NAME: _____ BLOCK: ____ DATE: _____

PMATH 12 - MIDTERM - PRACTICE QUESTIONS

Multiple Choice

*CIRCLE the choice that **best** completes the statement or answers the question.*

1. Divide: $(-4x^2 + 22x + 12) \div (x - 6)$

   A. $4x + 6$ **B.** $4x - 48$ **C.** $-4x + 12$ **D.** $-4x - 2$

2. What is the remainder when $x^3 + 4 - 11x + 3x^2$ is divided by $6 + x$?

   A. 70 **B.** -62 **C.** -38 **D.** 46

3. Divide $-3x^3 - 2x^2 + 4x + 3$ by $x + 3$. Write the division statement.

   A. $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 - 11x + 25)$
   B. $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 - 11x + 25) - 48$
   C. $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 + 7x - 17)$
   D. $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 + 7x - 17) + 54$

4. For the polynomial $P(x) = -3x^2 - 4x - 5$, what is the value of $P(-2)$?

   A. -25 **B.** 15 **C.** -21 **D.** -9

5. Which two binomials are factors of $x^4 + 8x^3 + 7x^2 - 40x - 60$?

   A. $x + 2$ and $x - 6$ **B.** $x - 2$ and $x - 6$ **C.** $x - 2$ and $x + 6$ **D.** $x + 2$ and $x + 6$

6. Use graphing technology. Graph the polynomial function $f(x) = x^3 - 7x^2 + 11x - 5$.
   Which characteristics apply to the graph?

   A. Number of x-intercepts: 3
   Number of hills: 1
   Number of valleys: 1

   B. Number of x-intercepts: 2
   Number of hills: 2
   Number of valleys: 1

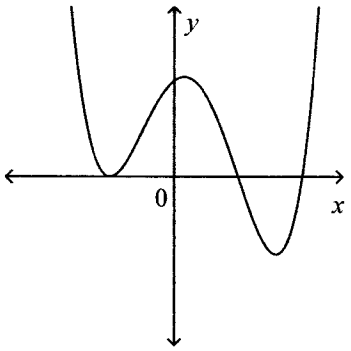
   C. Number of x-intercepts: 2
   Number of hills: 1
   Number of valleys: 1

   D. Number of x-intercepts: 1
   Number of hills: 1
   Number of valleys: 2

7. Determine the zeros of the polynomial function $f(x) = (x + 2)^4(x - 5)$. State the multiplicity of each zero.

   A. The zero 4 has multiplicity 2; the zero 1 has multiplicity -5.
   B. The zero 4 has multiplicity -2; the zero 1 has multiplicity 5.
   C. The zero -2 has multiplicity 4; the zero 5 has multiplicity 1.
   D. The zero 2 has multiplicity 4; the zero -5 has multiplicity 1.

8. The graph of a polynomial function of degree 4 is shown. Which statements are true?
   i) The function has an even degree.
   ii) The function has a zero of multiplicity 2.
   iii) The equation of the function has a negative leading coefficient.
   iv) The y-intercept is positive.



A. i, ii, iii **B.** i, iii, iv **C.** ii, iii, iv **D.** i, ii, iv

9. Use a graphing calculator to graph the function $V(x) = x^3 - 7x^2 + 10x$. Determine the coordinates of the local maximum point to the nearest tenth.

A. (0.9, 8.2) **B.** (3.8, 4.1) **C.** (3.8, 8.2) **D.** (0.9, 4.1)

10. Use graphing technology to solve: $\sqrt{3x-1} = -x+5$
Give the solution to the nearest tenth.

A. $x \doteq 10.5$ **B.** $x \doteq 10.8$ **C.** $x \doteq 2.2$ **D.** $x \doteq 2.5$

11. The graph of which function below has a hole?

A. $y = \dfrac{x+2}{x^2+2}$ **C.** $y = \dfrac{x^2}{x-4}$

B. $y = \dfrac{x^2-9}{x+3}$ **D.** $y = \dfrac{x^2-3}{x^2-2}$

12. The graph of which function below has a horizontal asymptote?

A. $y = \dfrac{x^2-7x+12}{x+7}$ **B.** $y = \dfrac{x^2-3}{x+7}$ **C.** $y = \dfrac{x^2+3}{x^2-2}$ **D.** $y = \dfrac{x^2}{x+3}$

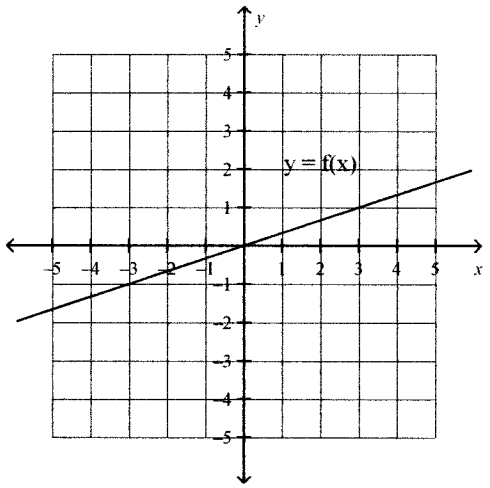
13. What is the equation of the vertical asymptote of the graph of this function?

$$y = \frac{x+4}{x^2+10x+25}$$

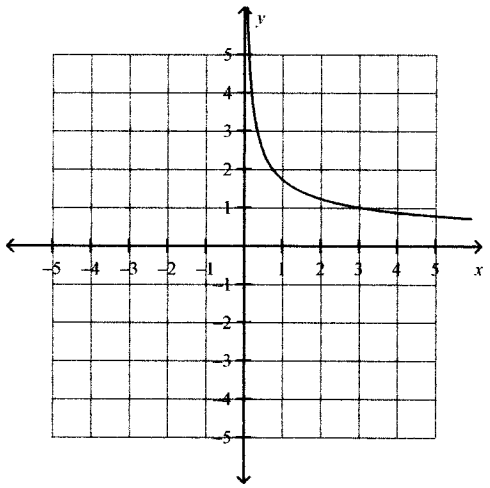
A. $x = -5$ **C.** $x = -4$

B. $x = 0$ **D.** The graph has no vertical asymptote.

14. For the graph of $y = f(x)$ shown below, which graph best represents $y = \sqrt{f(x)}$?



A.



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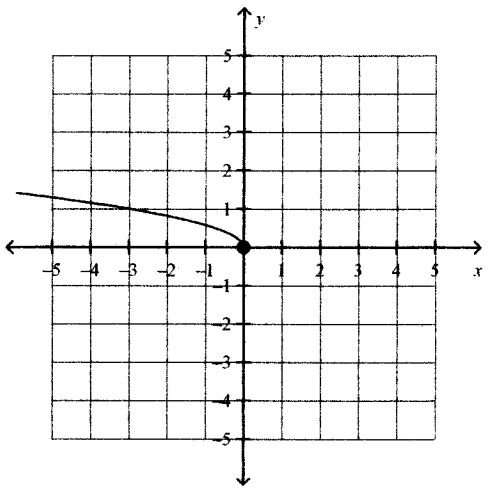
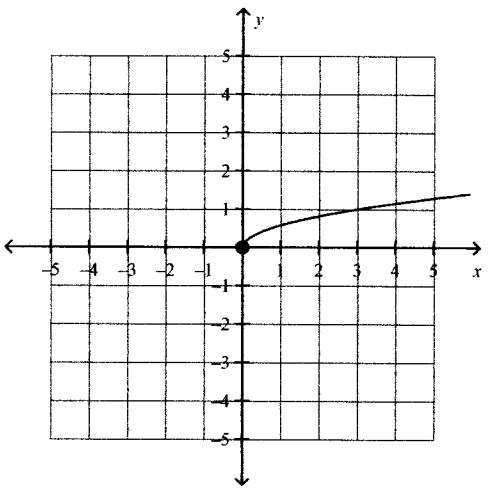
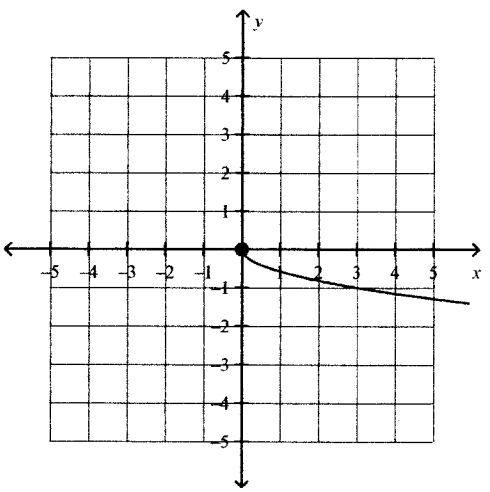


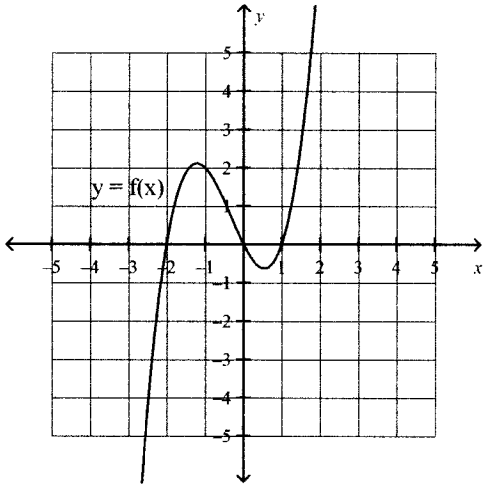
B.



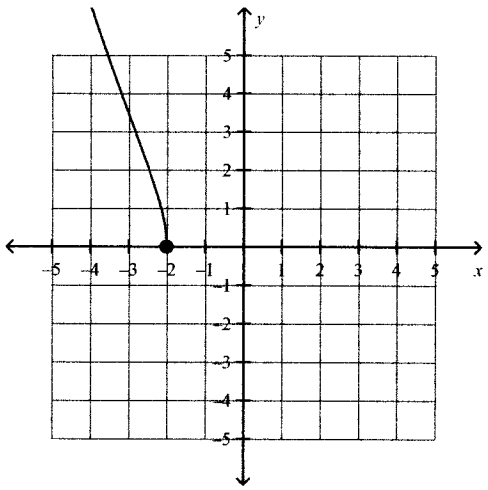
D.



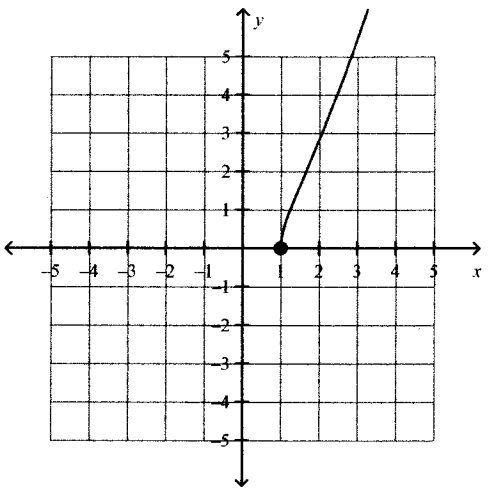
15. For the graph of $y = f(x)$ shown below, which graph best represents $y = \sqrt{f(x)}$?



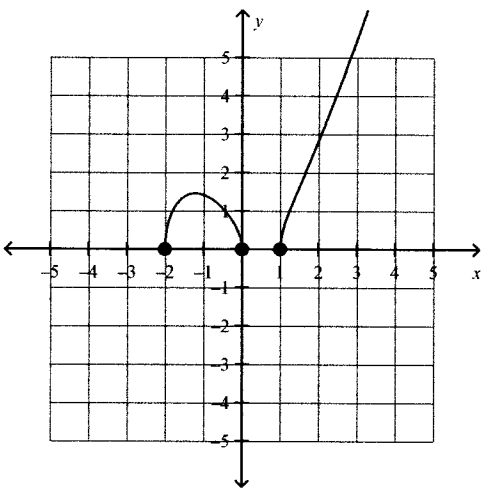
A.



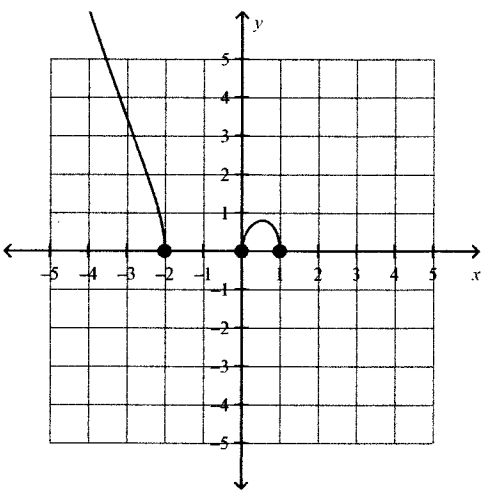
C.



B.

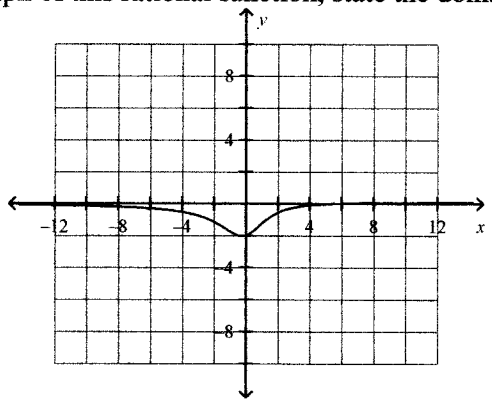


D.



16. For the graph of this rational function, state the domain and write the equations of any asymptotes.

$$y = \frac{x-6}{x^2+3}$$



A. domain: $x \in \mathbb{R}$;
horizontal asymptote: $y = 0$

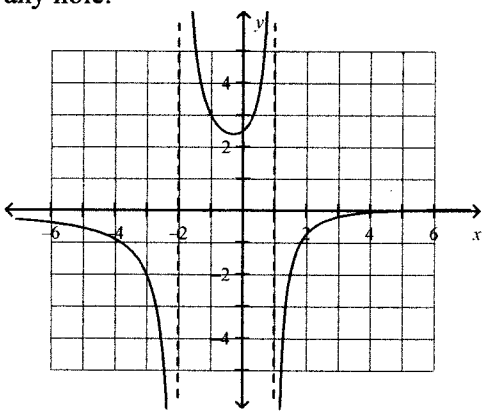
B. domain: $x \neq -3$;
horizontal asymptote: $y = 0$

C. domain: $x \neq 0$;
vertical asymptote: $x = 0$

D. domain: $x \in \mathbb{R}$;
no vertical or horizontal asymptotes

17. For the graph of this rational function, state the domain and write the equations of any asymptotes and the coordinates of any hole.

$$y = \frac{x-5}{x^2+x-2}$$



A. domain: $x \neq 1$ and $x \neq -2$;
vertical asymptotes: $x = 1, x = -2$;
horizontal asymptote: $y = 1$

B. domain: $x \neq 1$ and $x \neq -2$;
hole: $(-2,-7)$
vertical asymptote: $x = 1$;
horizontal asymptote: $y = 0$

C. domain: $x \neq 0$;
hole: $(0,-7)$
vertical asymptote: $x = 0$;
horizontal asymptote: $y = 0$

D. domain: $x \neq 1$ and $x \neq -2$;
vertical asymptotes: $x = 1, x = -2$;
horizontal asymptote: $y = 0$

18. For the graph of this rational function, identify the equations of any asymptotes and the coordinates of any hole

$$y = \frac{x^2 + 5x + 6}{x - 3}$$

A. The graph has a hole at $(3, 30)$.
B. The graph has a vertical asymptote at $x = 3$, and an oblique asymptote at $y = x - 3$.
C. The graph has a vertical asymptote at $x = 3$, and an oblique asymptote at $y = x + 8$.
D. The graph has a horizontal asymptote at $y = 0$.

19. What is the solution of this radical equation, to the nearest tenth if necessary?

$$\frac{4}{x - 1} = -8$$

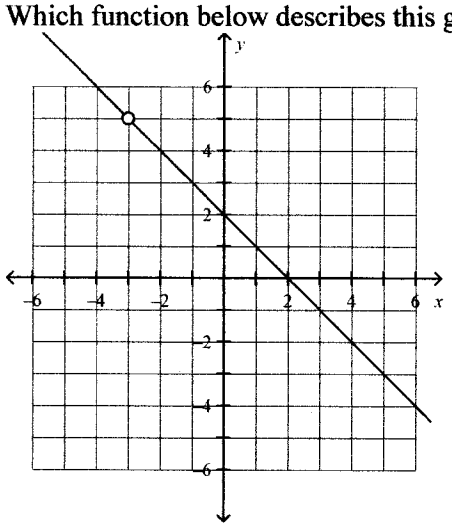
A. $x \doteq 1.5$
B. $x \doteq 0.5$
C. $x \doteq -1.5$
D. $x \doteq -0.5$

20. State the domain of this function.

$$y = \frac{x^2 + 7x + 10}{-2 - x}$$

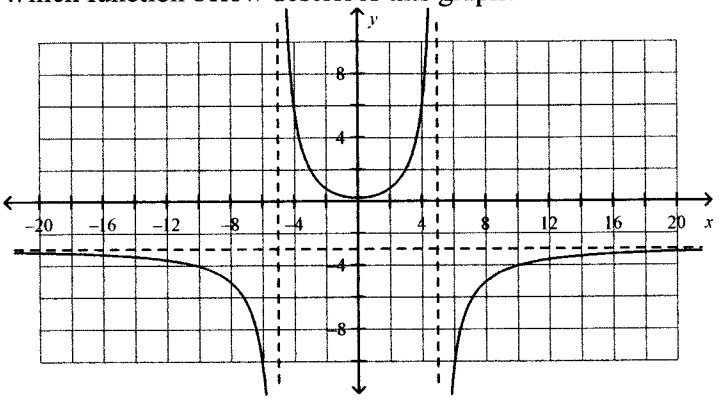
A. $x \neq \pm 2$
B. $x \neq -2$
C. $x \neq -2, x \neq -5$
D. $x \in \mathbb{R}$

21. Which function below describes this graph?



A. $y = \frac{-x^2 - x + 6}{x - 3}$
B. $y = \frac{-x^2 - x + 6}{x + 3}$
C. $y = \frac{-x^2 + 6x + 1}{x + 3}$
D. $y = \frac{x + 3}{-x^2 - x + 6}$

22. Which function below describes this graph?



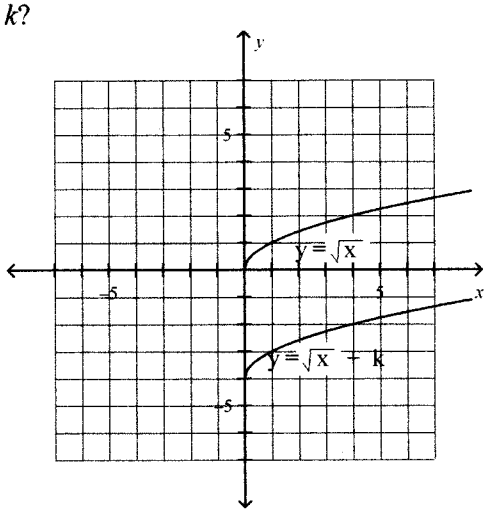
A. $y = \dfrac{-3x^2 - 5}{x^2 - 25}$

B. $y = \dfrac{2x^2 - 5}{x^2 - 25}$

C. $y = \dfrac{-3x^2 - 5}{x^2 + 5}$

D. $y = \dfrac{-3x^2 - 5}{x^2}$

23. The graph of $y = \sqrt{x} + k$ is the image of the graph of $y = \sqrt{x}$ after a single translation. What is the value of k?



A. 5

B. –4

C. 4

D. –5

24. The graph of $y = f(x)$ is translated 4 units down. What is the equation of the translation image in terms of the function f?

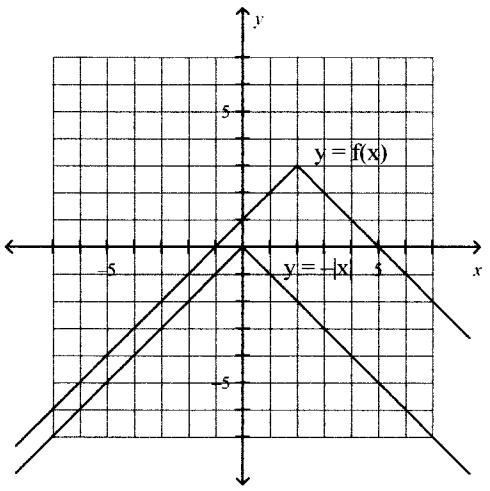
A. $y = f(x + 4)$

B. $y + 4 = f(x)$

C. $y - 4 = f(x)$

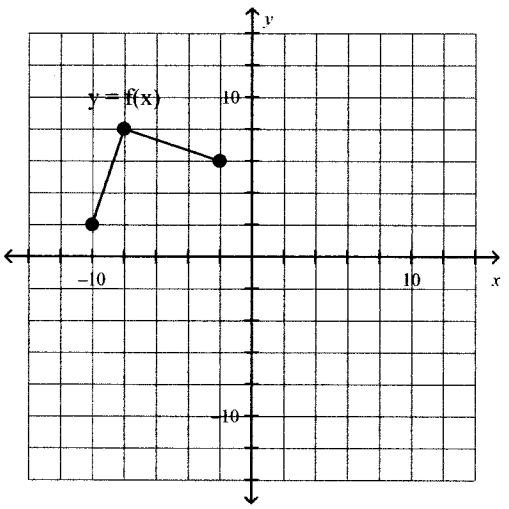
D. $y = f(x - 4)$

25. The graph of $y = f(x)$ is the image of the graph of $y = -|x|$ after a horizontal and vertical translation. What is an equation of the image graph?



A. $y - 3 = -|x|$ **B.** $y - 3 = -|x - 2|$ **C.** $y - 3 = |x + 2|$ **D.** $y - 2 = -|x - 3|$

26. Here is the graph of $y = f(x)$. What are the domain and range of its image after a reflection in the x-axis?



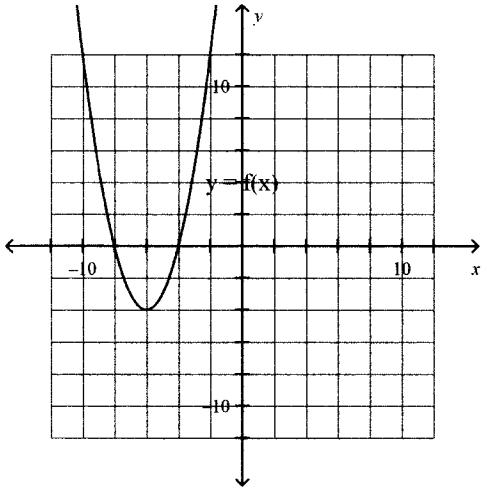
A. domain: $-10 \le x \le -2$
range: $-8 \le y \le -2$

B. domain: $2 \le x \le 10$
range: $2 \le y \le 8$

C. domain: $2 \le x \le 10$
range: $-8 \le y \le -2$

D. domain: $-10 \le x \le -2$
range: $2 \le y \le 8$

27. Here is the graph of $y = f(x)$. What are the domain and range of $y = -f(x)$?



A. domain: $x \in \mathbb{R}$, range: $y \leq -4$ **B.** domain: $x \in \mathbb{R}$, range: $y \leq 4$ **C.** domain: $x \leq 6$, range: $y \geq 4$ **D.** domain: $x \in \mathbb{R}$, range: $y \in \mathbb{R}$

28. The graph of $y = f(x)$ is stretched vertically by a factor of 6. What is the equation of the image graph in terms of the function f?

A. $y = 6f(x)$ **B.** $y = \frac{1}{6}f(x)$ **C.** $y = f(6x)$ **D.** $y = f(\frac{1}{6}x)$

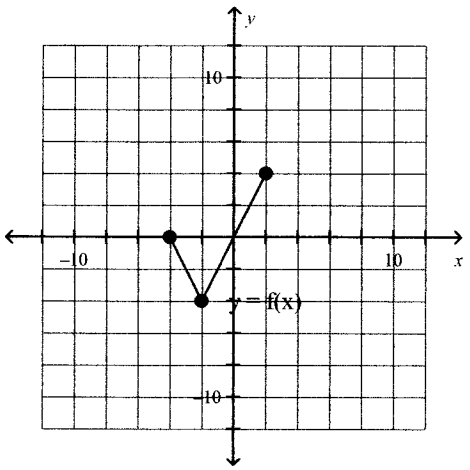
29. The point A (16,64) lies on the graph of $y = \sqrt{x^3}$. What are the coordinates of its image A′ on the graph of $y = \frac{1}{4}\sqrt{(2x)^3}$?

A. (8,16)
B. (8,32)
C. (4,16)
D. Not enough information is given.

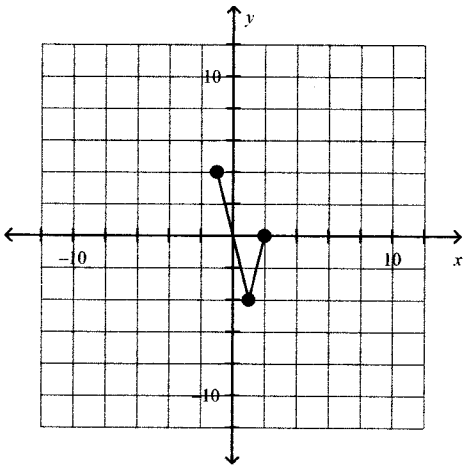
30. The graph of $y = f(x)$ is horizontally compressed by a factor of $\frac{1}{3}$, vertically compressed by a factor of $\frac{1}{2}$, and reflected in the y-axis. What is an equation of the image graph in terms of the function f?

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

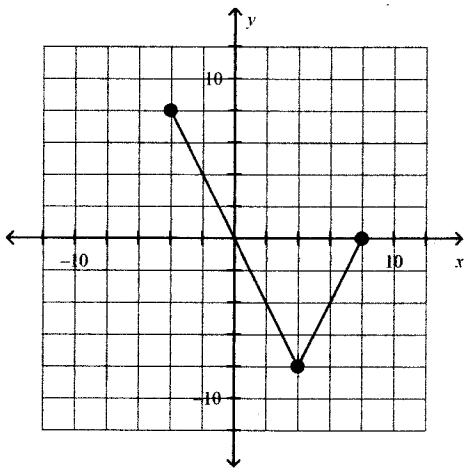
31. For the graph of $y = f(x)$ shown below, which graph represents $y = f(-2x)$?



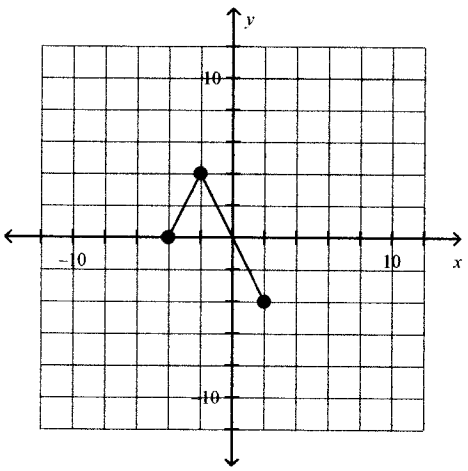
A.



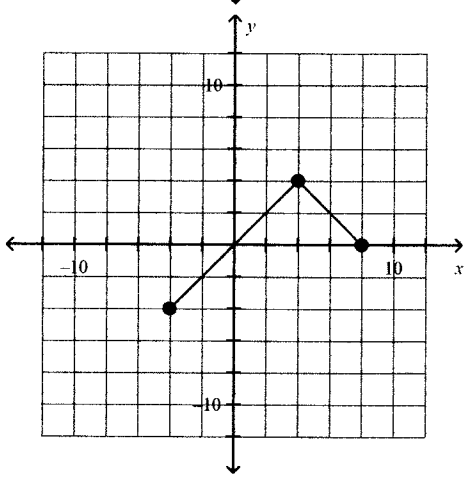
C.



B.



D.



32. Which statement below describes how the graph of $y = f(x)$ has been transformed to get the graph of $y = f(-\frac{1}{3}(x-2))$?

It is the image of the graph of $y = f(x)$ after:

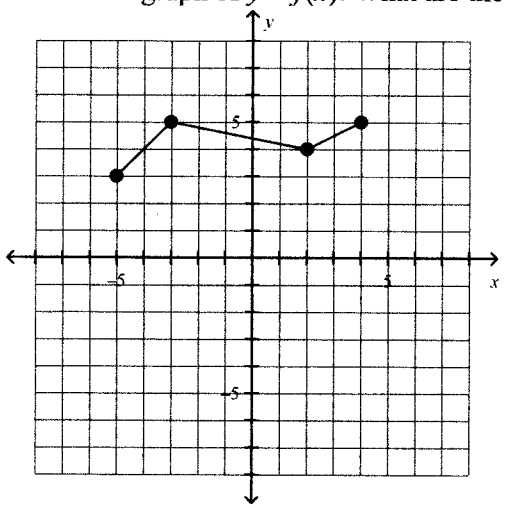
A. a vertical compression by a factor of $\frac{1}{3}$, a reflection in both axes, and a translation of 2 units right.

B. a vertical stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units down.

C. a horizontal stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units right.

D. a horizontal compression by a factor of $\frac{1}{3}$, a reflection in the y-axis, and a translation of 2 units right.

33. Here is the graph of $y = f(x)$. What are the domain and range of its inverse?



A. Domain: $-5 \le x \le 4$
Range: $-5 \le y \le -3$

B. Domain: $3 \le x \le 5$
Range: $-5 \le y \le 4$

C. Domain: $-5 \le x \le 4$
Range: $3 \le y \le 5$

D. Domain: $3 \le x \le 5$
Range: $-4 \le y \le 5$

34. Determine an equation of the inverse of the function $y = -6x - 5$.

A. $y = \frac{x-6}{-5}$

B. $y = \frac{x-5}{-6}$

C. $y = -6x + 5$

D. $y = \frac{x+5}{-6}$

35. The point A(–5,–3) lies on the graph of $y = f(x)$. What are the coordinates of its image A′ on the graph of $y = f^{-1}(x)$?

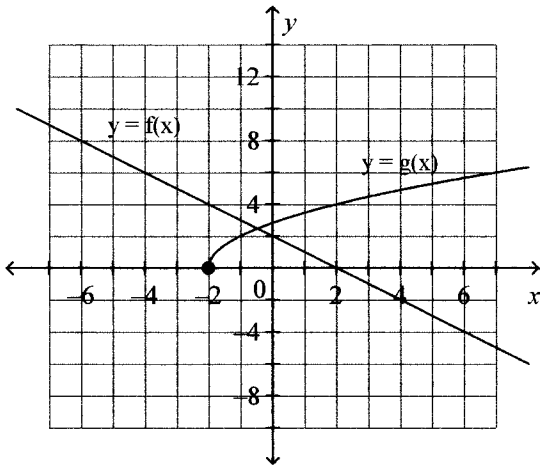
A. (3,5)

B. (5,3)

C. (–3,–5)

D. (–5,–3)

36. Use the graphs of $y = f(x)$ and $y = g(x)$. What are the domain and range of $y = f(x) - g(x)$?



A. Domain: $x \in \mathbb{R}$
Range: $y \leq -2$

B. Domain: $x \leq -2$
Range: $y \leq 4$

C. Domain: $x \geq -2$
Range: $y \in \mathbb{R}$

D. Domain: $x \geq -2$
Range: $y \leq 4$

37. Given $f(x) = x - 1$ and $g(x) = 3x^2 + 2$, what is an explicit equation for $p(x) = f(x) \cdot g(x)$?

A. $p(x) = 4x^3 + 3x^2 + 2x - 2$
B. $p(x) = 3x^2 + x + 1$
C. $p(x) = 3x^2 - x - 2$
D. $p(x) = 3x^3 - 3x^2 + 2x - 2$

38. Given $f(x) = x + 2$ and $g(x) = x^2 - 25$, what is the domain of $q(x) = \dfrac{f(x)}{g(x)}$?

A. $x \neq 25$
B. $x \neq 5, x \neq -5$
C. $x \neq -2$
D. $x \in \mathbb{R}$

39. Given $h(x) = 5x^2 + 2x - 3$, which pair of equations below are possible equations for $f(x)$ and $g(x)$ so that $h(x) = f(x) - g(x)$?

A. $f(x) = 5x^2$
$g(x) = 2x - 3$

B. $f(x) = 4x^2$
$g(x) = x^2 + 2x - 3$

C. $f(x) = 4x^2$
$g(x) = -x^2 - 2x - 3$

D. $f(x) = 5x^2$
$g(x) = -2x + 3$

40. Given $f(x) = |x - 5|$ and $g(x) = \frac{1}{x}$, what is the domain and range of $h(x) = f(x) + g(x)$?

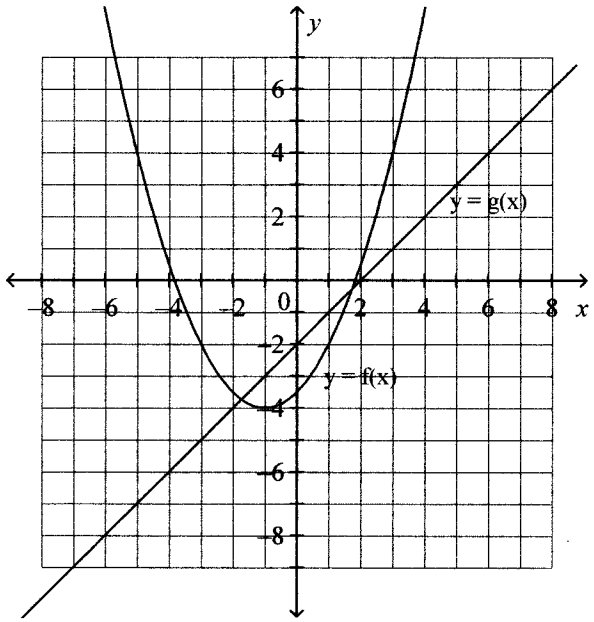
A. Domain: $x \neq 0$
Range: $y \in \mathbb{R}$

B. Domain: $x \geq 5$
Range: $y \leq 5$

C. Domain: $x \neq 0$
Range: $y \leq 5$

D. Domain: $x \neq 5$
Range: $y \in \mathbb{R}$

41. Given the graphs of $y = f(x)$ and $y = g(x)$, what is the value of $f\big(g(3)\big)$?



A. 4 **B.** –2 **C.** 2 **D.** –4

42. Given $f(x) = \sqrt{4 - x}$ and $g(x) = 3 - 5x$, what is an explicit equation for $f\big(g(x)\big)$?

A. $f\big(g(x)\big) = 3 - \sqrt{4 - 5x}$

B. $f\big(g(x)\big) = 1 - \sqrt{4 - 5x}$

C. $f\big(g(x)\big) = \sqrt{1 - 5x}$

D. $f\big(g(x)\big) = \sqrt{5x + 1}$

43. Use these tables. What is the value of $f\big(f(0)\big)$?

x	$f(x)$
−3	18
−2	11
−1	6
0	3
1	2
2	3
3	6

A. −2 **B.** 6 **C.** 2 **D.** 0

44. The function $h(x) = g\big(f(x)\big)$ is the composite of $f(x) = 2 - x$ and $g(x) = \frac{1}{\sqrt{x}}$.

What is the domain of $h(x)$?

A. $-2 < x < 0$
B. $x < 2$
C. $x < -2$ or $x > 0$
D. $x > 0$

45. Given $f(x) = \sqrt{2-x}$ and $g(x) = x^2 + 6x - 3$, which is an explicit equation for the composite function $h(x) = g\big(f(x)\big)$, and what is its domain?

A. $h(x) = \sqrt{-x^2 - 6x + 5}$
$x \geq 0$
B. $h(x) = -1 - x$
$x \in \mathbb{R}$
C. $h(x) = \sqrt{-1 - x}$
$x \leq -1$
D. $h(x) = -1 - x + 6\sqrt{2-x}$
$x \leq 2$