TRANSFORMATIONS

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. What is the inverse of the relation $y = x^3$?

   A. $y = \frac{1}{x^3}$

   B. $x = y^3$

   C. $y = (-x)^3$

   D. $x = y^{\frac{1}{3}}$

3. What happens to the graph of $y = x^2$ if the equation is changed to $y = x^2 - 2$?

   A. The graph is translated 2 units to the right.
   B. The graph is translated 2 units to the left.
   C. The graph is translated 2 units up.
   D. The graph is translated 2 units down.

4. 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 $\frac{1}{5}$.

   D. $y = \sqrt{x}$ has been compressed horizontally by a factor of $\frac{1}{5}$.

5. The graph of $y = -f(x)$ is a reflection of the graph of $y = f(x)$ in

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

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

   A. x

   B. $-x$

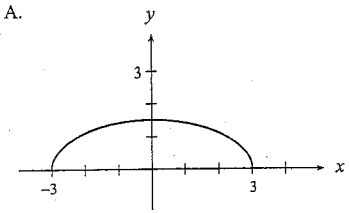
   C. $\frac{1}{x}$

   D. $-\frac{1}{x}$

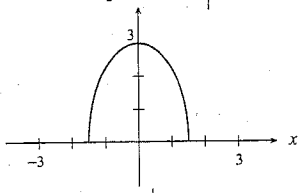
7. The graph of $y = \sqrt{9 - x^2}$ is shown below.

Which of the following graphs represents $2y = \sqrt{9 - x^2}$?

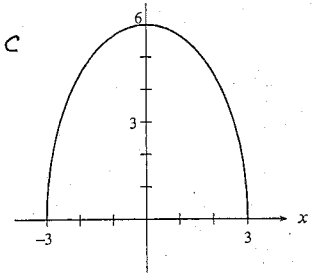
A.



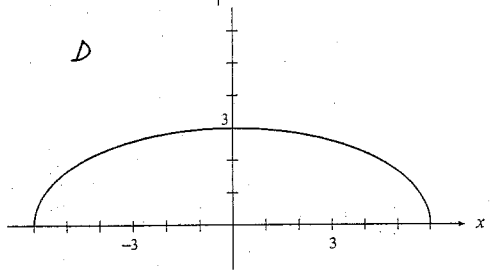
B.



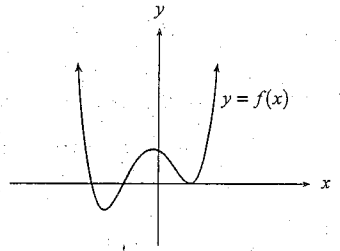
C



D

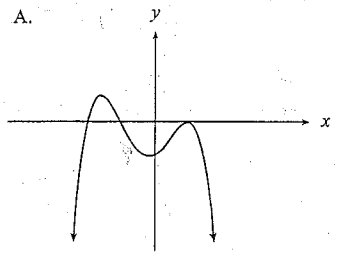


8. The graph of the function $y = f(x)$ is shown

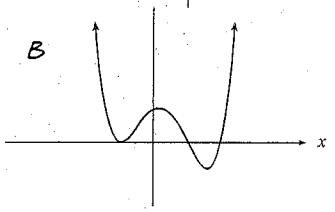


Which of the following is a graph of $y = |f(x)|$?

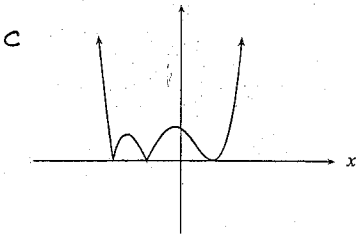
A.



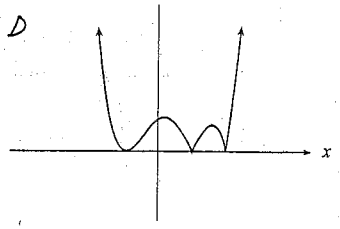
B



C



D



9. 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. $f^{-1}(x) = \sqrt[3]{x-2} - 1$

10. In the diagram below, $f(x)$ is graphed as a solid line.

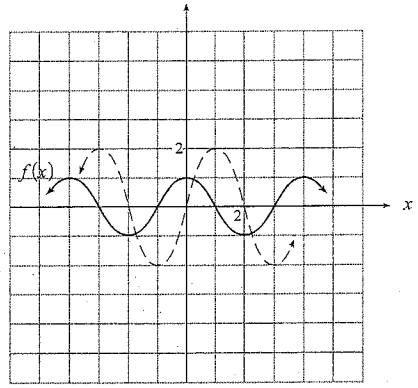
Which equation is defined by the broken line?

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

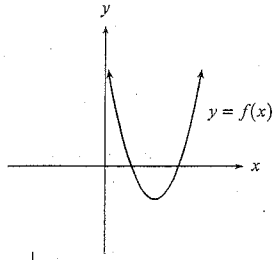
B. $y = f(2x-1)$

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

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

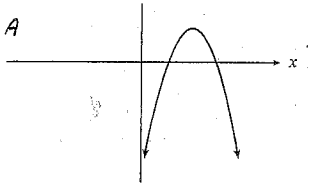


11. The graph of the function $y = f(x)$ is shown

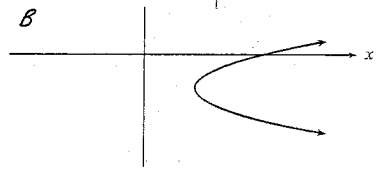


Which of the following is a graph of $y = \frac{1}{f(x)}$?

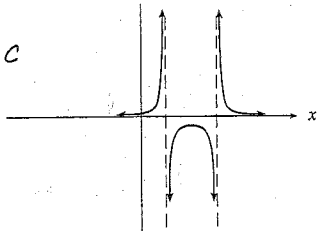
A



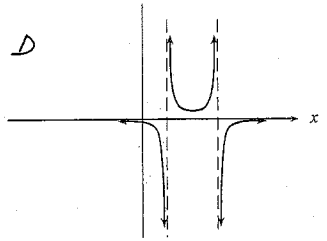
B



C



D



12. 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.

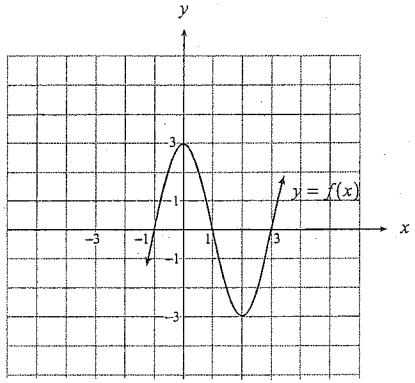
A. horizontal expansion by a factor of 2, then a translation of 4 units left.

B. horizontal compression by a factor of $\frac{1}{2}$, then a translation of 4 units left.

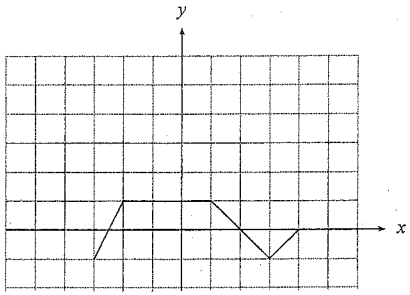
C. horizontal expansion by a factor of 2, then a translation of 2 units left.

D. horizontal compression by a factor of $\frac{1}{2}$, then a translation of 2 units left.

13. The graph of $y = f(x)$ is shown below. On the grid provided, sketch the graph of $y = -f\left(\frac{1}{2}(x+2)\right)$. Give coordinates for three points on your graph.



14. Given the graph of $f(x)$ below, sketch $g(x) = 3|f(x)| - 2$.



15. For the function $f(x) = \frac{1}{x+3}$:

a) determine the equation that defines the inverse function, $f^{-1}(x)$.

b) sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the grid provided.

SAMPLE 2001

16. What is the inverse of the relation $y = (x+1)^3$?

A. $y = \frac{1}{(x+1)^3}$

B. $y = -(x+1)^3$

C. $x = \sqrt[3]{y+1}$

D. $x = (y+1)^3$

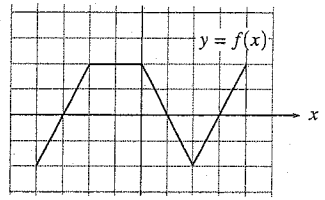
17. If the zeros of the function $y = f(x)$ are -2 and 3, determine the equations of the vertical asymptotes of the function $y = \frac{1}{f(x)}$.

A. $x = -2,\ x = 3$
B. $x = 2,\ x = -3$
C. $y = -2,\ y = 3$
D. $y = 2,\ y = -3$

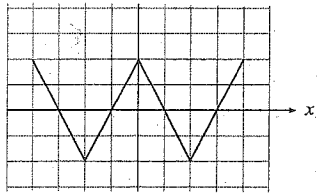
18. If $(6, -5)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = -f(2(x+2)) - 3$?

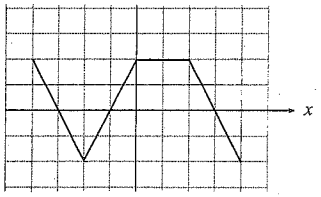
A. $(-1, 2)$
B. $(1, -2)$
C. $(1, 2)$
D. $(10, 2)$

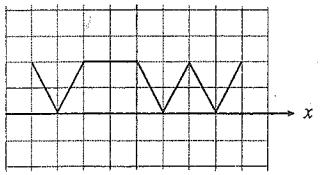
19. The graph of the function $y = f(x)$ is shown

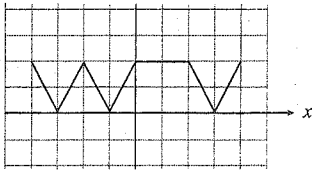


Which of the following is the graph of $y = |f(x)|$?

A


B


C


D


20. 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.

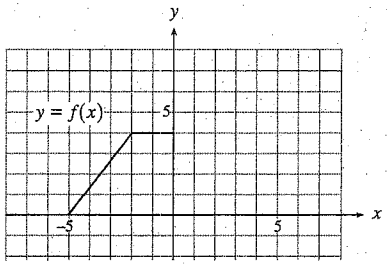
A. The graph of y_1 has been vertically compressed by a factor of $\frac{1}{4}$ then translated 2 units right to form the graph of y_2.

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 $\frac{1}{4}$ 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.

21. Given the graph of the function $y = f(x)$ below, sketch the graph of each relation on the grids provided.



a) $y = f(-x)$

b) $y = f(x-3)$

c) $y = 2f(x)$

d) $x = f(y)$

JAN 2002

22. 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. $y = \sqrt{x} + 4$

23. If $f(x) = 5x - 1$, determine the equation of $f^{-1}(x)$, the inverse of $f(x)$.

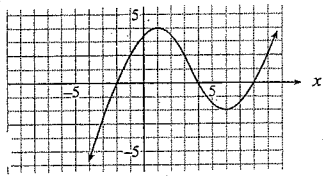
A. $f^{-1}(x) = \frac{1}{5x-1}$

B. $f^{-1}(x) = \frac{1}{5}x - 1$

C. $f^{-1}(x) = \frac{x+1}{5}$

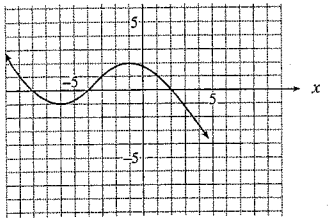
D. $f^{-1}(x) = \frac{x-1}{5}$

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

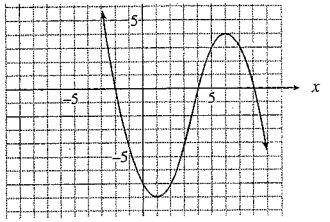


Which of the following graphs represents $y = -2f(x)$?

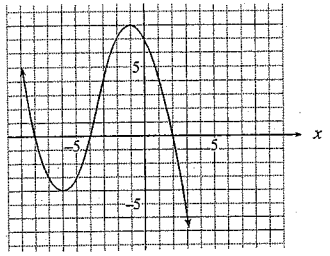
A



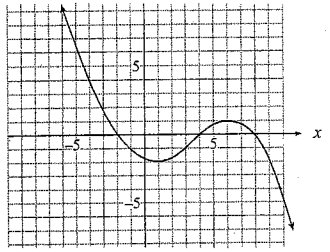
B



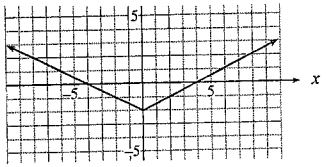
C



D

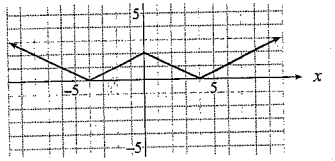


25. The graph of $y = f(x)$ is shown

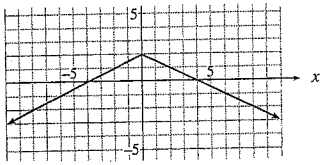


Which of the following graphs represents $y = \frac{1}{f(x)}$?

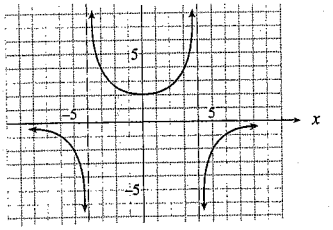
A



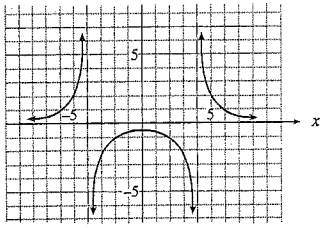
B



C



D



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

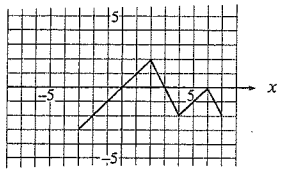
A. $y = -x^3 + x^2$

B. $y = -x^3 - x^2$

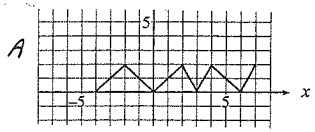
C. $y = \frac{1}{x^3 + x^2}$

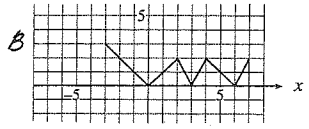
D. $x = y^3 + y^2$

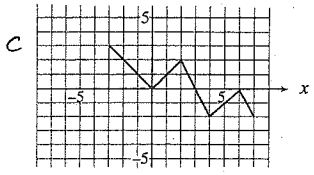
27. The graph of Math Mountain, $y = m(x)$ is shown

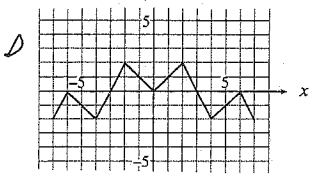


Which of the following graphs represents $y = m(|x|)$?

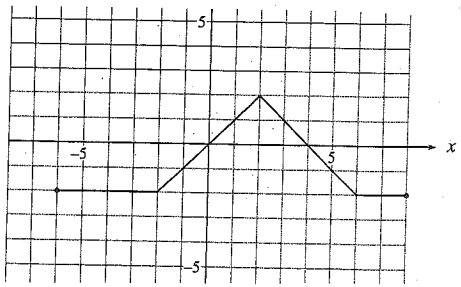








28. The graph of $y = f(x)$ is shown



On the grids provided, sketch the graphs of:

a) $y = f(x+2) - 3$

b) $y = f(2x)$

c) $y = |f(2x)|$

APR 2002

29. 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. $x = f(y)$

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

30. 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 $\frac{1}{7}$.

B. $y = f(x)$ has been compressed horizontally by a factor of $\frac{1}{7}$.

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.

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

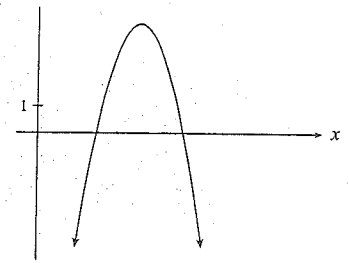
A. $f^{-1}(x) = \sqrt[3]{x+27}$

B. $f^{-1}(x) = \sqrt[3]{x-27}$

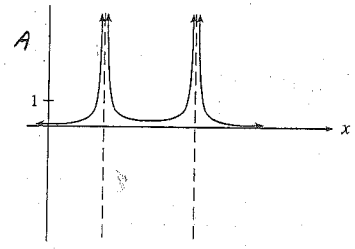
C. $f^{-1}(x) = \sqrt[3]{x} + 3$

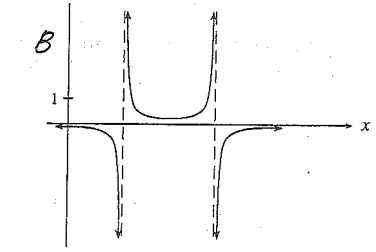
D. $f^{-1}(x) = x^3 + 27$

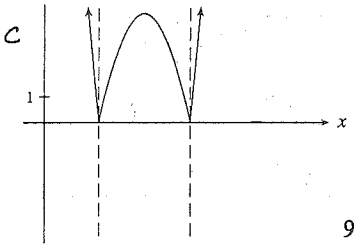
32. The graph of the function $y = f(x)$ is shown below.

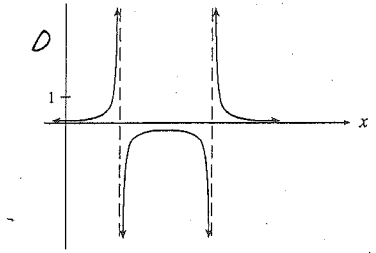


Which of the following is a graph of $y = \frac{1}{|f(x)|}$?





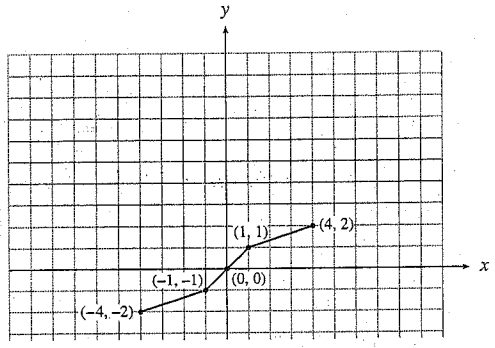




33. If $(4, -3)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = f(2x+10)$?

A. $(-8, -3)$
B. $(-3, -3)$
C. $(3, -3)$
D. $(18, -3)$

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

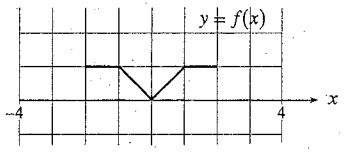


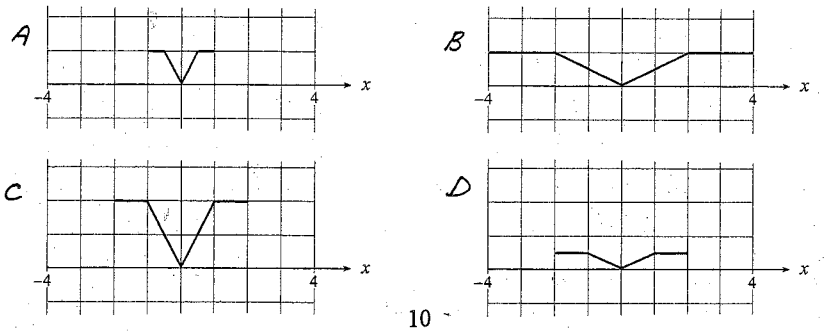
a) On the grid provided, sketch the graph of $y = 3f(x-2)$. **(2 marks)**

b) On the grid provided, sketch the graph of $y = -f\left(\frac{x}{2}\right)$. **(3 marks)**

JUN 2002

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

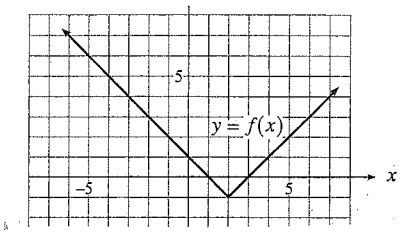


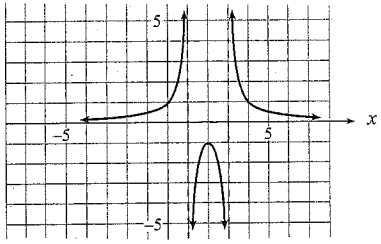


36. If (a, b) is a point on the graph of $y = f(x)$, determine a point on the graph of $y = f(x-2)+3$.

A. $(a-2, b+3)$
B. $(a-2, b-3)$
C. $(a+2, b+3)$
D. $(a+2, b-3)$

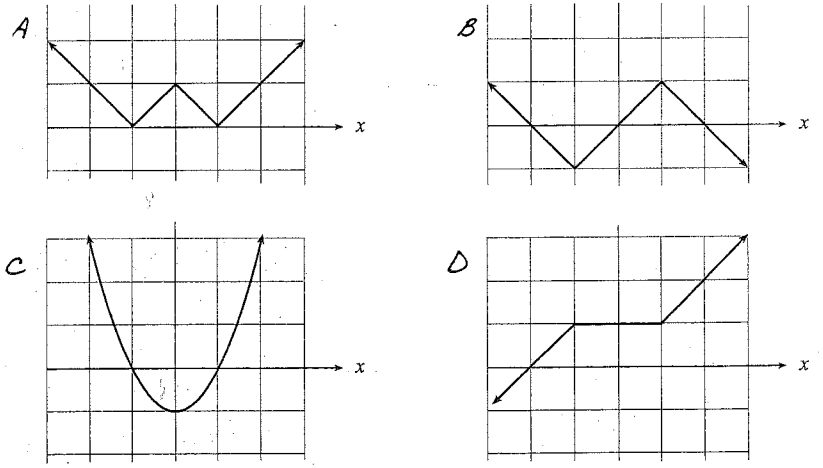
37. The graph of $y = f(x)$ is shown below on the left. Determine the equation of the function shown on the right.



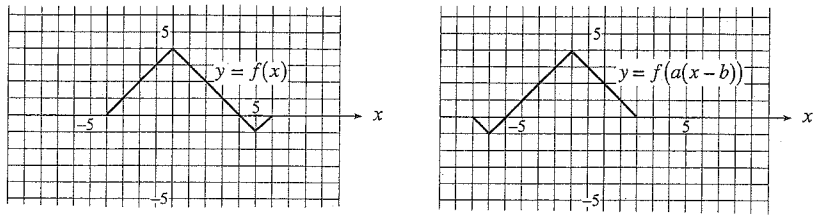


A. $y = |f(x)|$
B. $y = -f(x)$
C. $y = \frac{1}{f(x)}$
D. $y = f^{-1}(x)$

38. For which graph of $y = f(x)$ would $f(-x) = -f(x)$?

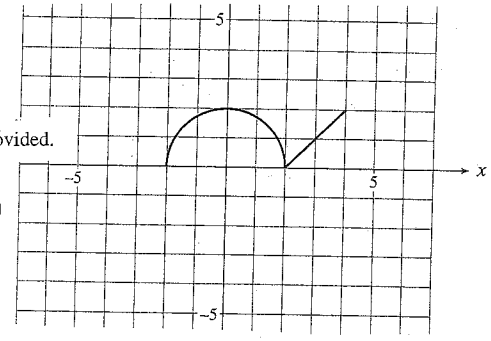


39. Two functions are graphed below, $y = f(x)$ and $y = f(a(x-b))$. Determine the values of a and b.



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

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



a) Graph $y = 2f(x+3) - 1$ on the grid provided.

b) Graph the inverse relation of $y = f(x)$.

AUG 2002

41. 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.

42. 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. $f^{-1}(x) = 2 - \frac{x}{3}$

43. 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. $-5 - x = 2y^2 + y$

44. If 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. $(-3,\ 19)$

45. Which equation represents the graph of $y = f(x)$ after it is compressed horizontally by a factor of $\frac{1}{2}$ and then translated 4 units right?

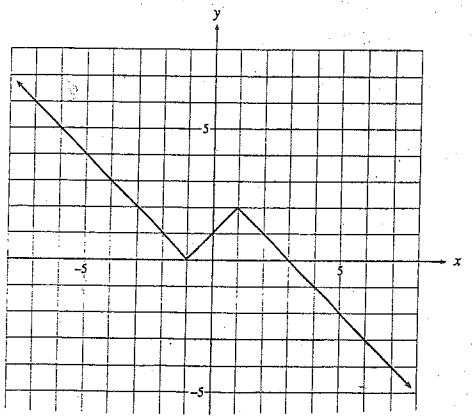
A. $y = f(2x - 8)$

B. $y = f(2x - 4)$

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

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

46. The graph of $y = f(x)$ is shown below. Sketch the graph of $y = \frac{1}{f(x)}$ directly on the same grid. Accurate location of key points is necessary for full marks. **(5 marks)**



JAN 2003

47. 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.

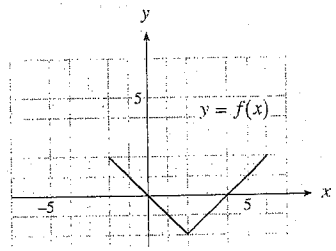
48. Which equation represents the graph of $y = f(x)$ after it is reflected in the line $y = x$?

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

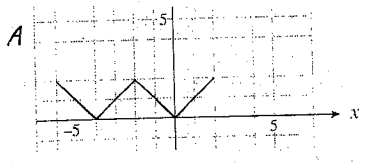
49. If the graph of the function $y = \sqrt{x}$ is horizontally expanded by a factor of 3 and then translated 2 units to the right, determine the equation of this new function.

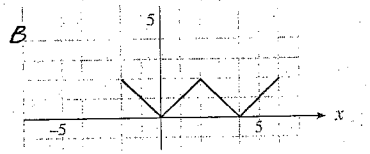
A. $y = \sqrt{3(x-2)}$
B. $y = \sqrt{\frac{1}{3}(x-2)}$
C. $y = \sqrt{3x-2}$
D. $y = \sqrt{\frac{1}{3}x-2}$

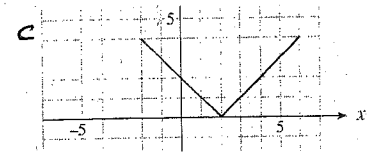
50. The graph of the function $y = f(x)$ is shown

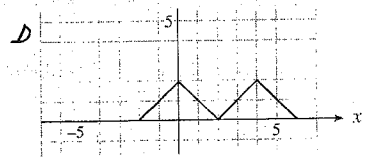


Which of the following is the graph of $y = |f(x)|$?





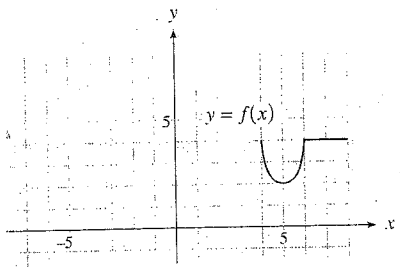


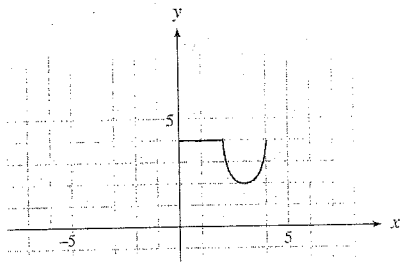


51. If $(8, -6)$ is a point on the graph of $y = f(x)$, what must be a point on the graph of $y = -f(2x)+3$?

A. $(-16, -3)$
B. $(-4, -3)$
C. $(4, 9)$
D. $(16, 9)$

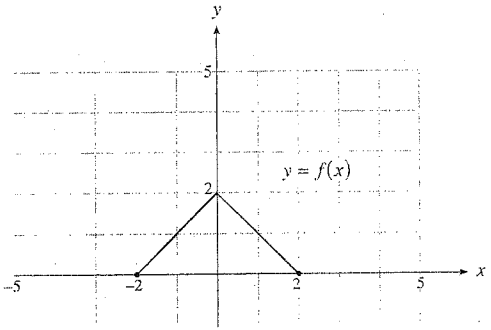
52. The graph of $y = f(x)$ is shown below on the left. Which equation represents the graph shown on the right?





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

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



a) On the grid provided, sketch the graph of $y = 2f(x+3)$.

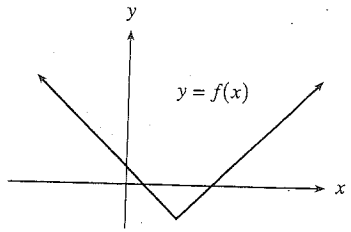
b) On the grid provided, sketch the graph of $y = \frac{1}{f(x)}$.

JUN 2003

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

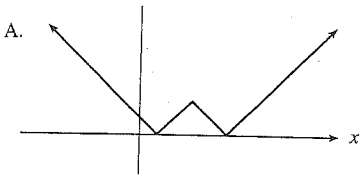
A. the y-axis
B. the x-axis
C. the line $y = x$
D. the line $y = -x$

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

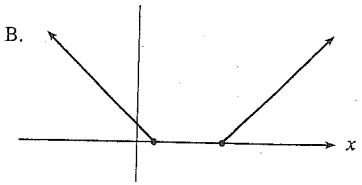


Which of the following is the graph of $y = |f(x)|$?

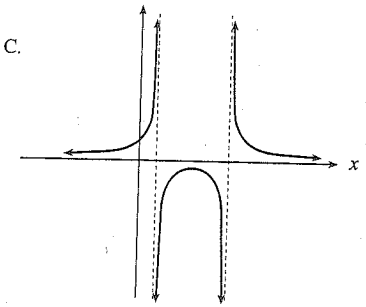
A.



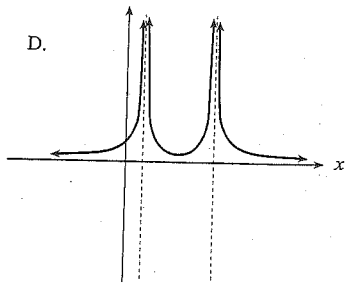
B.



C.



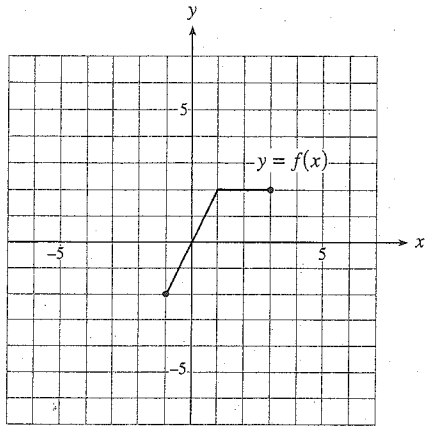
D.

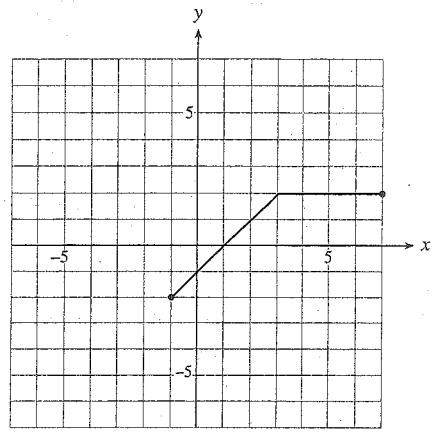


56. The point $(6, -12)$ is on the graph of the function $y = f(x)$. Which point must be on the graph of the function $y = 3f(-x)$?

A. $(-6, -36)$
B. $(6, 36)$
C. $(-6, -4)$
D. $(6, 4)$

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

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

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

58. If the point (a, b) is on the graph of $y = f(x)$, which point must be on the graph of $y = \frac{1}{f(x-2)}$? $(a \neq 0,\ b \neq 0)$

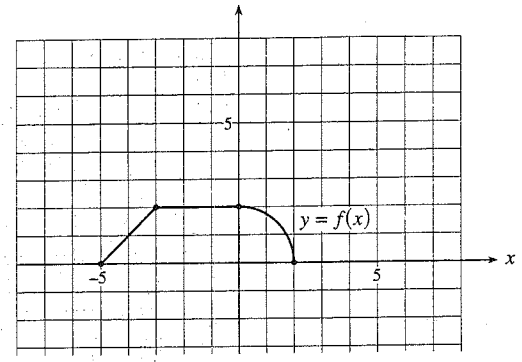
A. $\left(a-2, \frac{1}{b}\right)$

B. $\left(a+2, \frac{1}{b}\right)$

C. $\left(\frac{1}{a}, b\right)$

D. $(a+2, b)$

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

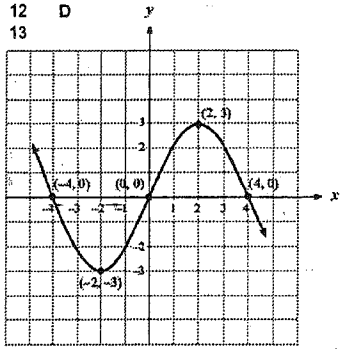


a) On the grid provided, sketch the graph of $y = 2f(x) - 3$.

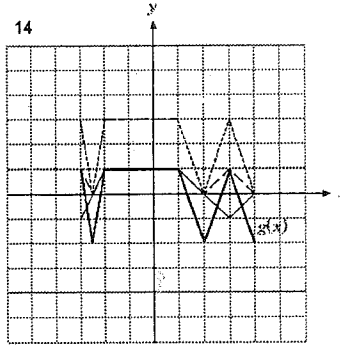
b) On the grid provided, sketch the inverse relation of $y = f(x)$.

TRANSFORMATIONS

1 D
2 B
3 D
4 C
5 B
6 A
7 A
8 C
9 B
10 D
11 C
12 D
13

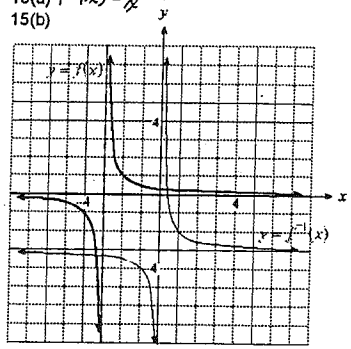


14

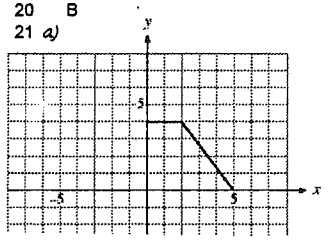


15(a) $f^{-1}(x) = \frac{1}{x} - 3$

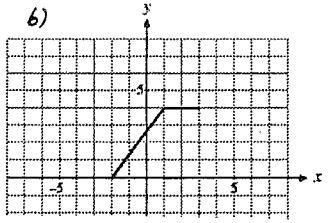
15(b)



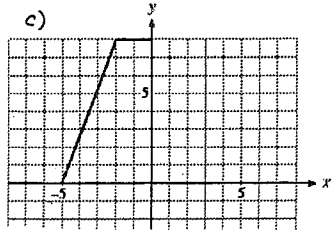
16 D
17 A
18 C
19 C
20 B
21 a)



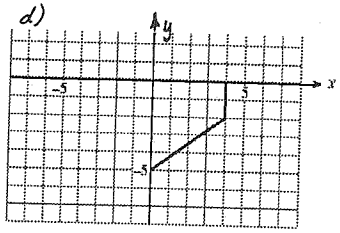
b)



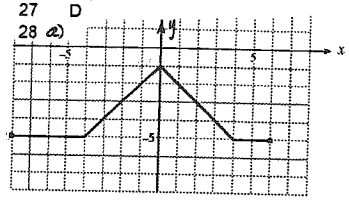
c)



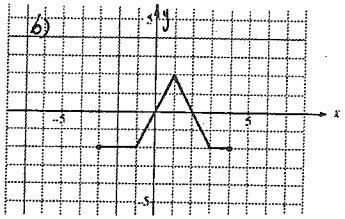
d)



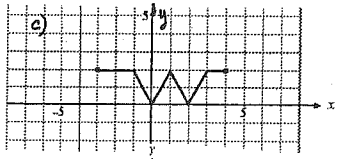
22 B
23 C
24 B
25 D
26 A
27 D
28 a)



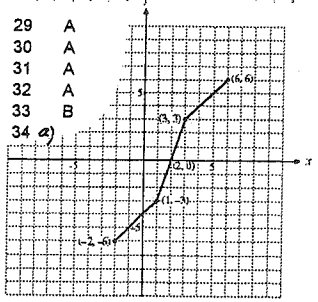
b)



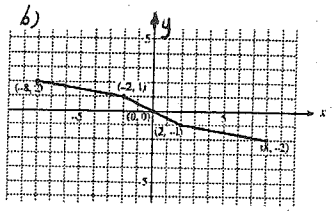
c)



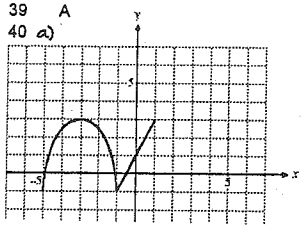
29 A
30 A
31 A
32 A
33 B
34 a)



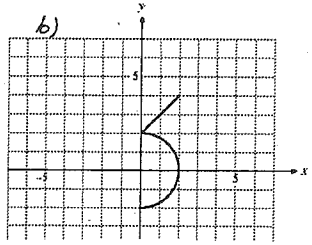
b)



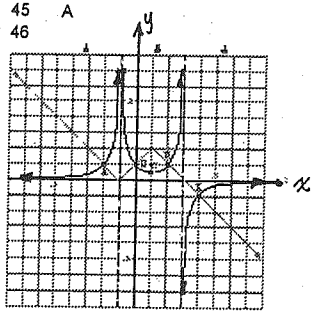
35 D
36 C
37 C
38 B
39 A
40 a)



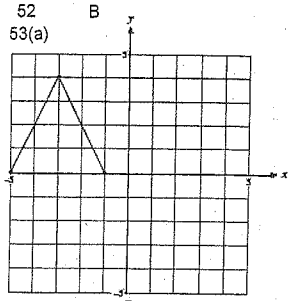
b)



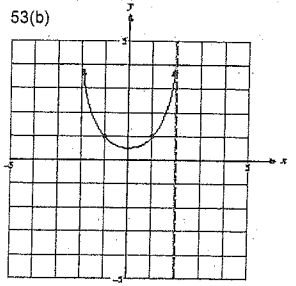
41 A
42 B
43 A
44 D
45 A
46



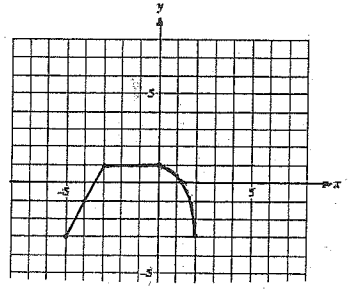
47 A
48 A
49 B
50 B
51 C
52 B
53(a)



53(b)



54 B
55 A
56 A
57 B
58 B
59(a)



59(b)