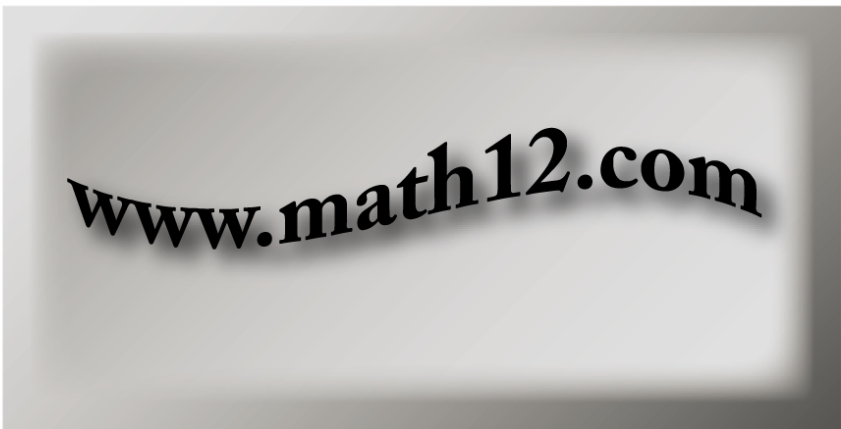


PRINCIPLES OF MATHEMATICS 12

Transformations Practice Exam



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Transformations Practice Exam

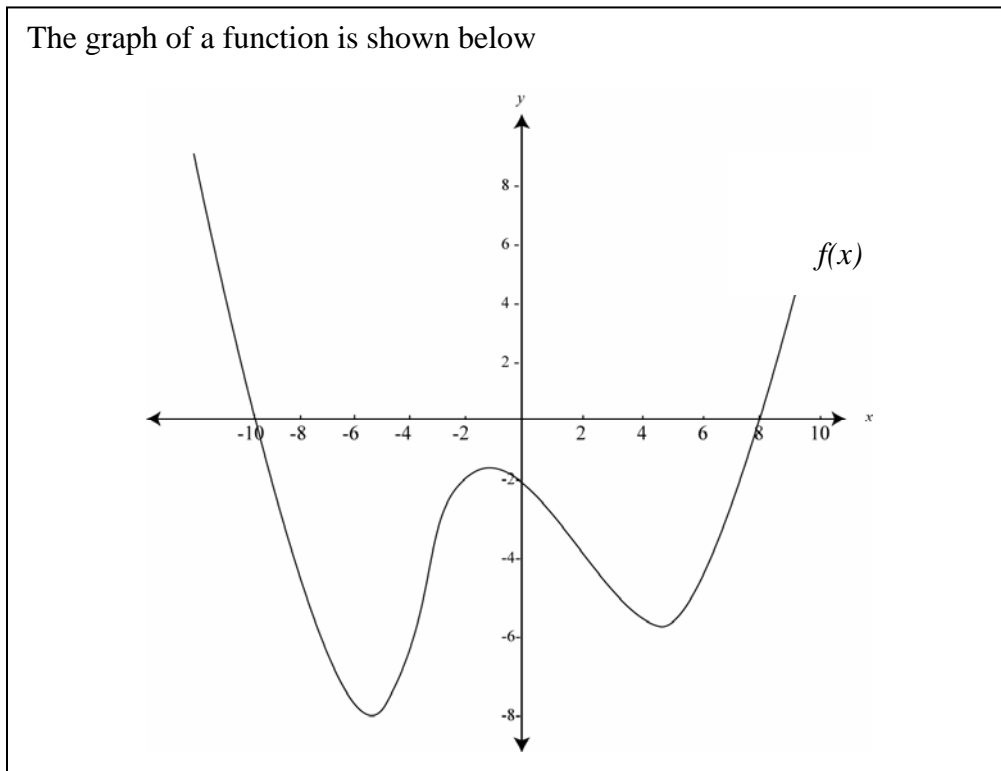
Use this sheet to record your answers

- | | | |
|--------------|--------------|--------------|
| 1. | 11. | 20. |
| NR 1. | 12. | NR 6. |
| 2. | NR 3. | 21. |
| 3. | 13. | 22. |
| NR 2. | 14. | 23. |
| 4. | 15. | 24. |
| 5. | 16. | 25. |
| 6. | 17. | 26. |
| 7. | NR 4. | 27. |
| 8. | NR 5. | 28. |
| 9. | 18. | 29. |
| 10. | 19. | |

Transformations Practice Exam

1. If $f(x) = x^2 - 1$, then a function with the same domain and range as $f(x)$ is
- A. $g(x) = f(x-1)$
 - B. $g(x) = f(x) - 1$
 - C. $g(x) = f^{-1}(x)$
 - D. $g(x) = \frac{1}{f(x)}$

Use the following information to answer the next five questions.



Numerical Response

1. If the transformation $y = f(-2x)$ is applied, the value of the largest x -intercept is, to the nearest whole number, _____.

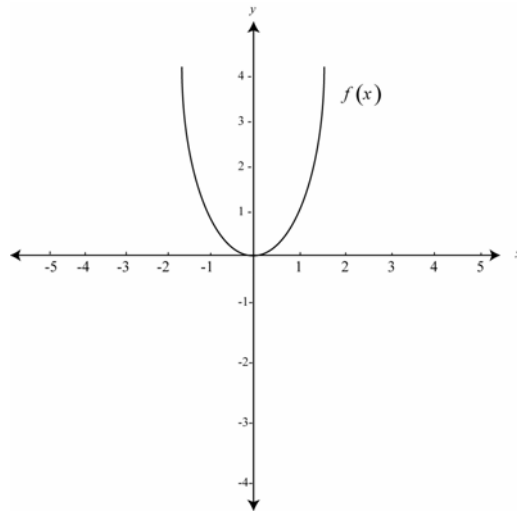
2. If the graph of $f(x)$ is transformed to a new function $y - 4 = f(x - 2)$, then the range of the new graph is
- A. $y \geq -8$
 - B. $y \geq -6$
 - C. $y \geq -4$
 - D. $y \geq 4$
3. The number of invariant points in the graph of $\frac{1}{f(x)}$ is
- A. 2
 - B. 4
 - C. 6
 - D. Impossible to determine

Numerical Response

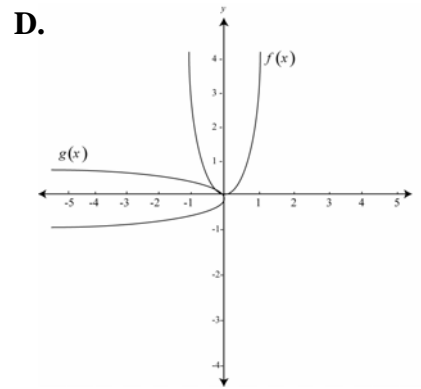
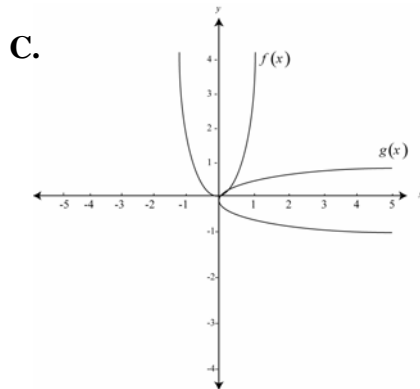
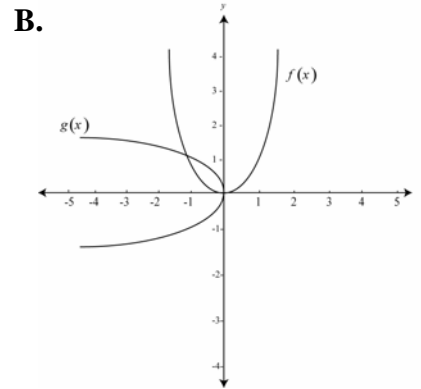
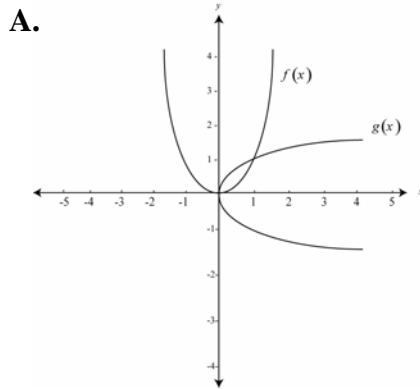
2. If the graph of $y = f(x)$ is stretched vertically about the line $y = -5$ by a factor of 3, then the new y -intercept is $(0, b)$. The value of b is _____.
4. A true statement regarding the graph of $y = f^{-1}(x)$ is
- A. An x -intercept occurs at the point $(0, -10)$
 - B. The graph is not a function
 - C. The point $(0, -2)$ becomes the point $(2, 0)$
 - D. The graph has no x -intercepts

Use the following information to answer the next question.

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

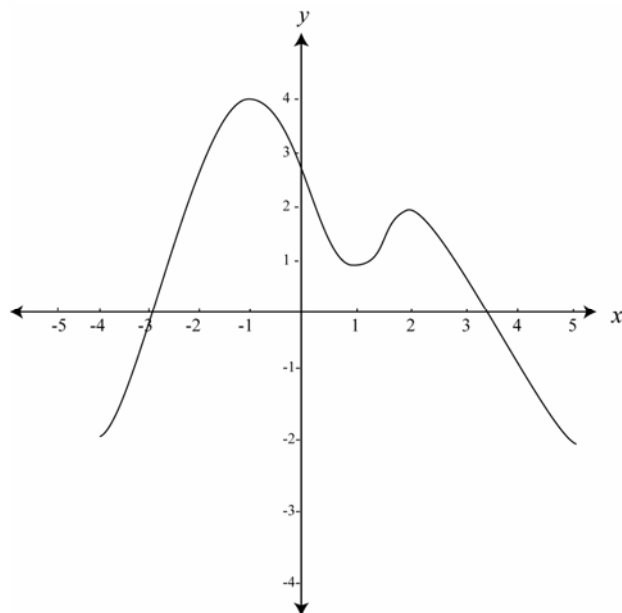


5. The graph of $f(x)$ and the graph of $g(x) = f^{-1}(x)$ are correctly represented by which of the following pairs of graphs?



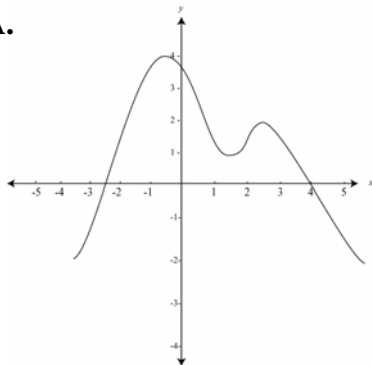
Use the following information to answer the next question.

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

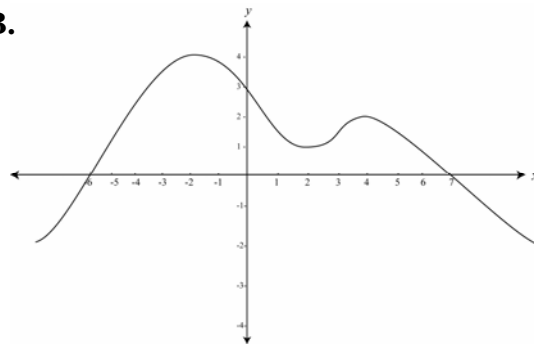


6. The graph of $f\left(\frac{1}{2}x\right)$ is correctly represented by which of the following?

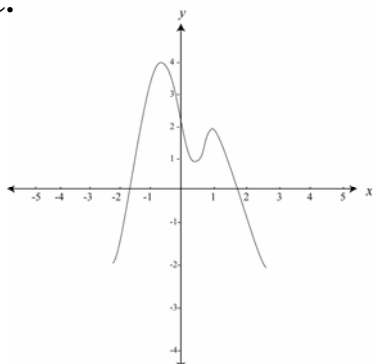
A.



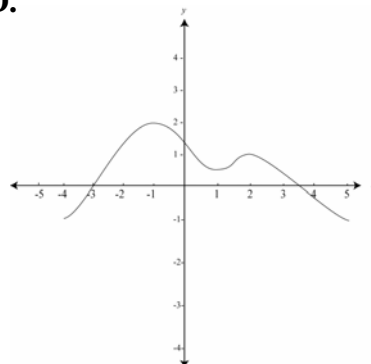
B.



C.

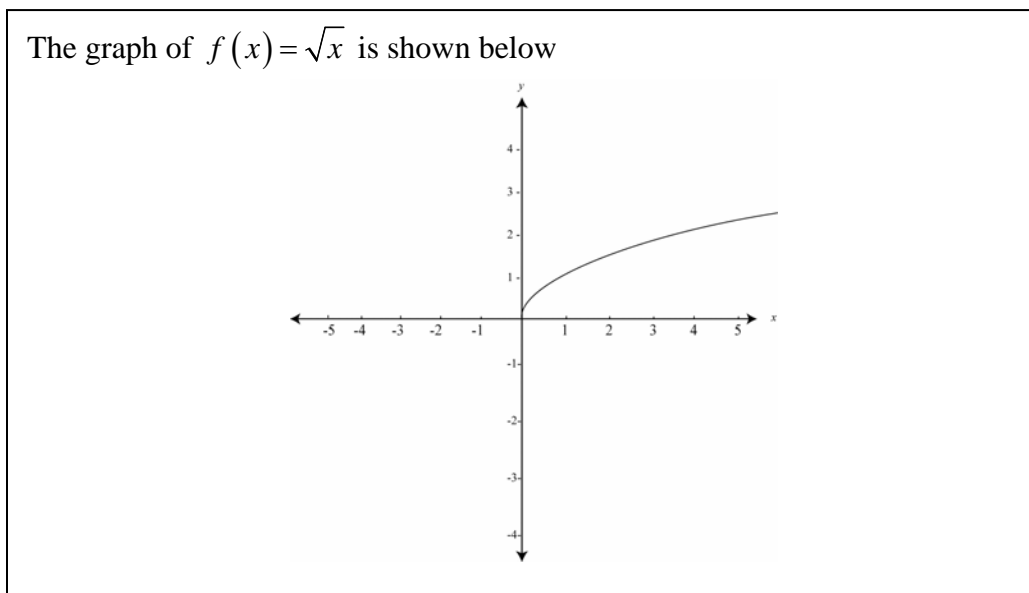


D.



7. The graph of $y = -2f(x+5)$ is the same as the graph of
- A. The graph of $y = f(x)$ reflected about the x -axis, then shifted five units right, then stretched vertically by a factor of 2 about the x -axis.
 - B. The graph of $y = f(x)$ reflected about the y -axis, then stretched vertically by a factor of $\frac{1}{2}$ about the x -axis, then shifted five units left.
 - C. The graph of $y = f(x)$ stretched by a factor of 2 about the y -axis, reflected about the y -axis, then shifted five units left.
 - D. The graph of $y = f(x)$ stretched by a factor of 2 about the x -axis, reflected about the x -axis, then shifted five units left.

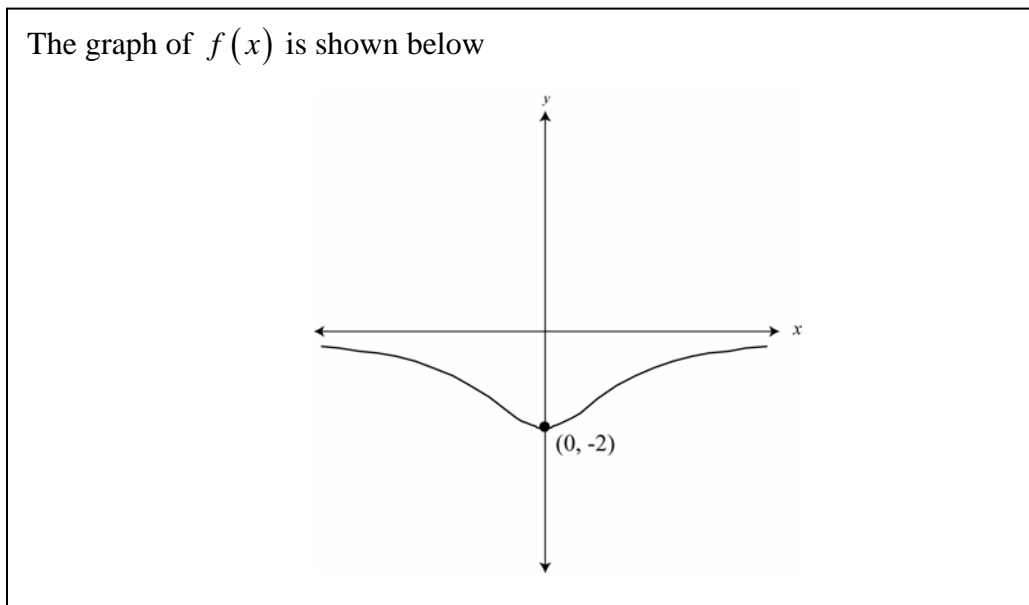
Use the following information to answer the next question.



8. The statement which best describes the graph of $g(x) = f(-x)$ is
- A. $g(x)$ is defined for all values of x
 - B. $g(x)$ is defined for $x \geq 0$
 - C. $g(x)$ has a range of $y \geq 0$
 - D. $g(x)$ is undefined for all values of x

9. The point $(8, -5)$ is on the graph of $y = f(x)$. If the transformation $y = f(2x + 4)$ is applied, then the new point is
- A. $(2, -5)$
 - B. $(20, -5)$
 - C. $(0, -5)$
 - D. $(4, -1)$

Use the following information to answer the next question.

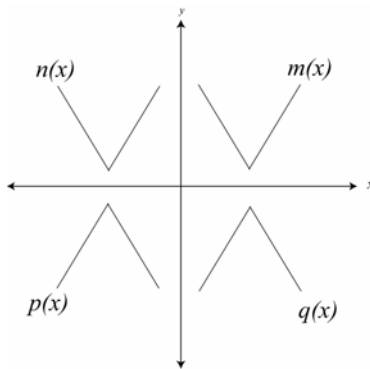


10. A true statement regarding the graph of $y = \frac{1}{f(x)}$ is
- A. The reciprocal graph has a vertical asymptote
 - B. The reciprocal graph is not a function
 - C. There are two invariant points
 - D. There are two x -intercepts in the reciprocal graph

11. The graph of $f(x) = x^2 - 2$ undergoes the transformation $f(x+1)$.
If a student wishes to graph the transformed function in their calculator,
the equation that gives the correct graph is
- A. $x^2 - 1$
 - B. $x^2 - 3$
 - C. $(x+1)^2 - 2$
 - D. $(x-1)^2 - 2$
12. If the graph of $f(x) = x^2$ is transformed to the graph of $y+2 = f(x+1)$,
then a true statement regarding the two graphs is
- A. The domain, but not the range, is the same.
 - B. The range, but not the domain, is the same.
 - C. Both the domain and range are the same
 - D. The domain and range are both different

Use the following information to answer the next question.

The graph of $m(x)$ is shown, along with three possible reflections.



A student knows the following reflections were used:

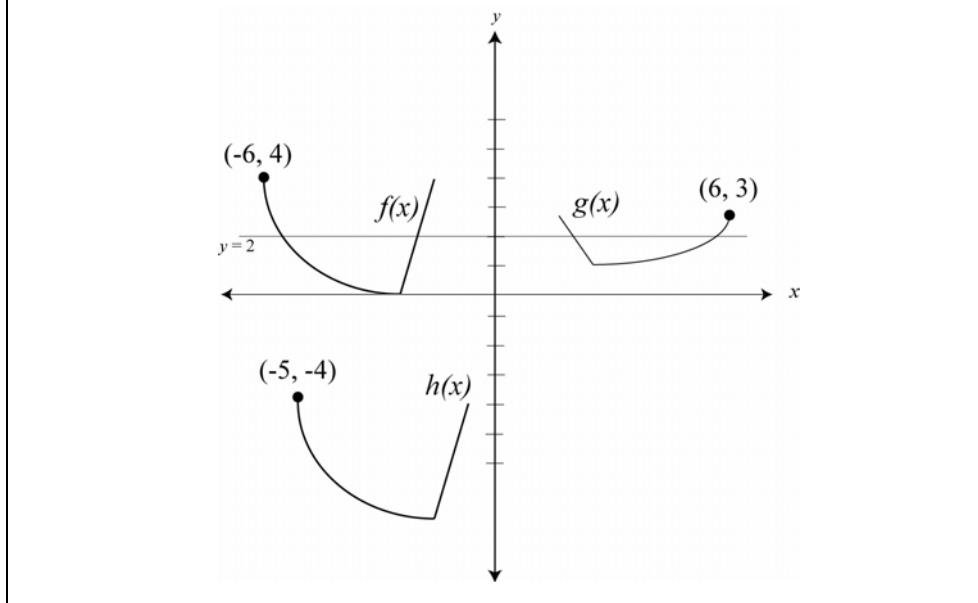
1. $y = -f(x)$
2. $y = f(-x)$
3. $y = -f(-x)$

Numerical Response

3. The reflections used to produce the graphs in quadrants II, III, & IV, respectively,
are _____, _____, and _____.

Use the following information to answer the next two questions.

The graphs of $f(x)$, $g(x)$, and $h(x)$ are shown below

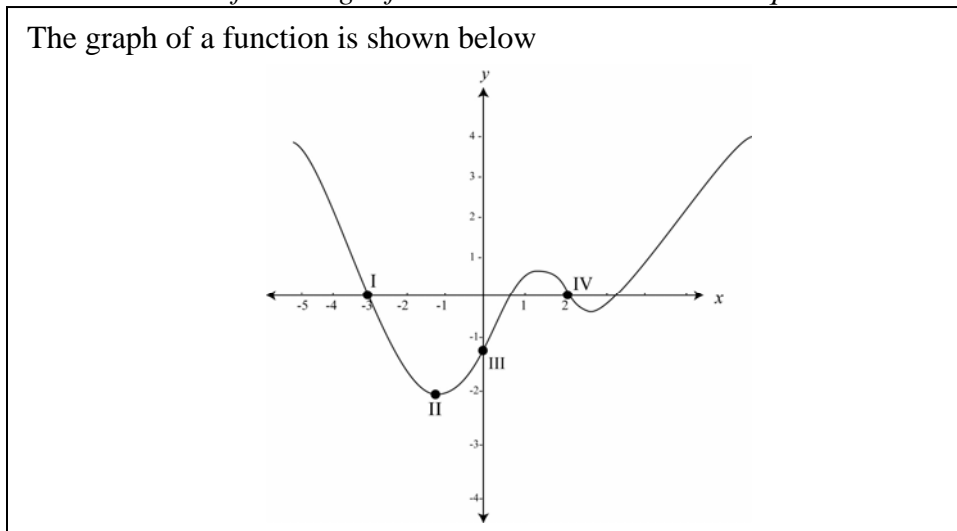


13. The transformation applied to $f(x)$ in order to obtain $g(x)$ is
- A reflection across the x -axis, then a vertical stretch by a factor of $\frac{1}{2}$ about the y -axis.
 - A reflection across the y -axis, then a vertical stretch by a factor of $\frac{1}{2}$ about the x -axis.
 - A vertical stretch by a factor of 2 about the line $y = 2$, then a reflection across the y -axis.
 - A vertical stretch by a factor of $\frac{1}{2}$ about the line $y = 2$, then a reflection across the y -axis.
14. The transformation applied to $f(x)$ in order to obtain $h(x)$ is
- $h(x) = -f(x-1) - 8$
 - $h(x) = f(x-1) - 8$
 - $h(x) = f(x+1) + 8$
 - $h(x) = f(x+1) - 8$

15. The graph of $y = f(x)$ is horizontally stretched by a factor of 3 about the y -axis, reflected in the x -axis, then translated four units right and two units up. The transformed graph is represented by

- A. $y = -f\left(\frac{1}{3}(x-4)\right) + 2$
 B. $y = -f(3(x-4)) + 2$
 C. $y = f(-3(x-4)) + 2$
 D. $y = f\left(\frac{1}{3}(-x-4)\right) + 2$

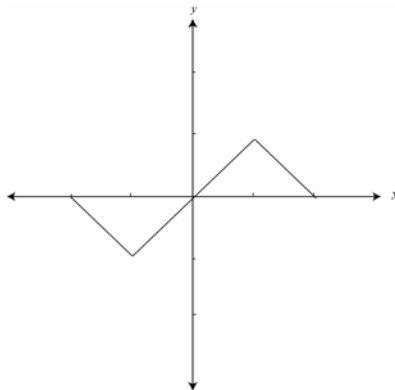
Use the following information to answer the next question.



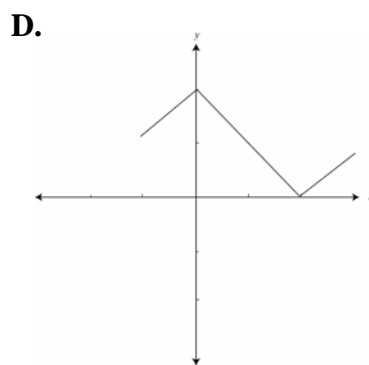
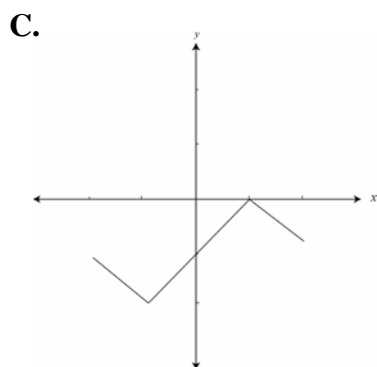
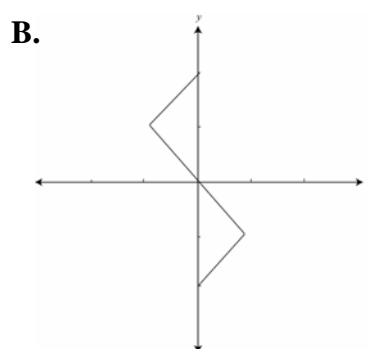
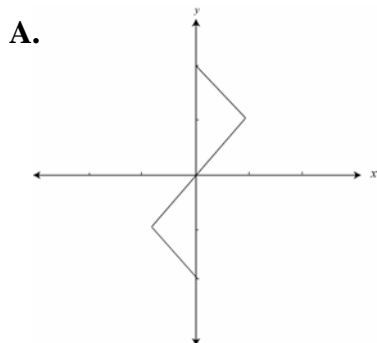
16. If the reflection $y = f(-x)$ is applied to the graph, the invariant point is
- A. I
 B. II
 C. III
 D. IV

Use the following information to answer the next question.

The graph of $f(x)$ is shown below. The domain is $-2 \leq x \leq 2$.



17. The graph of $x = f(y)$ is represented by which of the following graphs?

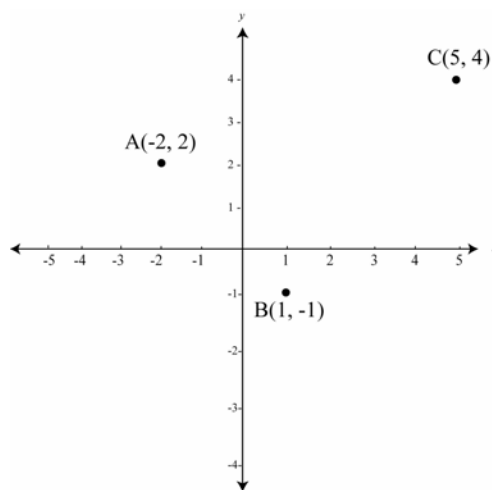


Numerical Response

4. The function $f(x) = 2x^3 - 4x^2 + 3x - 5$ is multiplied by a constant b to apply a vertical stretch to the graph. If the transformed graph passes through the point $(-2, -129)$, then the value of b is _____.

Use the following information to answer the next question.

Three points that lie on a function $f(x)$ are shown below

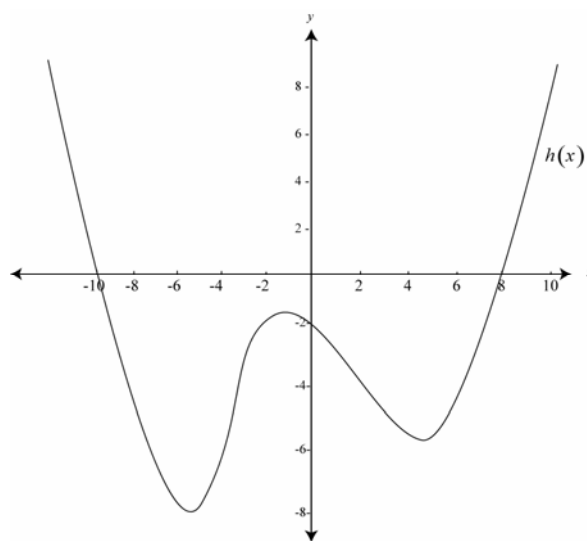


Numerical Response

5. If the function is transformed by $y - 4 = 2f(x)$, then the new y -values of points **A**, **B**, and **C** are, respectively, _____, _____, and _____.
18. A transformation is applied to the graph of $y = f(x)$ such that the point $(2, 2)$ is invariant. A transformation that can produce this result is
- A. $y = 2f(x)$
 - B. $y = -f(x)$
 - C. $y = \frac{1}{f(x)}$
 - D. $y = f^{-1}(x)$

Use the following information to answer the next question.

The graph of $h(x)$ is shown below



19. A vertical asymptote in the graph of $\frac{1}{f(x)}$ is located at
- A. $x = -5$
 - B. $x = -2$
 - C. $y = -2$
 - D. $x = 8$
20. If y is replaced with $\frac{1}{3}y$ in the equation $y = f(x)$, then the resulting transformation on the graph will be
- A. A vertical stretch by a factor of $\frac{1}{3}$ about the x -axis
 - B. A vertical stretch by a factor of 3 about the x -axis
 - C. A horizontal stretch by a factor of $\frac{1}{3}$ about the y -axis
 - D. A horizontal stretch by a factor of 3 about the y -axis

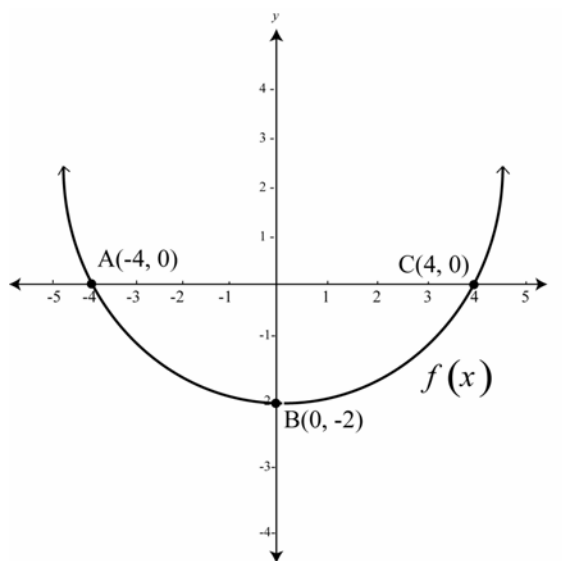
Numerical Response

6

A function $f(x)$ is transformed to produce the graph of $g(x) = f(x-7) + 8$. If the graph is further transformed by moving it two units left and one unit down, then the new graph can be written as $h(x) = f(x-a) + b$. The numerical values of a and b are, respectively, _____, and _____.

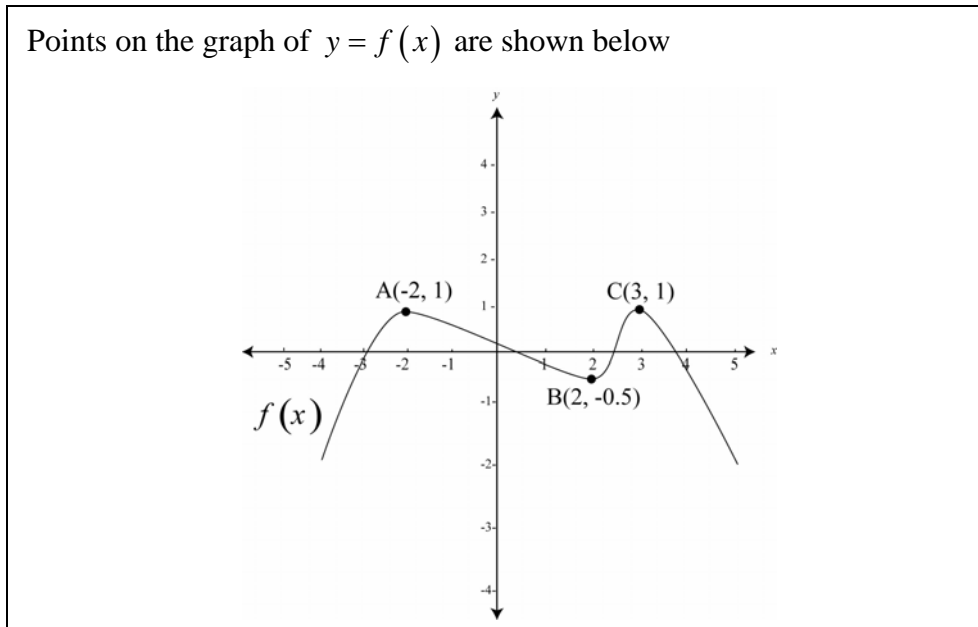
Use the following information to answer the next question.

Points on the graph of $y = f(x)$ are shown below



21. If the graph is stretched vertically about the line $y = -3$ by a factor of 2, then the new coordinate of point C is $(4, m)$. The value of m is
- A. 0
 - B. 1
 - C. 3
 - D. 6

Use the following information to answer the next three questions.

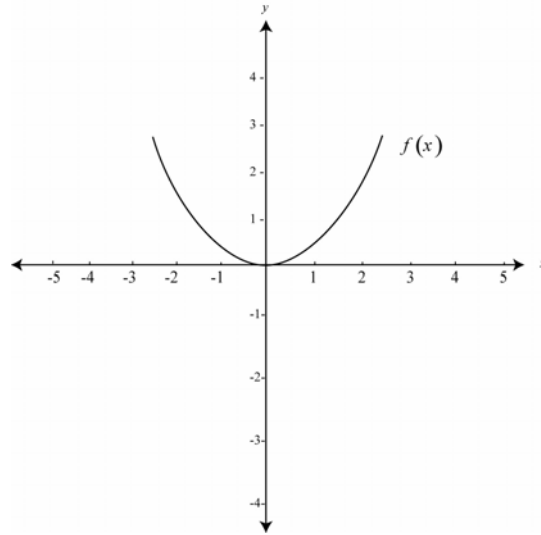


22. The number of vertical asymptotes found in the graph of $y = \frac{1}{f(x)}$ is
- A. 0
 - B. 1
 - C. 3
 - D. 4
23. The number of invariant points found in the graph of $y = \frac{1}{f(x)}$ is
- A. 0
 - B. 1
 - C. 3
 - D. 4
24. If the graph is transformed to $g(x) = f(2x - 4)$, then point **A** becomes $(m, 1)$. The value of m is
- A. 0
 - B. 1
 - C. 3
 - D. 4

25. The domain of $f(x)$ is $x \leq 3$. If the transformation $g(x) = f(x+10) - 2$ is applied, then the new domain of the function is
- A. $x \leq -10$
 - B. $x \leq -7$
 - C. $x \geq -10$
 - D. $x \geq -7$
26. A point on the graph of $f(x)$ is $(-3, 4)$. If the transformation $y = f(3x - 6) - 1$ is applied, then the new coordinates of the point are
- A. $(1, 3)$
 - B. $(-1, 4)$
 - C. $(-15, 3)$
 - D. $(5, 3)$
27. The function $f(x) = x^2 - 5x + 6$ is multiplied by a constant b to apply a vertical stretch to the graph. If the transformed graph passes through the point $(8, 15)$, then the value of b is _____.
- A. 4
 - B. $\frac{1}{4}$
 - C. 2
 - D. $\frac{1}{2}$
28. The graph of $y = (x+1)^2$ undergoes the transformation $y = f^{-1}(x)$. A true statement regarding the transformed graph is
- A. The transformed graph is the reciprocal of the original
 - B. The transformed graph is not a function
 - C. The transformed graph has the same domain and range as the original graph
 - D. The vertex of the parabola is invariant

Use the following information to answer the next question.

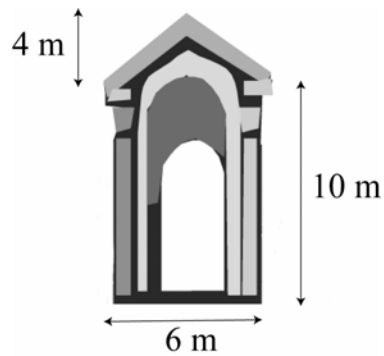
The graph of $y = f(x)$ is shown below



29. The graph of $f(x)$ is horizontally stretched about the line $x = 2$ by a factor of $\frac{1}{2}$.
The vertex on the transformed graph is located at the point
- A. $(-4, 0)$
 - B. $(0, 0)$
 - C. $(1, 0)$
 - D. $(0, -1)$

Use the following information to answer the next question.

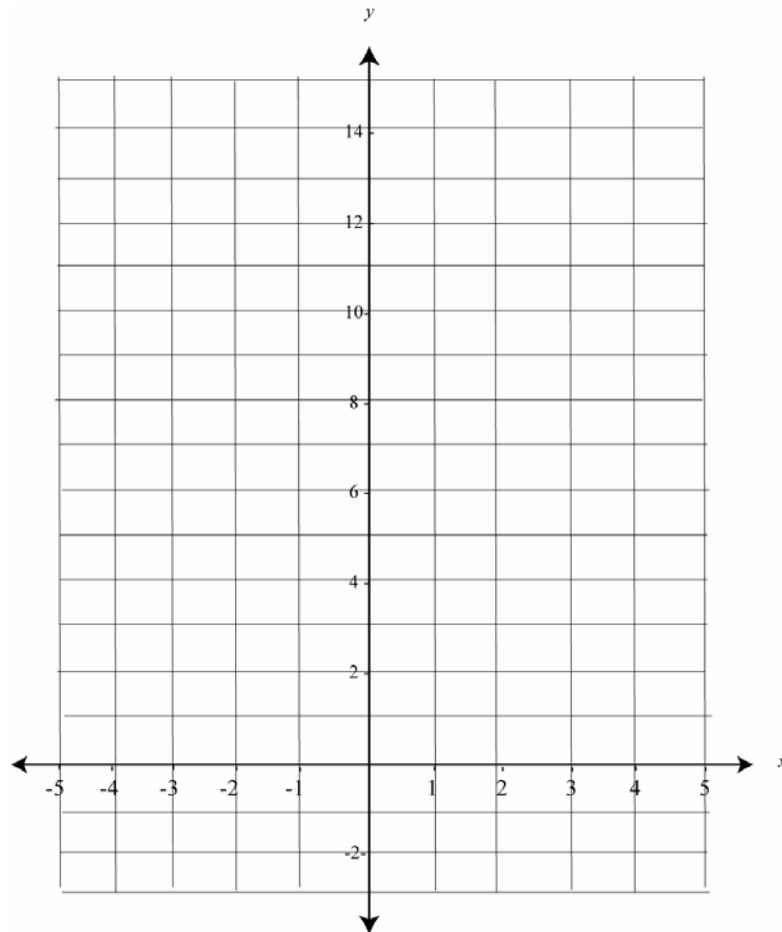
A triangular arch tops a doorway in an ancient building, as shown below.



Written Response – 10%

1.

- Draw a graph that represents the figure shown above, with the centre of the doorway at the origin.

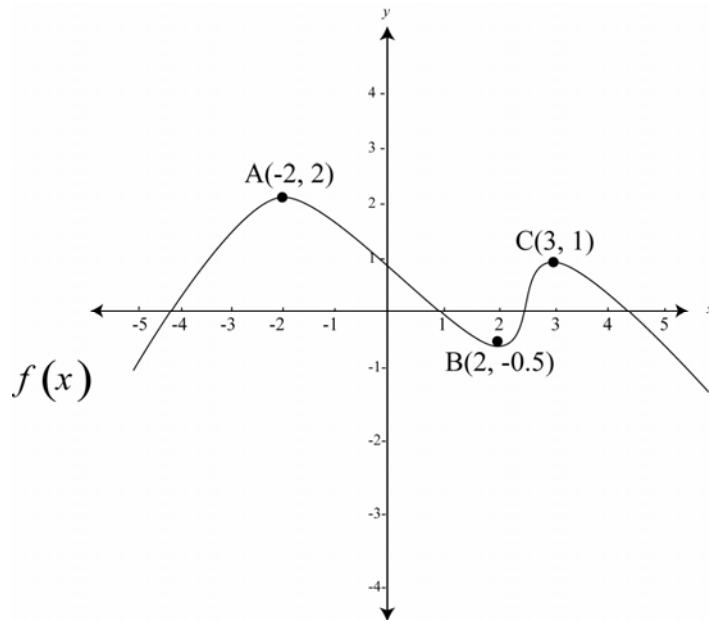


- Determine the equation of the triangular arch, and write it in the form $y = b|x - p| + q$, where b is the vertical stretch factor, and (p, q) is the vertex. Also, state the domain and range of the triangular arch.

- If the height of the arch is increased from 14 m to 16 m (*while keeping the base of the triangular arch at the same level*) describe what happens to each of the parameters b , p , and q .

Use the following information to answer the next question.

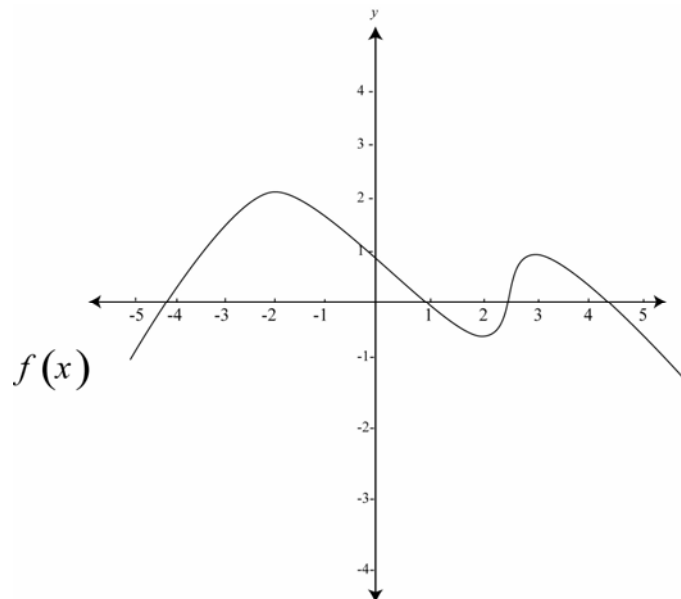
The graph of $y = f(x)$ is shown below.



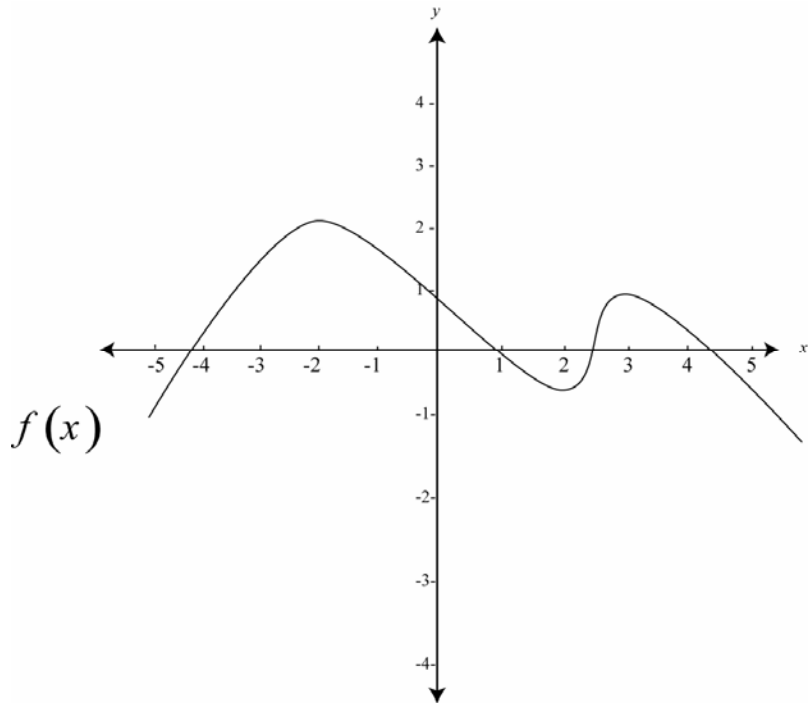
Written Response – 10%

2.

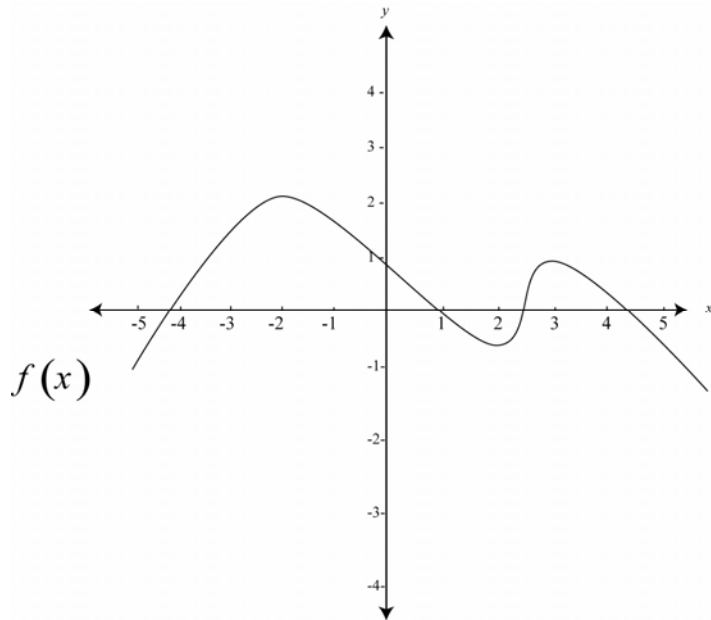
- In the space provided below, draw in the graph of $y = 2f(x)$ and write a description of the transformation.



- In the space provided below, draw in the graph of $y = -f(x)$ and write a description of the transformation.

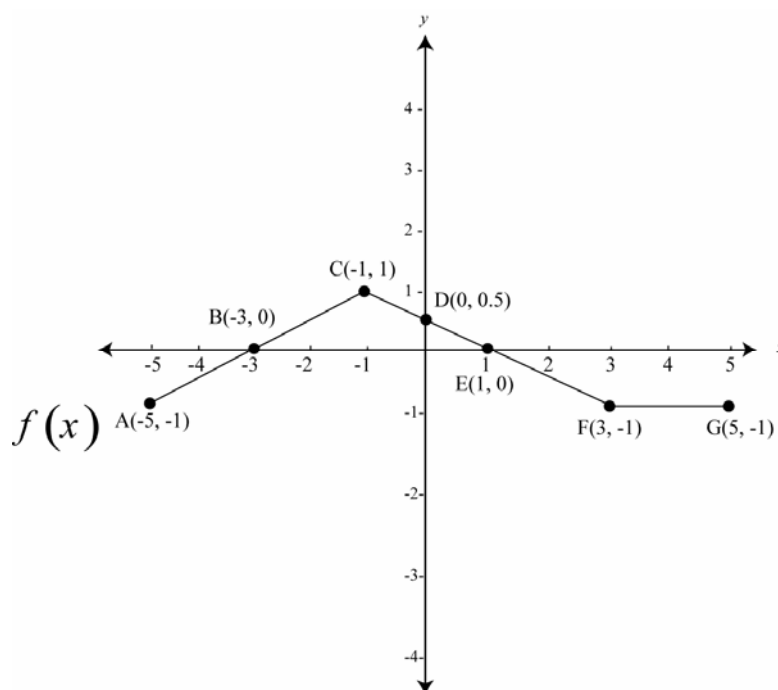


- In the space provided below, draw in the graph of $y = \frac{1}{f(x)}$ and write a description of the transformation.



Use the following information to answer the next question.

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



Written Response – 10%

3.

- List the invariant points in the graph of $y = -f(x)$
- List the invariant points in the graph of $y = f(-x)$
- List the invariant points in the graph of $y = f(2x)$
- List the invariant points in the graph of $y = \frac{1}{f(x)}$
- List the invariant points if the graph is stretched vertically about the line $y = \frac{1}{2}$ by a factor of 2
- List the invariant points in the graph of $y = -f(-x)$