**Relations and Functions**

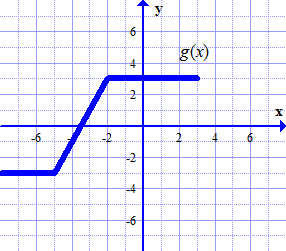
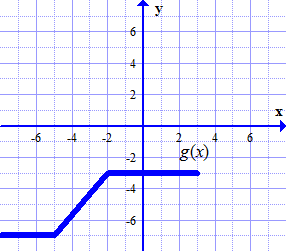
**Chapter 1 Transformations**

*Use the following information to answer the next question.*

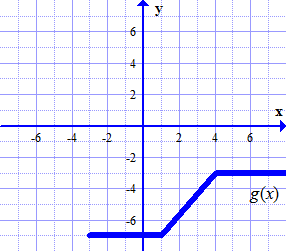
|  |
| --- |
| The graph of  is shown. |

1. Given the graph of , the graph of  can be represented by

A. B.

C. D.

1. Given , , , and , in which quadrant is the vertex?

A. Quadrant I B. Quadrant II C. Quadrant III D. Quadrant IV

1. Given the functions and , the transformations that will transform  to become are a translation of

A. 4 units left and 2 units down B. 4 units right and 2 units up

C. 1 unit left and 3 units up D. 2 units left and 4 units down

*Use the following information to answer the next question.*

Numbered words used to describe transformations

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | right | 2. | left |
| 3. | up | 4. | down |
| 5. | two | 6. | three |
| 7. | four | 8. | five |

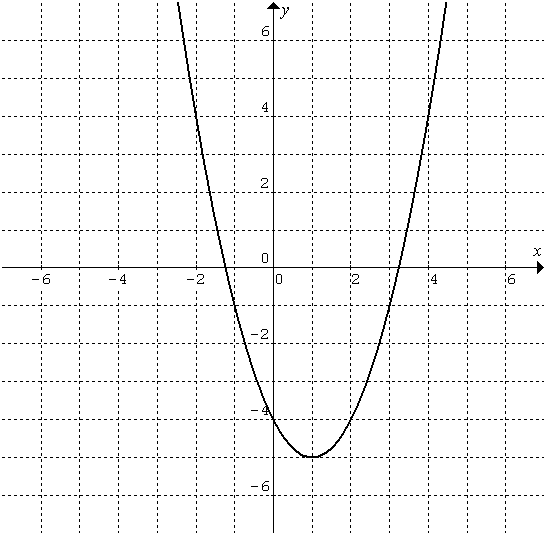
1. **Numerical Response:** The transformation of the function  is described by the mapping notation. Use the numbered words to complete the statement. The graph of  has been horizontally translated  *i* units to the  *ii* and vertically translated  *iii* units  *iv .*

*Record i in the first column.*

*Record ii in the second column.*

*Record iii in the third column.*

*Record iv in the fourth column.*

1. **Numerical Response:** Given the function, function, shown below, is a translation of. The equation of can be written in the form .The values of parameters *a*, *h*, and *k*, are \_\_\_, \_\_\_,and \_\_\_, respectively.



*Use the following information to answer the next question*

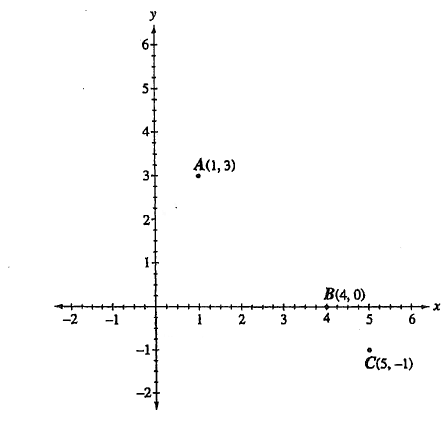
The graph of  is transformed into the graph of. The domain and range of each functions graph is shown below.

|  |  |  |
| --- | --- | --- |
|  | **Domain** | **Range** |
| Graph of |  |  |
| Graph of |  |  |

1. For the graph of, the values of *a*, *b*, *c*, and *d* are, respectively, \_\_\_, \_\_\_\_, \_\_\_\_, and \_\_\_\_.

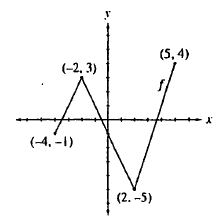
*Use the following information to answer the next question.*

Three points, A(1, 3), and B(4,0), and C(5, -1), that are on the graph of a function *f*, are shown below.



1. **Numerical Response:** If the function *f* is transformed into the function *g*, where, then the *y*-coordinates of the points corresponding to A, B, and C on the graph of the transformed function will be \_\_\_, \_\_\_ and \_\_\_ , respectively.

*Use the following information to answer the next question*



The graph of is shown below.

1. The range of is

A.  B. 

C.  D. 

*Use the following information to answer the next question.*

The ordered pairs below represent possible transformations of the point  on the graph of the function.

|  |  |  |
| --- | --- | --- |
| **Point 1:** | **Point 3:** | **Point 5:** |
| **Point 2:** | **Point 4:** | **Point 6:** |

1. **Numerical Response**: If  undergoes the following single transformation, identify the coordinates of the corresponding point *P* on the image graph.

The corresponding point on the function  is point number \_\_\_\_\_\_\_.

The corresponding point on the function  is point number \_\_\_\_\_\_\_.

The corresponding point on the function  is point number \_\_\_\_\_\_\_.

The corresponding point on the function  is point number \_\_\_\_\_\_\_.

1. The graph of has a *y*-intercept of 2 but no *x*-intercepts. A transformation of P that would result in two *x*-intercepts on the transformed graph is

A.  B.  C.  D. 

1. If is transformed into , then a point with coordinateson will be transformed into which point?

A.  B. 

C.  D. 

1. The graph of is a reflection of the graph of in the

A. *x*-axis B. *y*-axis C. line *y* = *x* D. line *y* = -*x*

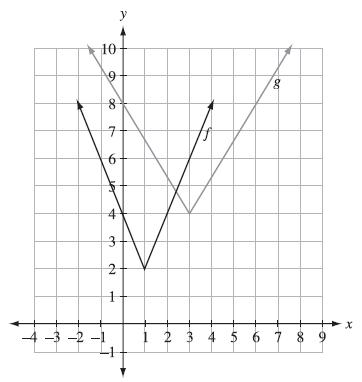
*Use the following information to answer the next question*

The graph of  is reflected in the *x*-axis, stretched vertically about the *x*-axis by a factor of , and stretched horizontally about the *y*-axis by a factor of 4 to create the graph of .

1. For the point  on the graph of , the corresponding point on the graph of is

A.  B.  C.  D. 

*Use the following information to answer the next question.*

The graph of the function *y*  is transformed to produce the graph of the function .

1. An equation for in terms of is

A.  B.  C.  D. 

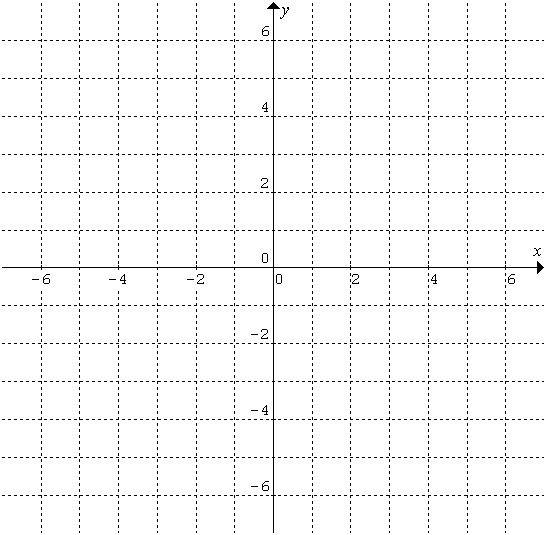
1. If , then the translation will change

A. the domain and range of  B. the domain but not the range of 

C. the range but not the domain of  D. neither the domain nor the range of 

*Use the following information to answer the next question.*

The point (-6, 1) lies on the graph of 



1. **Numerical Response:** The coordinates of the image of the point (-6, 1) after the transformations described by can be expressed as (*a*, *b*). The value of *a* is \_\_\_\_ and the value of *b* is \_\_\_.
2. If the point (-4, 7) is on the graph of , which point will be on the graph of ?

A.  B.  C.  D. 

1. If the point is a point on the graph of , what are the coordinates of the image of the point after the transformations described by ?

A.  B.  C.  D. 

1. When graph of  is reflected in the *y*-axis, the equation of the image function will be

A.  B.  C.  D. 

1. For the graph of a function *f*  and the graph of a function *g*, where , any invariant points must lie on the

A. line *y* = 1 or the line *y* = -1 B. line *y* = *x*

C. *x*-axis D. *y*-axis

1. Given that  and , identify the statement that is true.

A.  B. 

C.  D. 

1. A restriction on the domain of , such that its inverse is also a function, could be

A.  B.  C .  D. 

1. The graph of is reflected about the *x*-axis, horizontally stretched by a factor of 2 about the y-axis, and then translated 3 units to the left and 1 unit down. The equation of the transformed graph is

A.  B. 

C.  D. 

1. If *y* is replaced by in the equation , then the graph of  will be stretched

A. horizontally about the *y*-axis by a factor of 

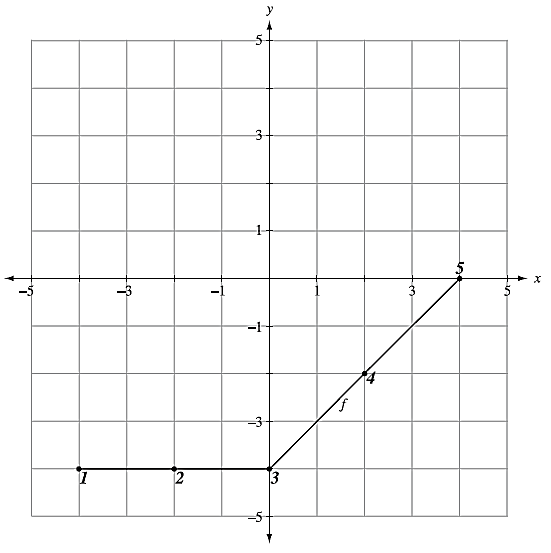
B. horizontally about the *y*-axis by a factor of 2

C. vertically about the *x*-axis by a factor of 

D. vertically about the *x*-axis by a factor of 2

1. **Numerical Response**: As a result of the transformation of the graph of  into the graph of , the point becomes point . The value of *y* is \_\_\_\_.

*Use the following information to answer the next question.*



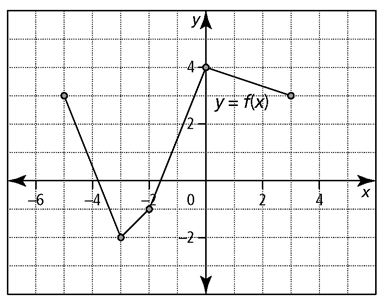
The graph of  is shown.

1. **Numerical Response:** For each transformation of  indicated, the invariant point exists at point number:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Use the following information to answer the next question.*

 The graph of  is shown.

4

1

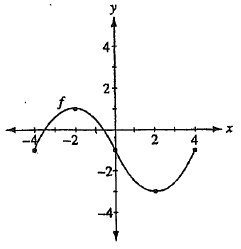
5

3

2

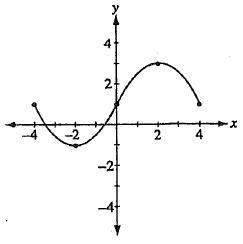
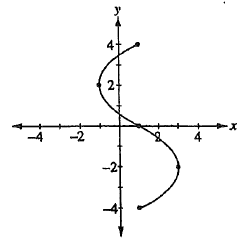
1. **Numerical Response:** The only invariant point of the transformation of  described by the mapping notation is located at point number \_\_\_.

*Use the following information to answer the next two questions.*

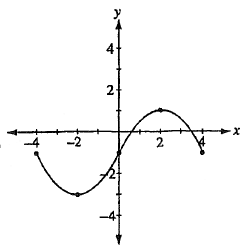
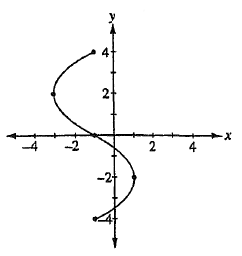
The graph of is shown.

1. Which of the following graphs represents the transformed equation ?

A. B.

C. D.

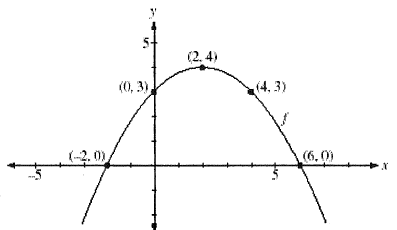
 

1. The domain of the graph of is

A.  B.  C.  D. 

*Use the following information to answer the next question.*

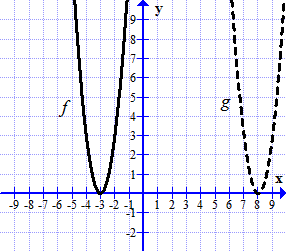
The partial graph of is shown.



1. **Numerical Response:** The sum of the *x*-coordinates of all invariant points when the graph of is transformed to the graph of is \_\_\_.

*Use the following information to answer the next question.*

The graph of function *f* has been transformed to the graph of *g*. The transformations include:



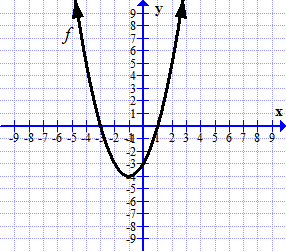
1. a reflection in the *y*-axis

2. a horizontal stretch about the *y*-axis by a factor of 2

3. a horizontal translation of 1 unit left

1. The transformations may be performed in the order \_\_\_\_, \_\_\_\_\_, and then \_\_\_\_\_ for the graph of *f* to be transformed to the graph of *g*. (There may be more than one answer.)

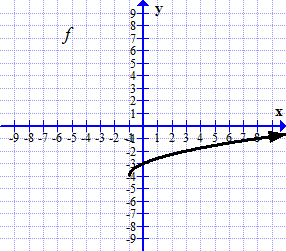
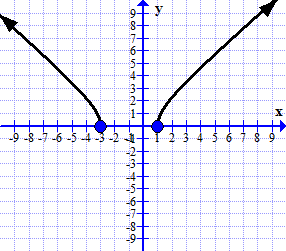
**Chapter 2 Radical Functions**

*****Use the following information to answer the next question.*

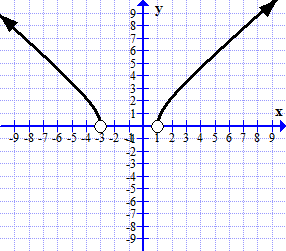
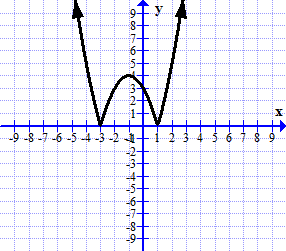
The graph of is shown.

1. The graph of is

A. B.

C. D.

** **

1. The graph of a radical function has a domain of  and a range of . The radical function equation can be expressed as

A.  B. 

C.  D. 

1. If *f* (*x*)  *x*2 − 3, then the domain ofis

A.  B. 

C.  D. 

1. **Numerical Response:** The graph of the function is reflected about the line *y*  *x*. The  
   *x*-intercept of the reflected graph is \_\_\_.



*Use the following information to answer the next question.*

|  |  |  |  |
| --- | --- | --- | --- |
| Numbered Statements Describing Transformations. | | | |
| 1. | horizontal translation 4 units right | 2. | horizontal translation 8 units left |
| 3. | vertical translation 10 units up | 4. | vertical translation 10 units down |
| 5. | reflection in the *x*-axis | 6. | reflection in the *y*-axis |
| 7. | horizontal stretch by a factor of 1/2 | 8. | horizontal stretch by a factor of 2 |

1. **Numerical Response:** The four numbered statements above that describe the sequence of transformations required to transform the graph of  to the graph of  to produce the correct image graph may occur in the order \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_. (There may be more than one answer.)
2. **Numerical Response:** The coordinates of the two invariant points when  is transformed to can be expressed as  and . The sum is \_\_\_.
3. **Numerical Response:** The *x*-intercept of , to the nearest hundredth, is \_\_\_.

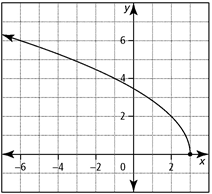
*Use the following information to answer the next question.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Numbered Function Equations to be Graphed | | | | | |
| 1. |  | 2. |  | 3. |  |
| 4. |  | 5. |  | 6. |  |

1. **Numerical Response:** A student wanted to solve the equation using a graphing approach. To determine the solution to the equation, the student could choose to graph function equation numbers \_\_\_\_ and \_\_\_\_\_ on the same grid or they could choose to graph function equation numbers\_\_\_\_\_ and \_\_\_\_\_\_ .

(There may be more than one answer.)

*Use the following information to answer the next question.*

The graph of is shown.

1. Which of the statements is true regarding the parameters *a*, *b*, *h*, and *k*?

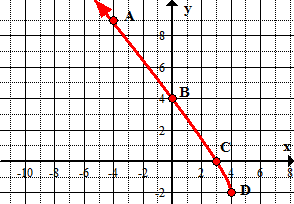
A. 

B. 

C. 

D. 

*Use the following information to answer the next question.*



The partial graph of a radical function is shown.

1. Which labeled point on the graph above relates to the zero of the function?

A. Point A B. Point B C. Point C D. Point D

**Chapter 3 Polynomial Functions**

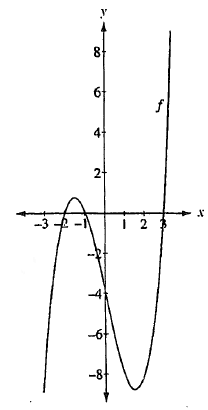
1. **Numerical Response:** The remainder when  is divided by  is \_\_\_.
2. **Numerical Response:** When  is divided by , the remainder is 0 the value of *p* is \_\_\_\_.
3. A polynomial, *P*(*x*), is divided by *x* − 3. If the remainder is 5, then *P*(*x*) is

A. *x*3 − 2*x*2 − 3*x* − 5 B. *x*3  2*x*2 − 3*x*  5

C. *x*3 − 2*x*2 − 3*x*  5 D. *x*3  2*x*2 − 3*x* − 5

1. **Numerical Response:** If *f* (*x*)  *x*3 − 8*x*2  4*x*  48 and *g* (*x*) = *f* (2*x*), the sum of the zeros of *g*(*x*) is \_\_\_\_\_.

*Use the following information to answer the next question.*

A partial graph of is shown below. All of the *x*-intercepts of *f* are shown, and all of the *x*-intercepts are integers.

1. If , then the largest *x*-intercept of the graph of function *g* has a value of

A. 1 B. 2 C. 3 D. 4

1. Which of the following is a factor of =?

A.  B.  C.  D. 

1. If is a factor of , then = \_\_\_\_.

*Use the following information to answer the next question.*

A list of five functions is given below.

1. 

2. 

3. 

4. 

5. 

1. **Numerical Response:** The two numbered functions above that represent polynomial functions are \_\_\_ and \_\_\_. (Record answers in any order.)

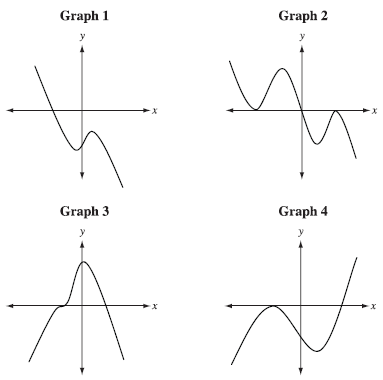
*Use the following information to answer the next two questions.*

The partial graph of the polynomial function  is shown below.



1. **Numerical Response:** The minimum possible degree for the polynomial function above is \_\_\_.
2. **Numerical Response:** The equation of the above function in reduced factored form can be represented by . The value of *a* is \_\_\_\_, the value of *b* is \_\_\_\_\_ and the value of *e* is \_\_\_.

*Use the following information to answer the next question.*

The graphs of four polynomials are shown below.

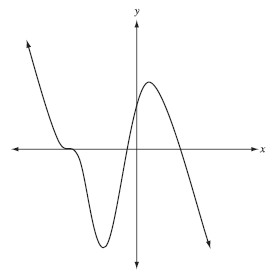
1. **Numerical Response:** Match three of the graphs numbered above with a statement below that best describes the function.

The graph that has a positive leading coefficient is graph number \_\_\_\_.

The graph of a function that has two different zeros, each with multiplicity 2, is graph number \_\_\_.

The graph that could be a degree 4 function is graph number \_\_\_\_\_\_\_.

*Use the following information to answer the next question.*

The partial graph of a polynomial function is shown.

1. The leading coefficient is positive.

2. The leading coefficient is negative.

3. The graph could be of an even degree polynomial.

4. The graph could be of a third degree polynomial

5. The graph could be of a fifth degree polynomial.

6. There is a negative real root of multiplicity 3.

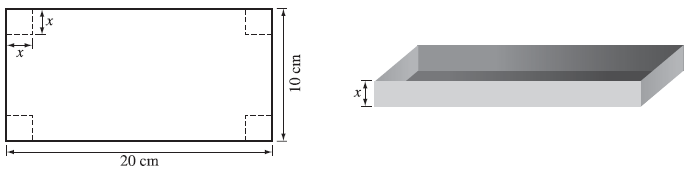
7. There is a positive real root of multiplicity 3.

8. There is a negative real root of multiplicity 2.

9. The constant term of the polynomial is positive.

1. The four numbered statements that are true regarding the graph of the polynomial function above are \_\_\_\_, \_\_\_\_, \_\_\_\_, and \_\_\_\_.(Record answers in any order.)

*Use the following information to answer the next three questions.*

A box with no lid is made by cutting four squares of side length *x* from each corner of a 10 cm by 20 cm rectangular sheet of metal.

1. Which expression could represent the volume of the box?

A.  B. 

C.  D. 

1. **Numerical Response:** The value of *x*, to the nearest hundredth of a centimetre, which gives the maximum volume, is \_\_\_.
2. **Numerical Response:** The maximum volume of the box, to the nearest cubic centimetre is \_\_\_\_.
3. Which of the following represents the polynomial,, expressed in factored form?

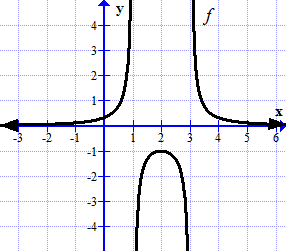
A.  B. 

C.  D. 

1. **Numerical Response:** The polynomial, expressed in factored form is . The value of *a* is \_\_\_\_, *b* is \_\_\_\_, and *c* is \_\_\_\_\_.

**Chapter 9Rational Functions**

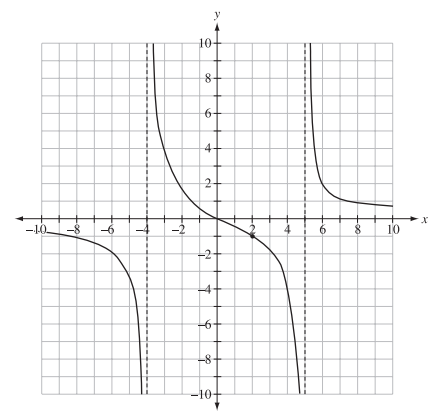
*Use the following information to answer the next question.*

The graph of *f* is shown.

1. The function equation that models the graph above is

A.  B. 

C.  D. 

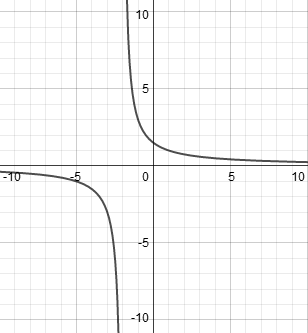
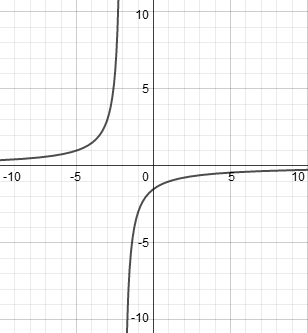
1. **Numerical Response:** The graph of the function below can be expressed in the form.

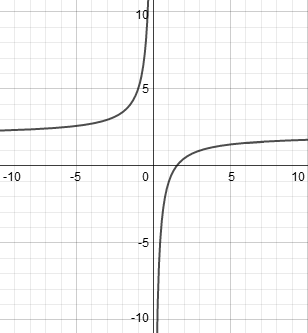
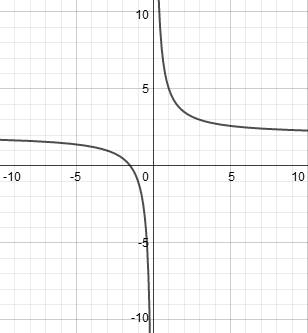
The value of *a* is \_\_\_.

The value of *b* is \_\_\_.

The value of *c* is \_\_\_.

*Use the following information to answer the next question.*

 **Graph 1 Graph 2**

 **Graph 3 Graph 4**

1. **Numerical Response:** Use the numbered graphs above to complete the statements.

 is represented by Graph \_\_\_

 is represented by Graph \_\_\_

 is represented by Graph \_\_\_

 is represented by Graph \_\_\_

1. For the graph of , the domain and range are, respectively,

A.  B. 

C.  D. 

1. **Numerical Response:** The coordinatesof the point of discontinuity on the graph of  are represented by (*a*, *b*).

The value of *a* is \_\_\_.

The value of *b* is \_\_\_.

1. Which of the following statements is true regarding the graph of ?

A. There is a vertical asymptote at *x* = -10.

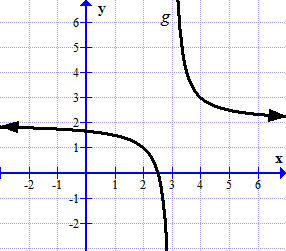
B. There is a hole at *x* = -2.

C. There is a vertical asymptote at *x* = -3.

D. There is a hole at *x* = -3.

*Use the following information to answer to next question.*

The graph of *g* is shown



1. The graph of function *g*, shown above, is a transformation of the graph of . The equation that represents the transformation on function g is

A.  B. 

C.  D. 

1. Which of the following represent the solution(s) to the equation ?

A.  B.  C.  D. 

1. **Numerical Response:** For the graph of , the equation of the horizontal asymptote is  *y* = \_\_\_.
2. The graph of is a transformation of the graph of . If the image point lies on the graph of , what are the coordinates of the original point on the graph of ?

A.  B.  C.  D. 

1. Which statement is true about the behaviour of the function  as the value of *x* approaches, from the left?

A.  B.  C.  D. is undefined

1. **Numerical Response:** The *x*-intercept of the graph of  is 3. The value of *k* is \_\_\_\_\_.

**Chapter 10 Function Operations**

*Use the following information to answer the next two questions.*

The graph of  are shown.



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Graphs of combined functions involving | | | | | |
| 1. |  | 2. |  | 3. |  |

1. **Numerical Response:** Write the number of the graph above which matches each of the following combined functions .

 Graph number \_\_\_

 Graph number \_\_\_

 Graph number \_\_\_

1. Using the graphs of above, the value of  is \_\_\_ .
2. Consider the functions and . The non-permissible values for are

A. -5 and -2 only B. -5, -2, 5 only C. -6, -5, -2, and 5 D. 5 and 2 only

1. Given and , the simplified expression for is

A.  B.  C.  D. 

1. Given and , the domain of the graph of is

A.  B.  C.  D. 

1. If the domain of the graph of is and the domain of the graph of is , then the domain of the graph of is

A.  B.  C.  D. 

1. If the range of the graph of is and the range of the graph of is , then the range of the graph of is

A.  B.  C.  D. 

1. If  and , then the expression  represents the simplified form of the combined function

A.  B.  C.  D. 

1. **Numerical Response:** Given , , and , the simplified expression for , including restrictions on the domain can be expressed as .

The value of *a* is \_\_\_.

The value of *b* is \_\_\_.

The value of *c* is \_\_\_.

**Answers for Relations and Functions**

**Chapter 1Transformations**

1. A

2. D

3. A

4. 5184

5. 115

6. 2608

7. 931

8. D

9. 3142

10. C

11. B

12. B

13. D

14. D

15. C

16. 3,3

17. B

18. C

19. B

20. C

21. A

22. B

23. B

24. D

25. 31

26. 531

27. 5

28. D

29. B

30. 4

31. 321 or 312

**Chapter 2 Radical Functions**

1. B

2. A

3. A

4. 2

5. 6823 or 6832 or 8623 or 8632

6. 15

7. 6.25

8. 1635 or 6135 or 1653 or 6153

9. B

10. C

**Chapter 3 Polynomial Functions**

1. 5

2. 14

3.

4. 4

5. B

6. A

7. 4

8. 13 or 31

9. 4

10. 1155

11. 423

12. 2569 or 5269 or 2596 or 5296

13. C

14. 2.11

15. 192

16. A

17. 213

**Chapter 9 Rational Functions**

1. A

2. 9120

3. 3421

4. D

5. 713

6. D

7. A

8. A

9. 1.5

10. A

11. A

12. 6

**Chapter 10 Function Operations**

1. 312

2. 26

3. B

4. D

5. C

6. C

7. D

8. C

9. 211