**SPECS 2001**

1. If the graph of $y = f(x)$ is translated 5 units to the left, determine the resulting equation.

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

2. How is the graph $5y = \sqrt{x}$ related to the graph $y = \sqrt{x}$?

   A. $y = \sqrt{x}$ has been vertically translated 5 units up
   B. $y = \sqrt{x}$ has been expanded vertically by a factor of 5
   C. $y = \sqrt{x}$ has been compressed vertically by a factor of 5
   D. $y = \sqrt{x}$ has been compressed horizontally by a factor of 5

3. Simplify: $f^{-1}(f(x))$

   A. x B. $-x$ C. $\dfrac{1}{x}$ D. $-\dfrac{1}{x}$

4. Given the function $f(x) = (x - 1)^3 + 2$, determine $f^{-1}(x)$, the inverse function.

   A. $f^{-1}(x) = \sqrt[3]{x + 2} + 1$ B. $f^{-1}(x) = \sqrt[3]{x - 2} + 1$
   C. $f^{-1}(x) = \sqrt[3]{x + 2} - 1$ D. $f^{-1}(x) = \sqrt[3]{x - 2} - 1$

5. The function $y = f(x)$ is transformed to $y = f(2x + 4)$. Identify the horizontal expansion or compression factor, then the translation to the graph of the function.

   A. horizontal expansion by a factor of 2, then a translation of 4 units left.
   B. horizontal compression by a factor of 2, then a translation of 4 units left.
   C. horizontal expansion by a factor of 2, then a translation of 2 units left.
   D. horizontal compression by a factor of 2, then a translation of 2 units left.

6. The graph of $y = \sqrt{9 - x^2}$ is shown.
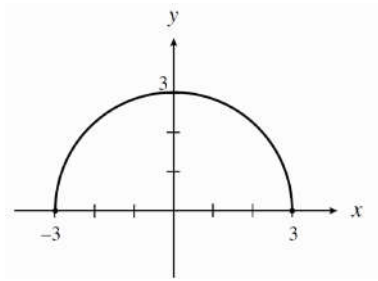
Which of the following graphs represents $2y = \sqrt{9 - x^2}$?

A.

B.

C.



D.
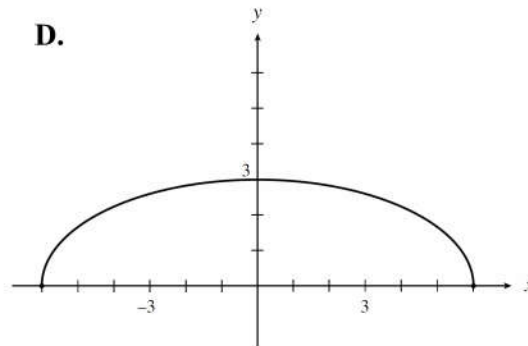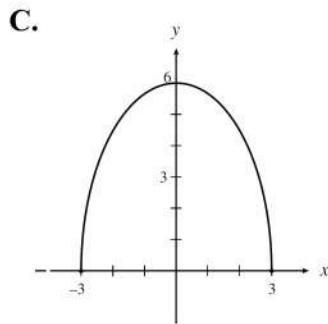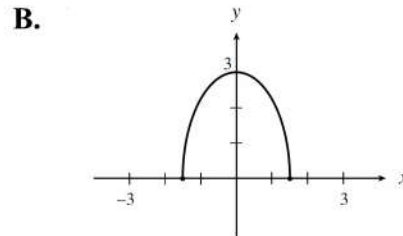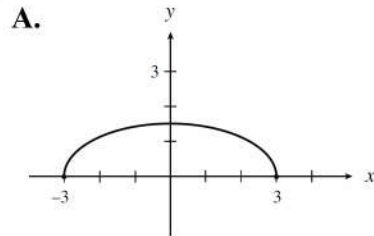
SAMPLE 2001

7. If $(6, -5)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = -f(2(x + 2)) - 3$?

    A. $(-1, 2)$ B. $(1, -2)$ C. $(1, 2)$ D. $(10, 2)$

8. Given the function $y_1 = f(x)$, describe how the graph of the new function, $y_2 = 4f(x - 2)$, is related to the graph of y_1.

    A. The graph of y_1 has been vertically compressed by a factor of 4 then translated 2 units right to form the graph of y_2.

    B. The graph of y_1 has been vertically expanded by a factor of 4 then translated 2 units right to form the graph of y_2.

    C. The graph of y_1 has been vertically compressed by a factor of 4 then translated 2 units left to form the graph of y_2.

    D. The graph of y_1 has been vertically expanded by a factor of 4 then translated 2 units left to form the graph of y_2.

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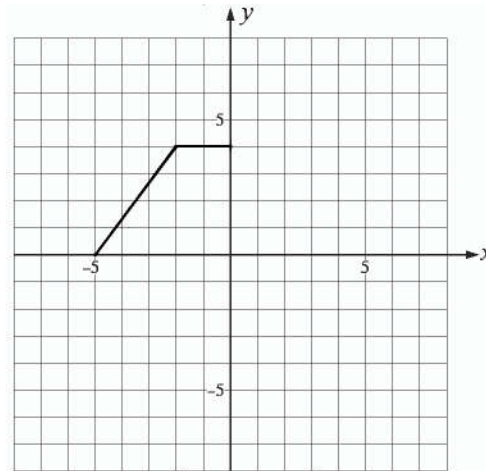
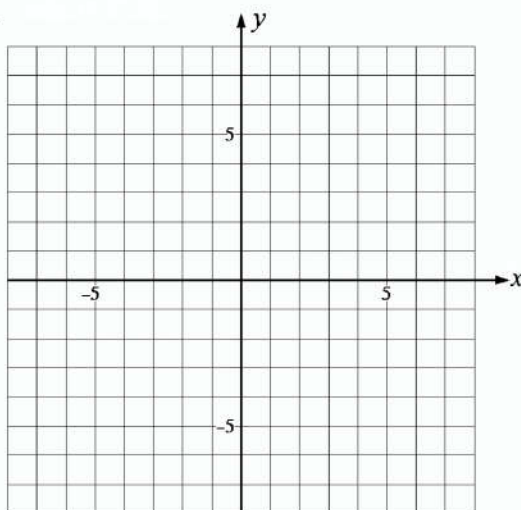

Sketch the graphs of:

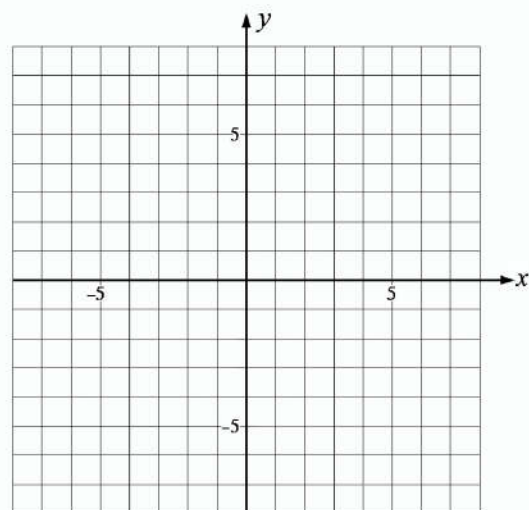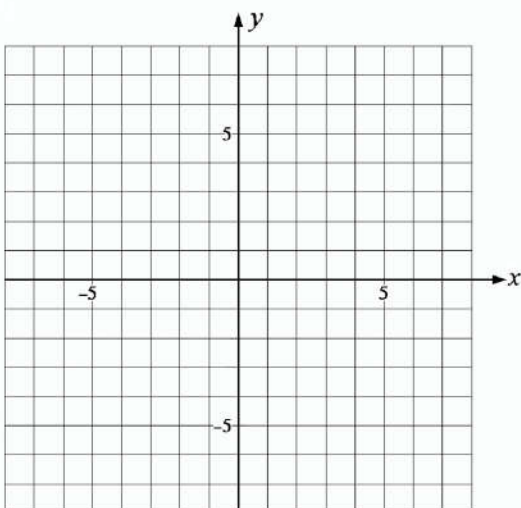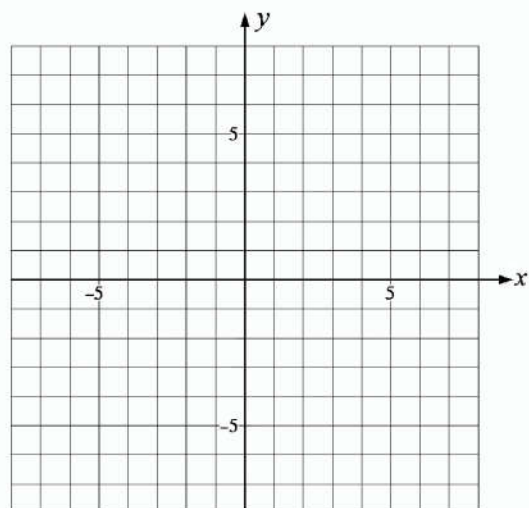A. $y = f(-x)$ B. $y = f(x - 3)$ C. $y = 2f(x)$ D. $x = f(y)$
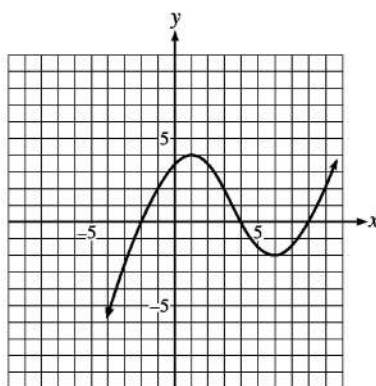
A.

B.

C.

D.

JAN 2002

10. Which equation represents the graph of $y = \sqrt{x}$ after it is translated 4 units to the right?

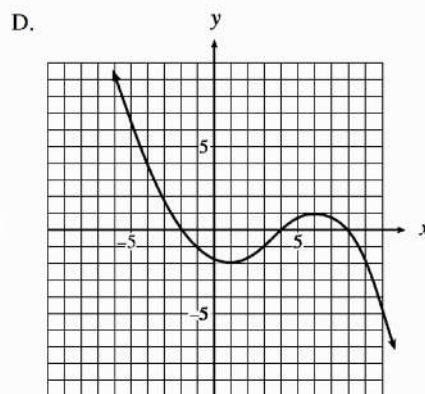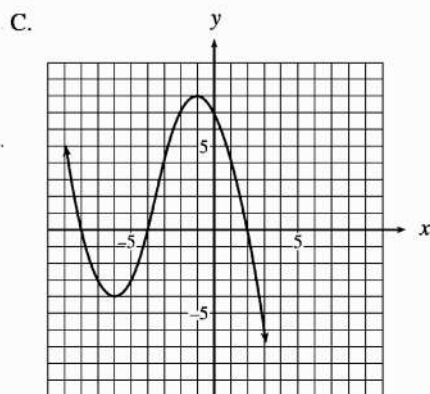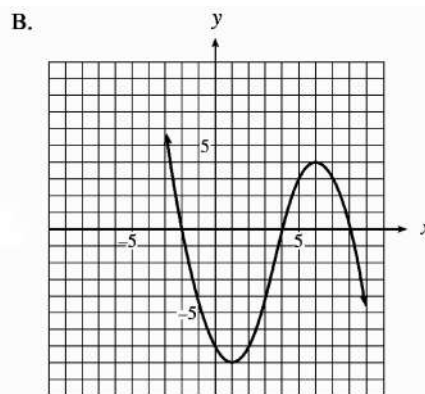   A. $y = \sqrt{x} - 4$ B. $y = \sqrt{x - 4}$ C. $y = \sqrt{x + 4}$ D. $y = \sqrt{x} + 4$
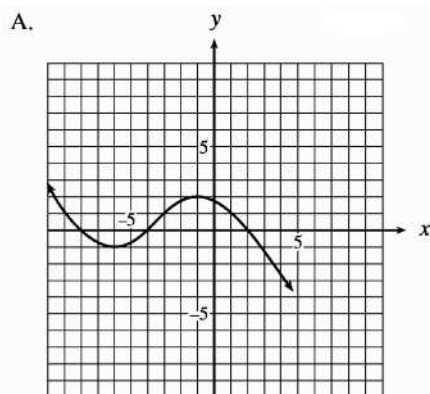
11. If $y = 5x - 1$, determine the equation of $f^{-1}(x)$, the inverse of $f(x)$.

    A. $f^{-1}(x) = \dfrac{1}{5x - 1}$ B. $f^{-1}(x) = \dfrac{1}{5}x - 1$ C. $f^{-1}(x) = \dfrac{x + 1}{5}$ D. $f^{-1}(x) = \dfrac{x - 1}{5}$
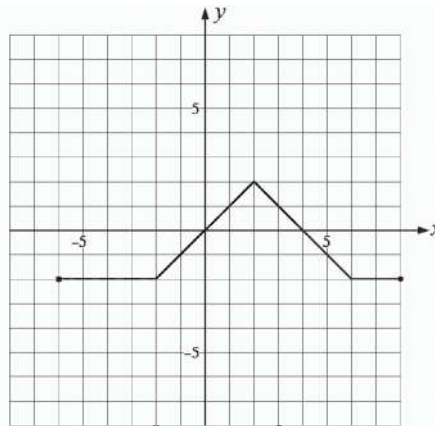
12. The graph of $y = f(x)$ is shown.

Which of the following graphs represents $y = -2f(x)$?
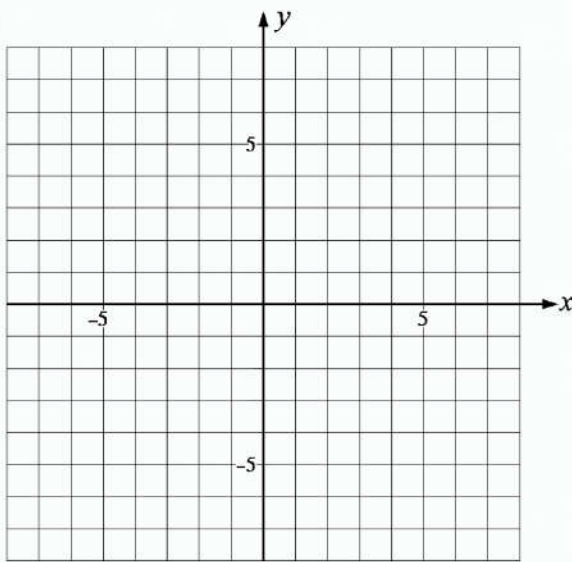
13. The graph of $y = f(x)$ is shown.

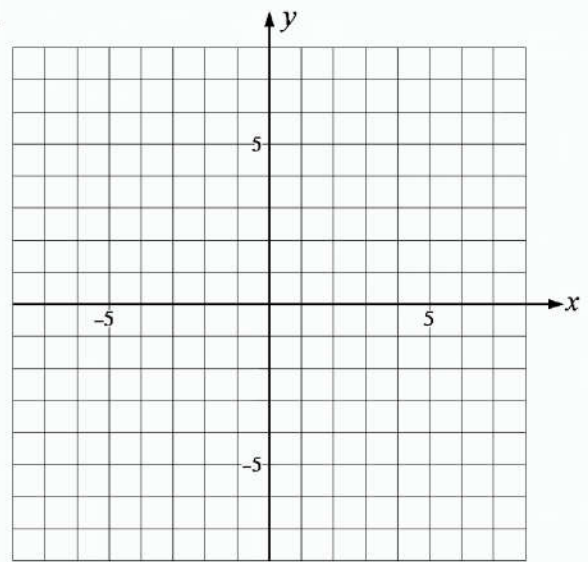On the grids provided, sketch the graphs of:

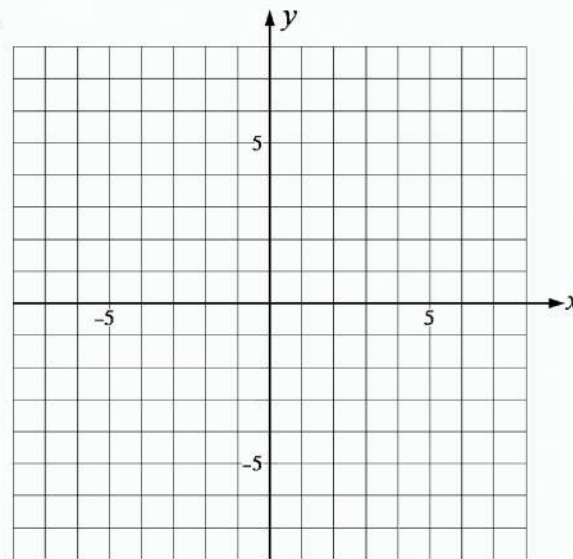A. $y = f(x + 2) - 3$ B. $y = f(2x)$ C. $y = |f(2x)|$

A.

B.

C.

14. Which equation represents the graph of $y = x^3 + x^2$ after it is reflected in the y-axis?

    A. $y = -x^3 + x^2$ B. $y = -x^3 - x^2$ C. $y = \dfrac{1}{x^3 + x^2}$ D. $y = y^3 + y^2$

APR 2002

15. Given the function $y = f(x)$, which of the following represents its reflection in the y-axis?

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

16. How is the graph of $y = \frac{1}{7}f(x)$ related to the graph of $y = f(x)$?

    A. $y = f(x)$ has been compressed vertically by a factor of 7
    B. $y = f(x)$ has been compressed horizontally by a factor of 7
    C. $y = f(x)$ has been expanded vertically by a factor of 7
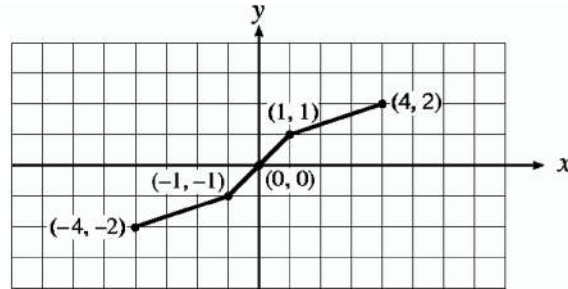   D. $y = f(x)$ has been expanded horizontally by a factor of 7

17. Given $f(x) = x^3 - 27$, determine $f^{-1}(x)$, the inverse of $f(x)$.

    A. $f^{-1}(x) = \sqrt[3]{x + 27}$ B. $f^{-1}(x) = \sqrt[3]{x - 27}$ C. $f^{-1}(x) = \sqrt[3]{x} + 3$ D. $f^{-1}(x) = x^3 + 27$
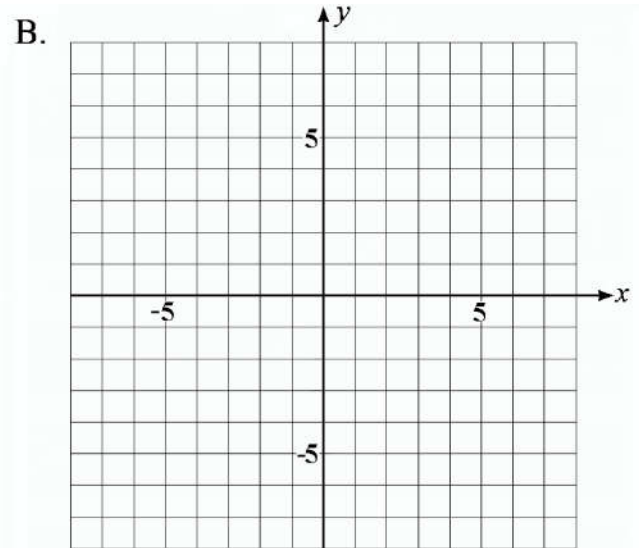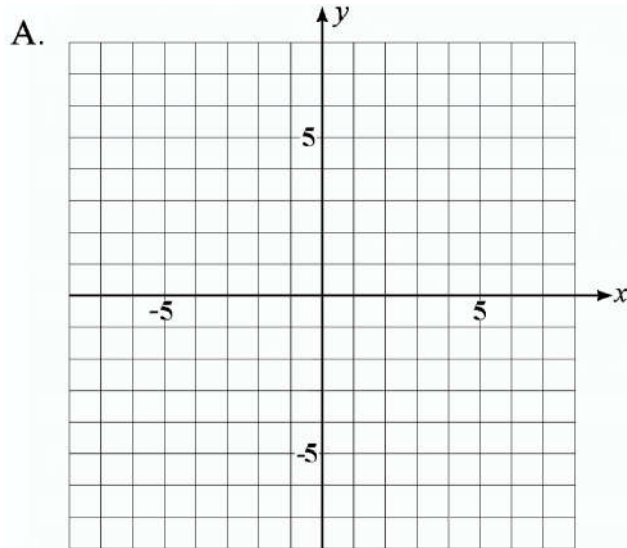
18. If $(4, -3)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = f(2x + 10)$?

    A. $(-8, -3)$ B. $(-3, -3)$ C. $(3, -3)$ D. $(18, -3)$
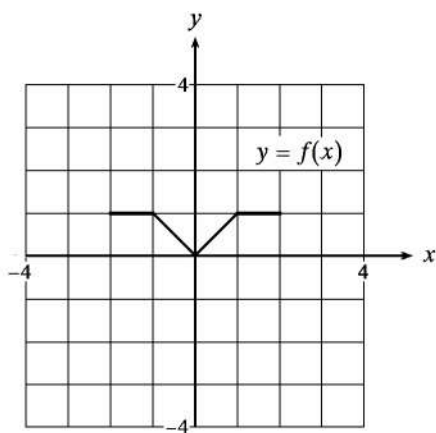
19. The graph of the function $y = f(x)$ is shown below.

Sketch the graphs of: A. $y = 3f(x - 2)$ B. $y = -f\left(\dfrac{x}{2}\right)$
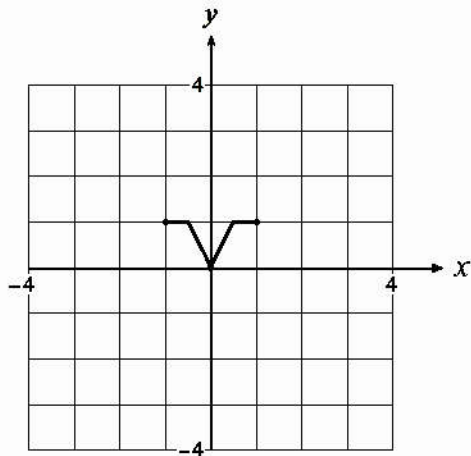
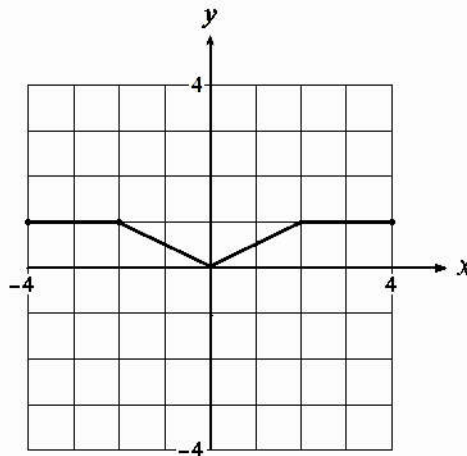A.

B.

JUNE 2002

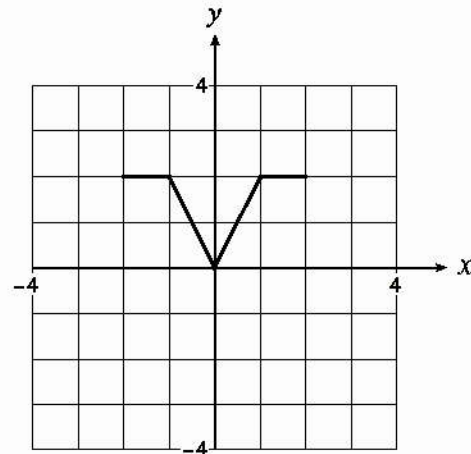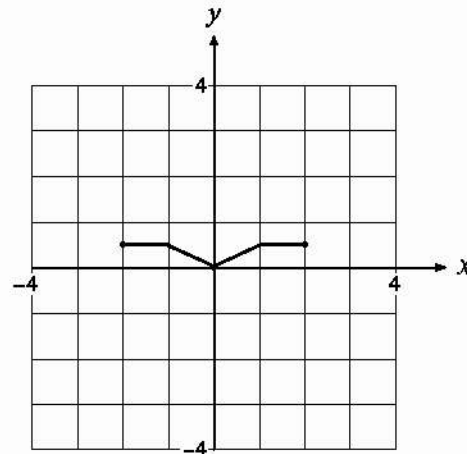20. Given the graph of $y = f(x)$, select the graph of $y = \frac{1}{2}f(x)$.

A.

B.

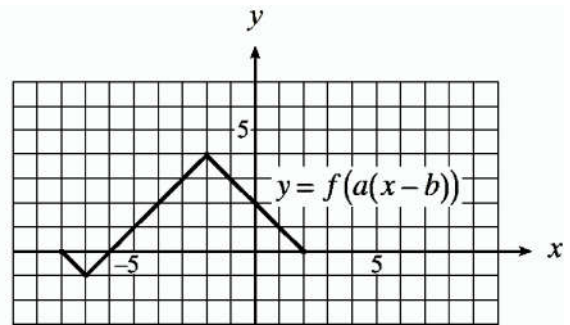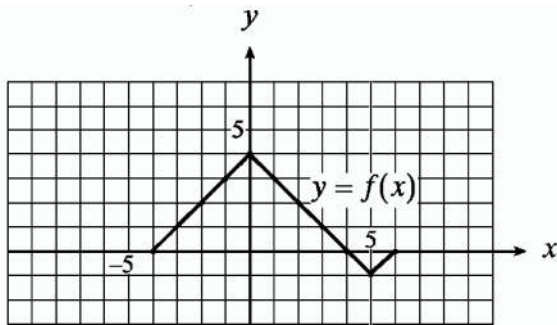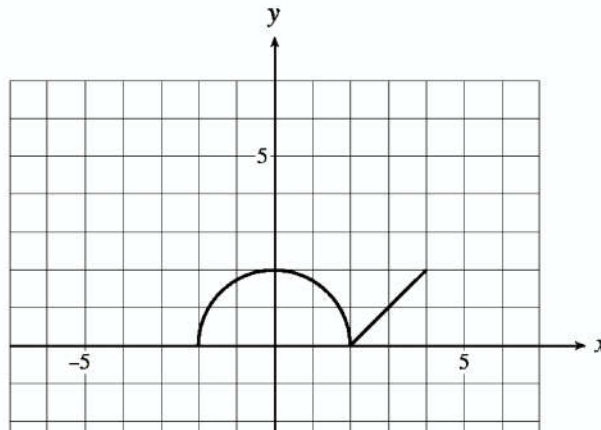C.

D.

21. Two functions are graphed below, $y = f(x)$ and $y = f(a(x - b))$. Determine the values of a and b.
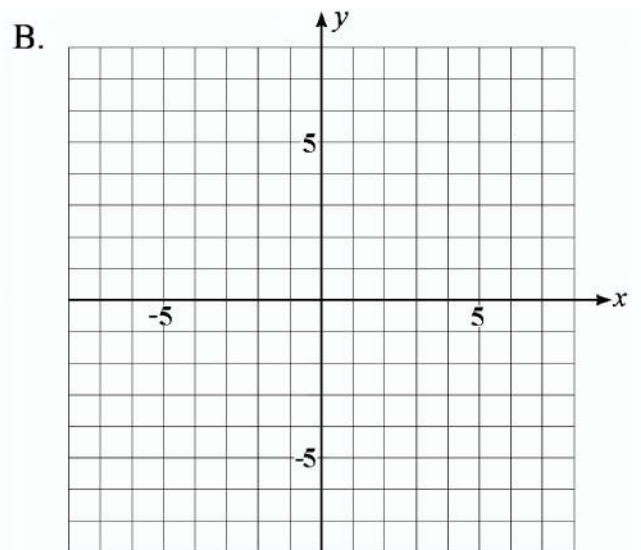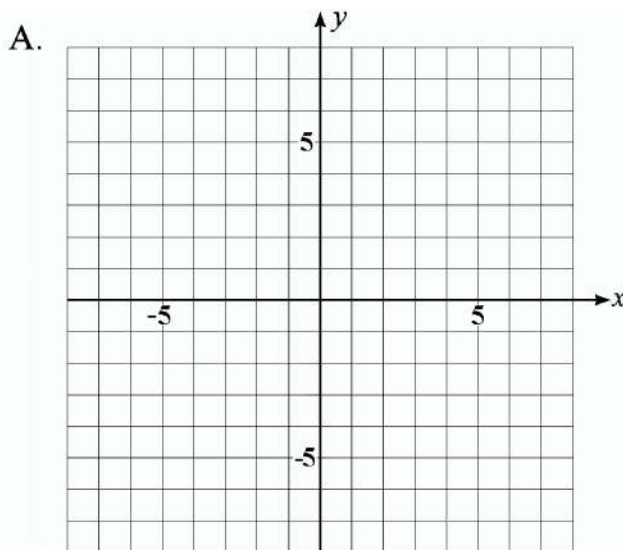

A. $a = -1, b = -2$ B. $a = -1, b = 2$ C. $a = 1, b = -2$ D. $a = 1, b = 2$

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

On the grids provided, sketch the graphs of: A. $y = 2f(x + 3) - 1$ B. $y = f^{-1}(x)$

A.

B.

AUG 2002

23. How is the graph of $y = \sqrt{x-3} + 1$ related to the graph of $y = \sqrt{x}$?

    A. $y = \sqrt{x}$ has been translated 3 units right and 1 unit up.

    B. $y = \sqrt{x}$ has been translated 3 units right and 1 unit down.

    C. $y = \sqrt{x}$ has been translated 3 units left and 1 unit up.

    D. $y = \sqrt{x}$ has been translated 3 units left and 1 unit down.

24. Given $f(x) = 3x + 2$, determine $f^{-1}(x)$, the inverse of $f(x)$.

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

25. Which equation represents a reflection of the graph of $5 - x = 2y^2 + y$ in the y-axis?

    A. $5 + x = 2y^2 + y$ B. $5 - x = 2y^2 - y$ C. $5 + y = 2x^2 + x$ D. $-5 - x = 2y^2 + y$

26. In the point $(-3, -6)$ is on the graph of $y = f(x)$, determine a point on the graph of $y = 3|f(x)| + 1$.

    A. $(3, 3)$ B. $(3, 19)$ C. $(-3, 3)$ D. $(-3, 19)$

27. Which equation represents the graph of $y = f(x)$ after it is compressed horizontally by a factor of 2 and then translated 4 units right?

    A. $y = f(2x - 8)$ B. $y = f(2x - 4)$ C. $y = f\left(\frac{x-4}{2}\right)$ D. $y = f\left(\frac{x}{2} - 4\right)$

JAN 2003

28. 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 to the left.

    D. $y = f(x)$ has been translated 3 units to the right.

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

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

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

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

31. If $(8, -6)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = -f(2x) + 3$?
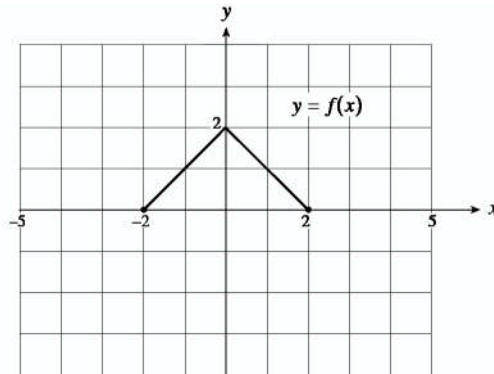
    A. $(-16, -3)$ B. $(-4, -3)$ C. $(4, 9)$ D. $(16, 9)$

32. The graph of $y = f(x)$ is shown below on the left. Which equation represents the graph shown on the right?
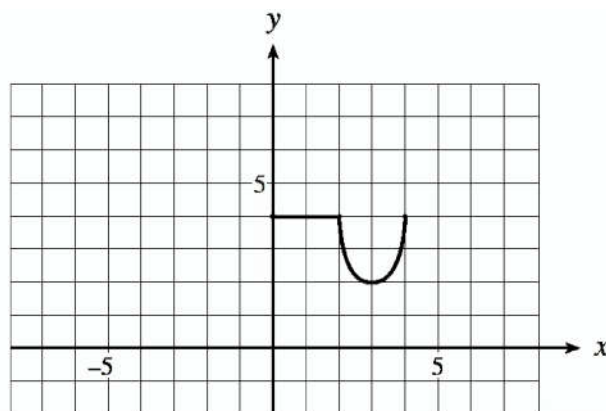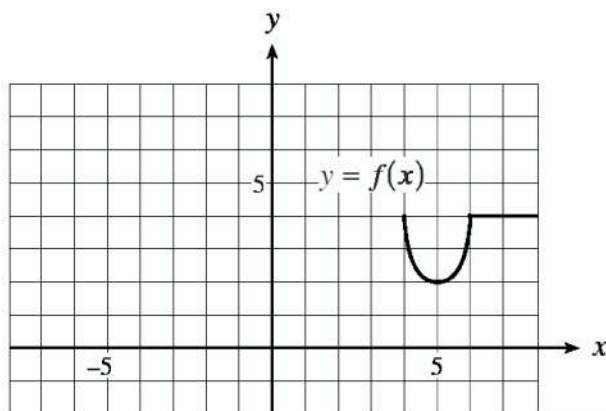
    A. $y = f(-(x+8))$ B. $y = f(-(x-8))$ C. $y = -f(x-8)$ D. $y = -f(x+8)$
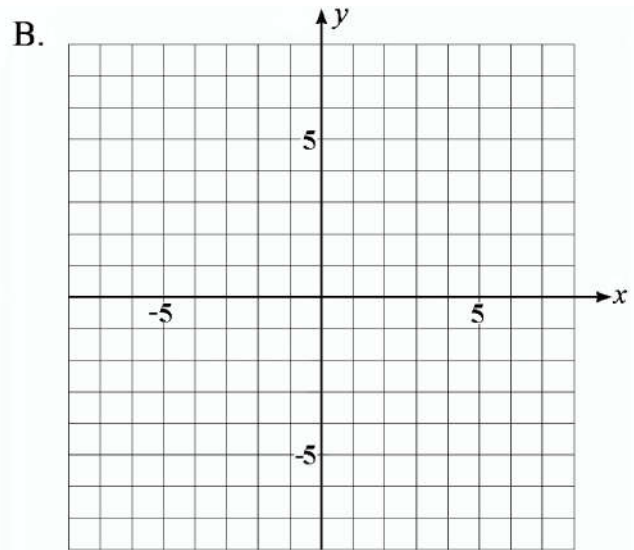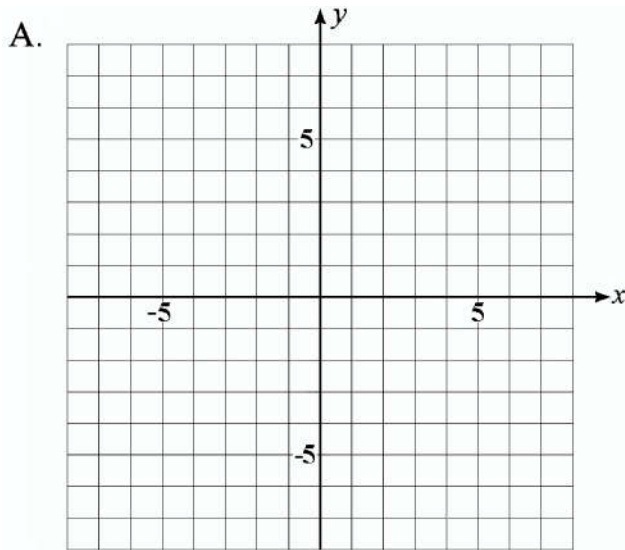
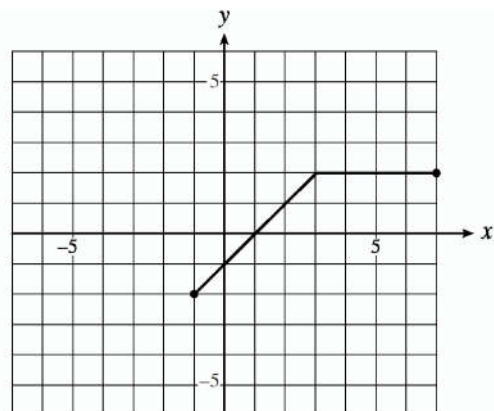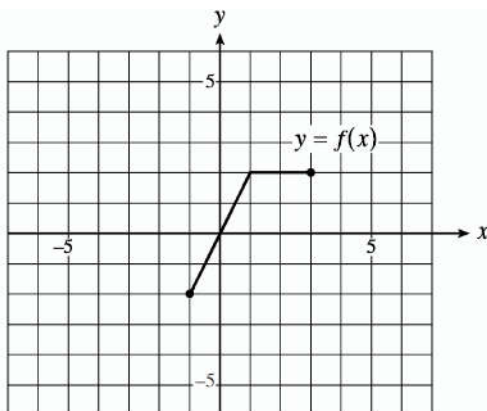33. The graph of $y = f(x)$ is shown.

Sketch the graphs of

A. $y = 2f(x + 3)$ B. $y = \dfrac{1}{f(x)}$

A.

B.

JUNE 2003

34. The function $y = f(x)$ is graphed to the left below. Determine the equation of the function shown to the right.
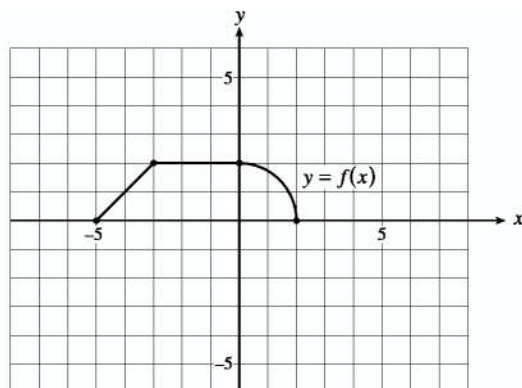
A. $y = f(2(x - 1))$ B. $y = f\left(\dfrac{1}{2}(x - 1)\right)$ C. $y = 2f(x - 1)$ D. $y = \dfrac{1}{2}(x - 1)$

35. If the point (a, b) is on the graph of $y = f(x)$, which point must be on the graph of $y = \dfrac{1}{f(x-2)}$? ($a \doteq 0$, $b \doteq 0$)
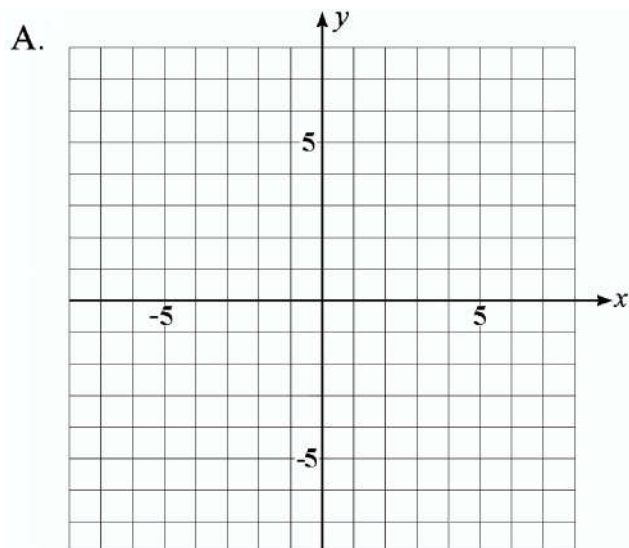
A. $\left(a-2, \dfrac{1}{b}\right)$ 　　　 B. $\left(a+2, \dfrac{1}{b}\right)$ 　　　 C. $\left(\dfrac{1}{a}, b\right)$ 　　　 D. $(a+2, b)$

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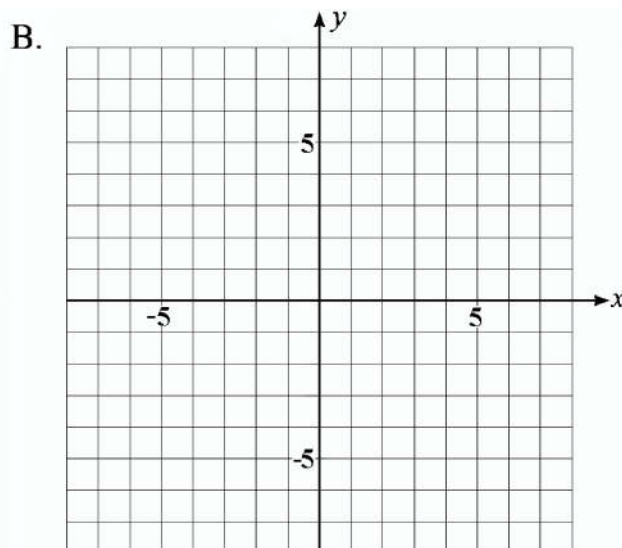

Sketch the graphs of
A. $y = 2f(x) - 3$ 　　　　　　　　　　　　　　　　B. $y = f^{-1}(x)$
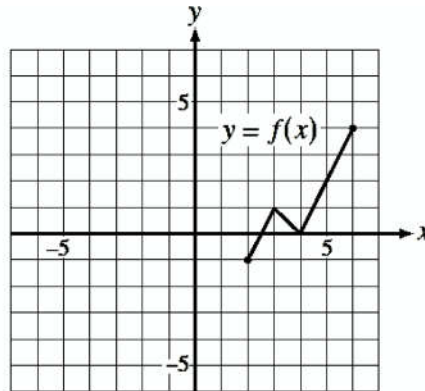
A.

B.

JAN 2004

37. Which equation represents the graph of $y = g(x)$ after it is translated 5 units up?
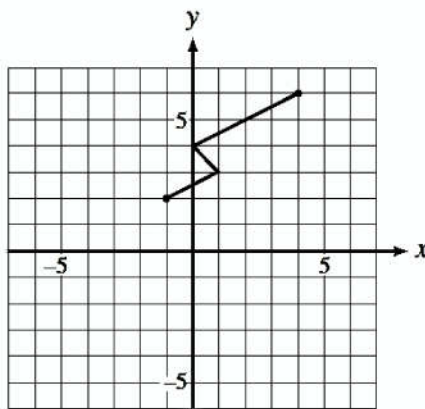
A. $y = g(x) + 5$ 　　　 B. $y = g(x) - 5$ 　　　 C. $y = g(x + 5)$ 　　　 D. $y = g(x - 5)$

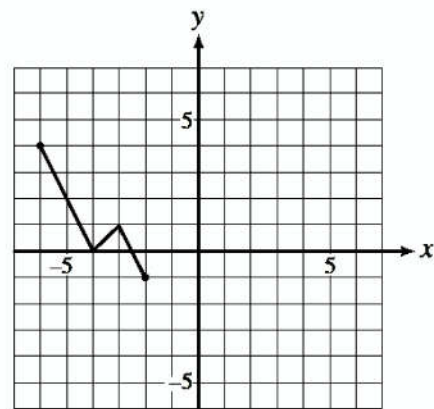38. The graph of $y = f(x)$ is shown below.

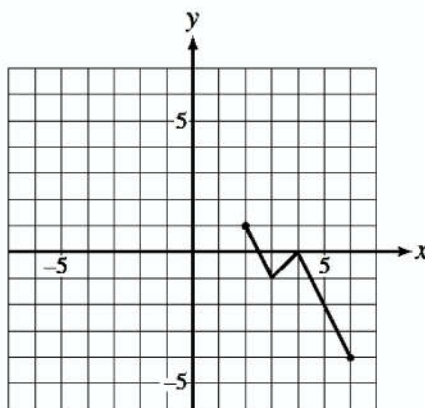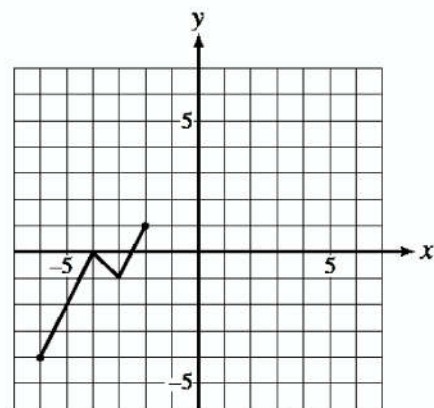Which graph represents $x = f(y)$?

A.

B.

C.

D.

39. If the point $(4, 6)$ is on the graph of $y = f(x)$, what point must be on the graph of
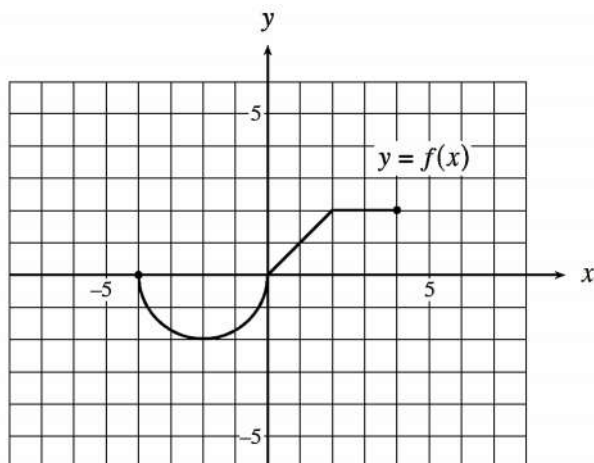$y = 3\left(\dfrac{1}{f(x)}\right)$?

A. $\left(12, \dfrac{1}{6}\right)$ B. $\left(4, \dfrac{1}{18}\right)$ C. $\left(4, \dfrac{1}{2}\right)$ D. $(2, 18)$
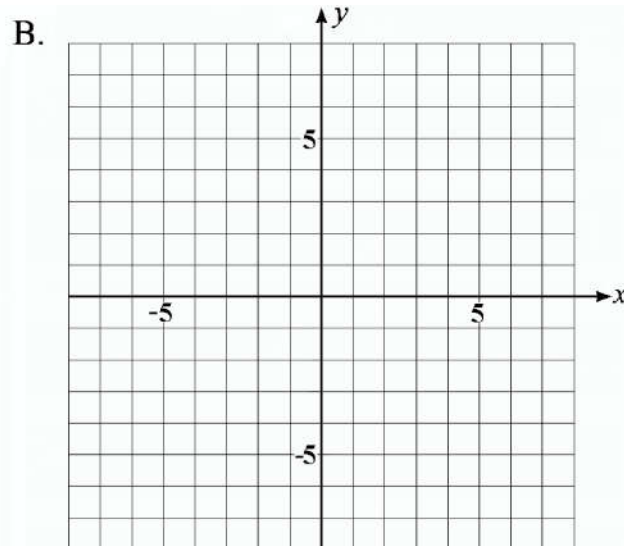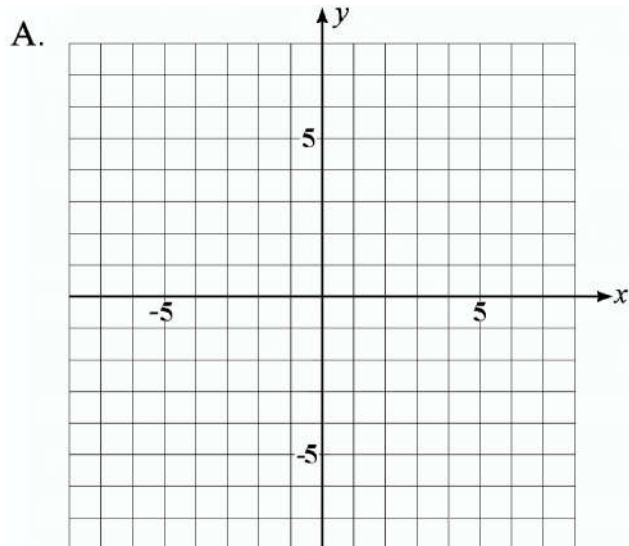
40. The graph of $y = f(x)$ is shown below. Sketch the graphs of:

A. $y = -2f(x+3)$ B. $y = \left| f\left(\dfrac{x}{2}\right) \right|$

A.

B.

JUNE 2004

41. Which equation represents the graph of $y = \tan x$ after it has been translated 4 units up and 7 units left?

   A. $y = \tan(x+7)+4$ B. $y = \tan(x+7)-4$ C. $y = \tan(x-7)+4$ D. $y = \tan(x-7)-4$

42. The point $(9, -12)$ is on the graph of a function. What will the coordinates of this point be after all of the following transformations are performed on the function, in the order given?
   - horizontal expansion by a factor of 3
   - reflection in the x-axis
   - vertical translation of 5 downward
   - reflection in the line $y = x$

   A. $(-27, 7)$ B. $(-17, -27)$ C. $(7, 3)$ D. $(7, 27)$