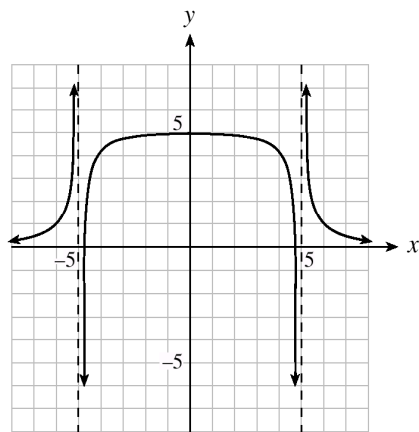
B.



C.

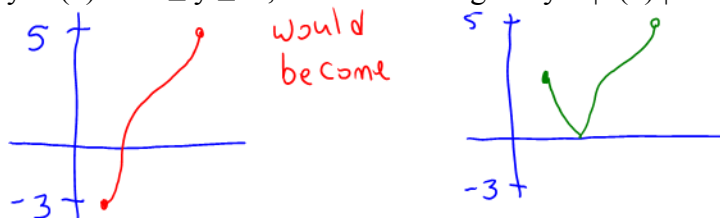


D.



25. If the range of  $y = f(x)$  is  $-3 \leq y \leq 5$ , what is the range of  $y = |f(x)|$ ?

- A.  $-3 \leq y \leq 5$
- B.  $0 < y \leq 3$
- C.  $0 \leq y \leq 5$
- D.  $3 \leq y \leq 5$



26. If the point  $(4, -9)$  is on the graph of  $y = f(x)$ , which of the following points must be on the graph of  $y = \frac{1}{3}f(2(x-1))$ ?

- A.  $(3, -3)$
- B.  $(9, -3)$
- C.  $(9, -27)$
- D.  $(3, -27)$

vert. comp by  $\frac{1}{3}$        $(4, -3)$   
 hori. comp by  $\frac{1}{2}$        $(2, -3)$   
 1 R       $(3, -3)$

27. The graph of  $y = -f(x)$  is a reflection of the graph of  $y = f(x)$  in which line?

- A. the y-axis
- B. the x-axis
- C. the line  $y = x$
- D. the line  $y = -x$

28. The point  $(6, 1)$  is on the graph of the function  $y = f(x)$ . Which point must be on the graph of the function  $y = -3f(-2x + 6) - 9$ ?

- A.  $(0, -12)$
- B.  $(-6, 6)$
- C.  $(6, 1)$
- D.  $(0, -6)$

Factor!  $\rightarrow$   $y = -3f(-2(x-3)) - 9$   
 vert exp by 3, hori comp by  $\frac{1}{2}$ , vert refl, hori refl,  
 3 R, 9 Down  
 $0 \rightarrow 3 \rightarrow (6, 1) \rightarrow 3 \rightarrow -3 \rightarrow -12$

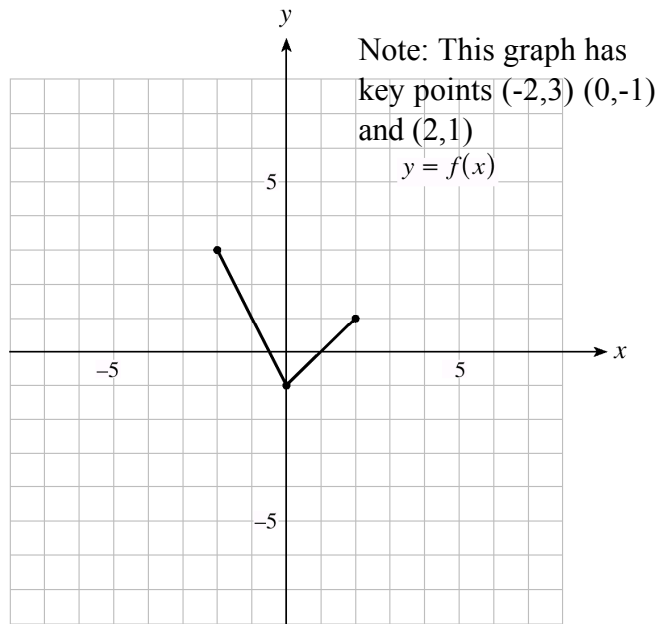
29. If the point  $(a, b)$  is on the graph of  $y = f(x)$ , which point must be on the graph of

$y = \frac{1}{f(x-2)}$  ( $a \neq 0, b \neq 0$ )

2 right) reciprocal

- A.  $(a-2, \frac{1}{b})$
- B.  $(a+2, \frac{1}{b})$
- C.  $(\frac{1}{a}, b)$
- D.  $(a+2, b)$

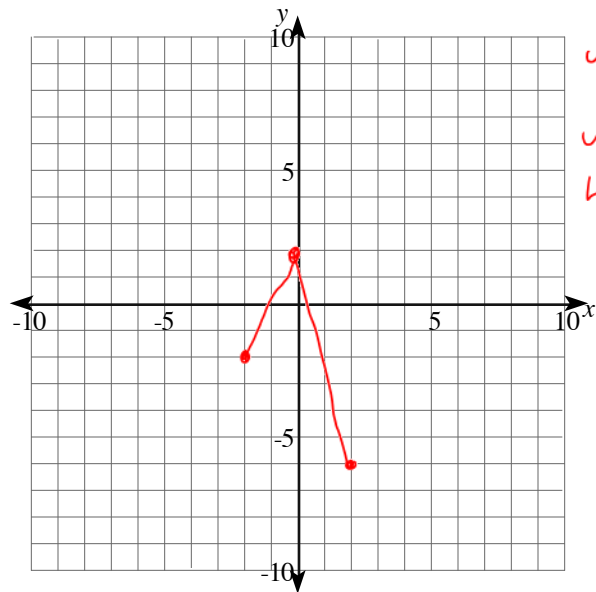
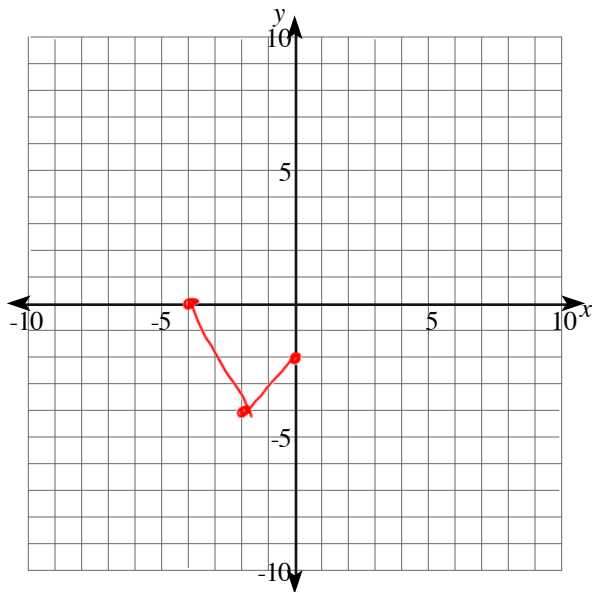
30. The graph of  $y=f(x)$  is shown below.



a) On the graph below, sketch  $y = f(x + 2) - 3$

b) On the graph below, sketch  $y = -2f(-x)$

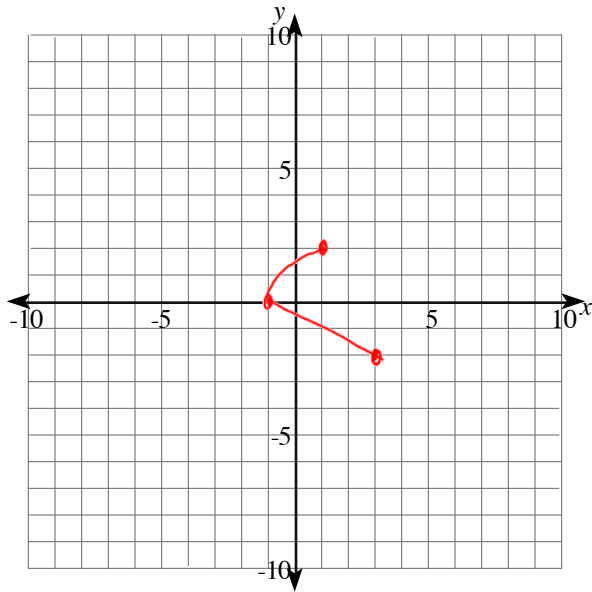
2 L  
3 D



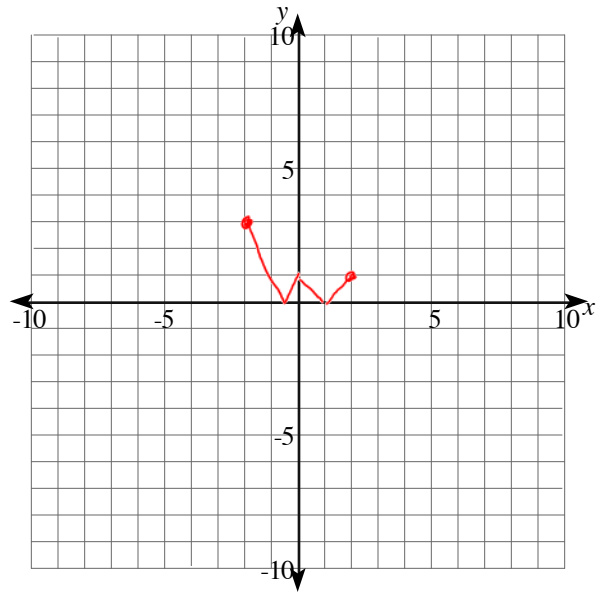
vert exp  
by 2  
vert refl.  
horiz. refl.

inverse

c) On the graph below, sketch  $f^{-1}(x)$

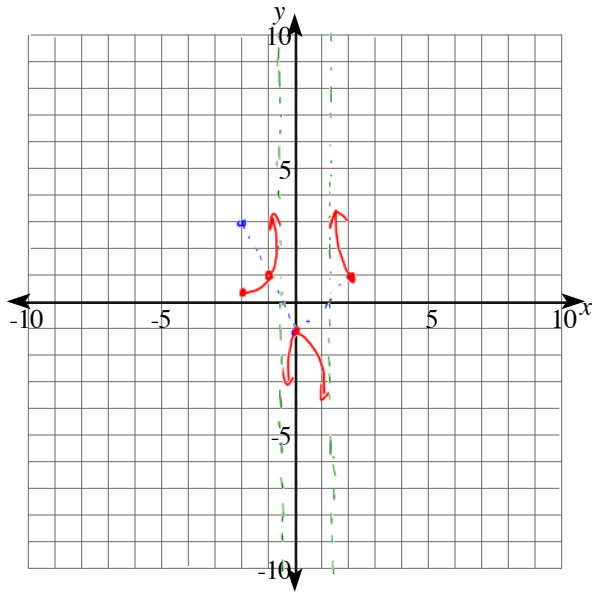


e) On the graph below, sketch  $y = |f(x)|$



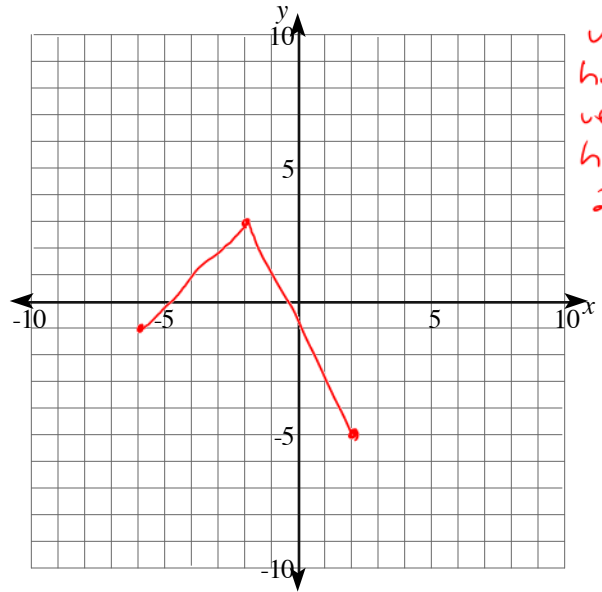
d) On the graph below, sketch  $y = \frac{1}{f(x)}$

-2, 3  
0, -1  
2, 1



f) On the graph below, sketch

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



vert exp by 2  
hori exp by 2  
vert refl  
hori refl  
2 <  
1 U

31. If the graph of  $2x + 3y = 8$  is translated 5 units down, determine the equation of the new graph.

- A.  $2x + 3y = 3$
- B.  $2x + 3y = 13$
- C.  $2x + 3(y + 5) = 8$
- D.  $2x + 3(y - 5) = 8$

replace  $y \rightarrow y + 5$   
 $2x + 3(y + 5) = 8$

32. How is the graph of  $y = 6^{4x}$  related to the graph of  $y = 6^x$ ?

- A. The graph of  $y = 6^x$  has been expanded vertically by a factor of 4.
- B. The graph of  $y = 6^x$  has been compressed vertically by a factor of  $1/4$ .
- C. The graph of  $y = 6^x$  has been expanded horizontally by a factor of 4.
- D. The graph of  $y = 6^x$  has been compressed horizontally by a factor of  $1/4$ .

replace  $x \rightarrow 4x$

33. Determine an equation that will cause the graph of  $y = f(x)$  to expand vertically by a factor of 3 and reflect about the x-axis.

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

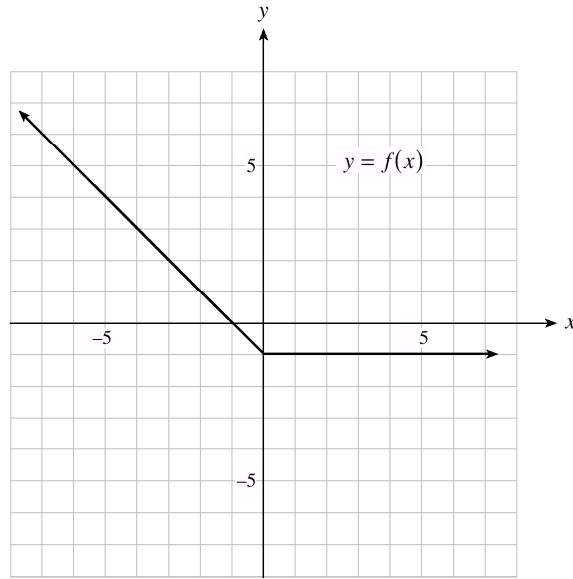
34. If the graph of  $x^2 + y^2 = 9$  is horizontally compressed by a factor of  $\frac{1}{4}$ , and then reflected in the y-axis, determine an equation for the new graph.

- A.  $\frac{x^2}{16} + y^2 = 9$
- B.  $16x^2 + y^2 = 9$
- C.  $-\frac{x^2}{16} + y^2 = 9$
- D.  $-16x^2 + y^2 = 9$

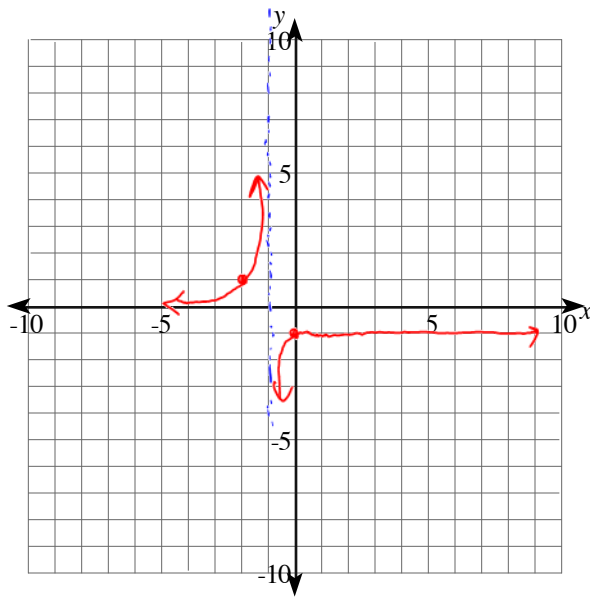
replace  $x \rightarrow 4x$   
replace  $x \rightarrow -x$   
 $(-4x)^2 + y^2 = 9$   
 $16x^2 + y^2 = 9$



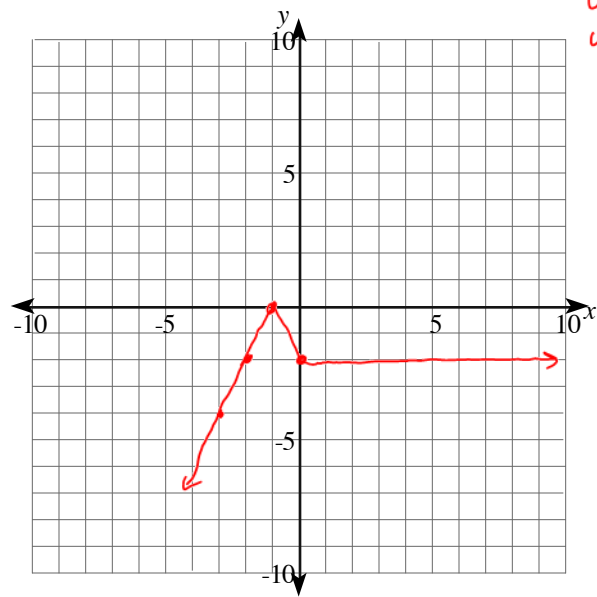
35. The graph of  $y = f(x)$  is shown below. Note: This graph goes through  $(0, -1)$ .



a) On the graph below, sketch  $y = \frac{1}{f(x)}$



b) On the graph below, sketch  $y = -2|f(x)|$



*abs. value  
vert exp by 2  
vert refl.*

## Solutions

1. c
2. a
3. a
4. d
5. d
6. c
7. b
8. d
9. c
10. a
11. c
12. b
13. b
14. b
15. a
16. b
17. c
18. b
19. a)  $y = |f(x + 4)|$  b)  $y = |f(x)|$  c)  $y = f(x) + 2$  d)  $y = -|f(x)| + 2$
20. a) see my answer key b) see key
21. b
22. b
23. a
24. a
25. c
26. a
27. b
28. a
29. b
30. a) see key b) see key c) see key d) see key e) see key f) see key
31. c
32. d
33. a
34. b
35. a) see key b) see key

Note to teachers:

The questions here come from a variety of sources. Some come from Alberta provincial exams, or are based on questions from those documents. Most of the multiple choice questions are based on provincial exams from 1994-1996, but I have tried to change the numbers where formatting was not too large an issue.

I generally hand this out at the beginning of the unit (including the answer key), and I collect it the day of the test. I flip through the booklet just to see if there is writing on each page, and I give the students a few marks. During the unit, I have a few photocopied solution manuals (showing all my steps) floating around the class as well. Students can sign them out and take them home if they wish.

If you find any errors in the answer key, or have any suggestions that I could add, feel free to email me at [kdueck@sd42.ca](mailto:kdueck@sd42.ca) and I'll be happy to reply.

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