

1. Given the functions  $f(x) = \sqrt{3-x}$  and  $g(x) = \frac{1}{x^2+1}$ , determine which of the following is correct.

A.  $(f - g)(3) = \frac{1}{10}$

B.  $(gf)(0) = \sqrt{3}$

C.  $\left(\frac{f}{g}\right)(-1) = \frac{1}{4}$

D. More than one of the above

E. None of the above

2. If  $f(x) = \frac{x-1}{x+4}$  and  $g(x) = x - 2$ , find  $(fg)(x) = 0$ .

A.  $x = -4, 2$

B.  $x = 1, 2$

C.  $x = 3$

D.  $x = -2$

E. None of the above

3. Solve  $81x^2 > 16x$  and express the solutions in interval notation.

A.  $\left(\frac{16}{81}, \infty\right)$

B.  $\left(-\frac{4}{9}, \frac{4}{9}\right)$

C.  $\left(-\infty, -\frac{4}{9}\right) \cup \left(\frac{4}{9}, \infty\right)$

D.  $\left(-\infty, 0\right) \cup \left(\frac{16}{81}, \infty\right)$

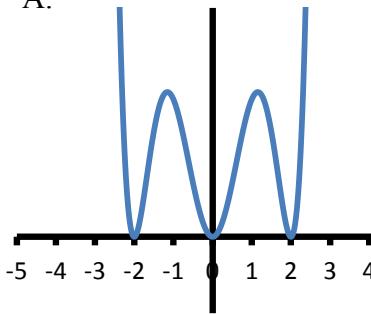
E.  $\left(-\infty, \infty\right)$

4. Solve  $\frac{x+2}{x^2(3-x)} \geq 0$  and express the solutions in interval notation.

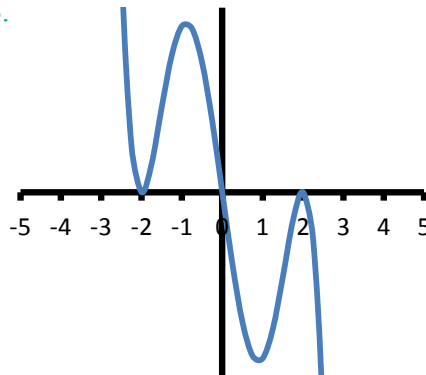
- A.  $[-2, 0) \cup (0, 3)$   
 B.  $(-\infty, -2] \cup (3, \infty)$   
 C.  $[-2, 3)$   
 D.  $(-\infty, -2) \cup (3, \infty)$   
 E.  $(-2, 0) \cup (0, 3)$

5. Which of the following is the graph of the function  $f(x) = -x(x+2)^2(x-2)^2$ ?  
 (assume each tick mark represents 1 unit)

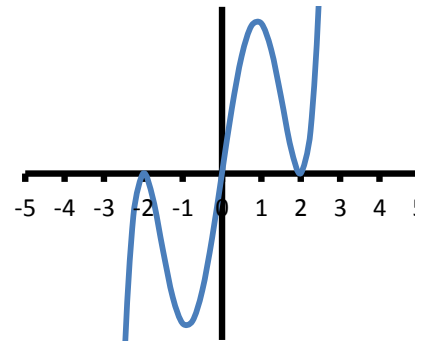
A.



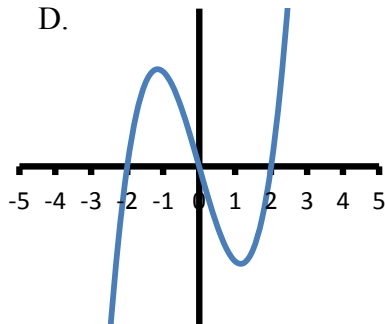
B.



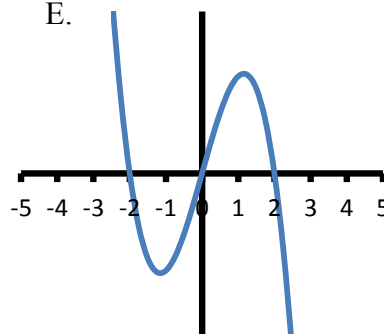
C.



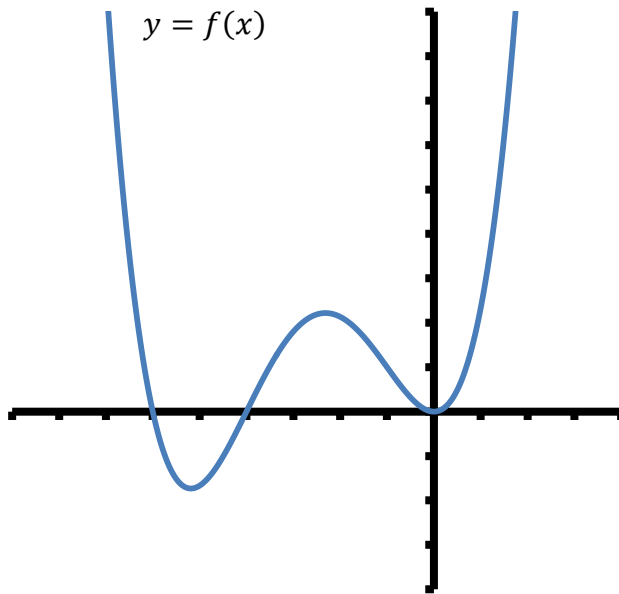
D.



E.



6. Determine which of the following statements is/are true about the graph of the function  $y = f(x)$  given below? (assume each tick mark represents 1 unit)



- |      |   |
|------|---|
| I.   | The domain of the function is $(-\infty, \infty)$   |
| II.  | The zeros of the function are $-6$ , $-4$ , and $0$ |
| III. | $f(x) < 0$ on the interval $(-6, -4)$               |

- A. I and II only  
B. I and III only  
C. II and III only  
D. I, II, and III are all true  
E. I, II, and III are all false

7. Suppose  $w$  is directly proportional to the product of  $x$  and  $y$ , and inversely proportional to the sum of  $v$  and  $z$ . Find the constant of proportionality if  $w = 5$  when  $x = 2$ ,  $y = 1$ ,  $v = 4$ , and  $z = 5$ .

- A.  $\frac{45}{2}$   
B.  $\frac{100}{3}$   
C. 15  
D. 50  
E. None of the above

8. Solve the system of equations for  $x$ .

$$\begin{cases} x^2 + y^2 = 25 \\ x^2 - y = 5 \end{cases}$$

- A.  $x = -1, 0, 1$
- B.  $x = -3, 0, 3$
- C.  $x = 0, 1$
- D.  $x = 0, 3$
- E. None of the above

9. Solve the system of equations for  $y$ .

$$\begin{cases} x - 3y = 1 \\ -2x + 6y = 2 \end{cases}$$

- A.  $y = \frac{1}{2}$
- B.  $y = 0$
- C. There are infinitely many solutions
- D. There is no solution
- E. None of the above

10. Which of the following is true about the system of equations given by:

$$\begin{cases} 3x - y = -6 \\ 9x + 3y = 18 \end{cases}$$

- A. The solution lies below the  $x$ -axis
- B. The solution lies above the  $x$ -axis
- C. The solution lies on the  $x$ -axis
- D. There is no solution
- E. There are infinitely many solutions

11. Given in each table are several values of two functions  $f$  and  $g$ . Use this information to determine which of the following compositions is/are true:

$x$	$f(x)$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4

$x$	$g(x)$
$\frac{1}{2}$	2
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$
4	$\frac{1}{4}$

A.  $(g \circ f^{-1})(2) = 1$

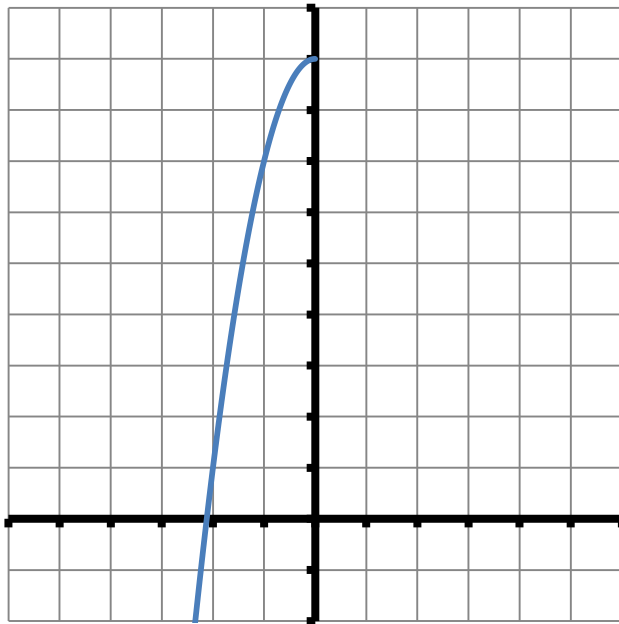
B.  $(f \circ g^{-1})\left(\frac{1}{2}\right) = 2$

C.  $(f^{-1} \circ g^{-1})(2) = 4$

D. More than one of the above

E. None of the above

12. Given the function  $f(x) = 9 - 2x^2, x \leq 0$  and its graph, determine which of the following statements is/are true.



I.  $f$  is a one-to-one function

II.  $f(-2) = 1$

III.  $f^{-1}(7) = -1$

A. I only

B. II only

C. III only

D. I, II, and III are all true

E. I, II, and III are all false

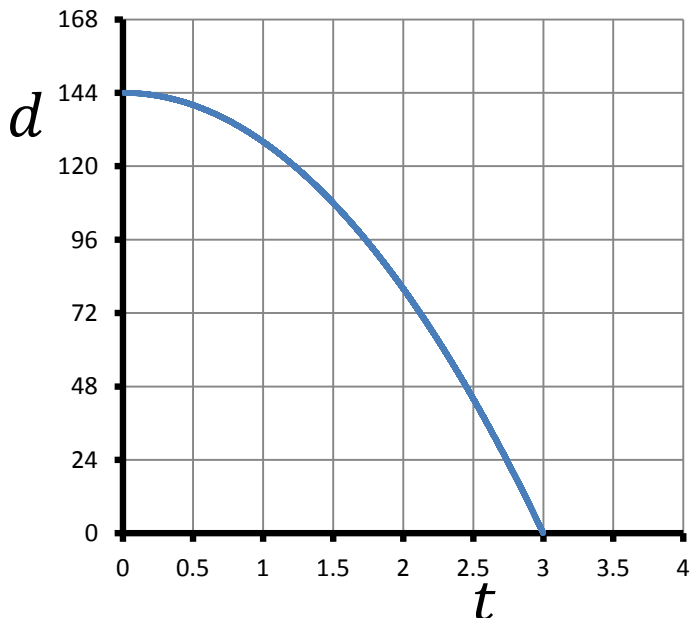
13. A person's IQ varies directly with their mental age and inversely with their chronological age. A person with a mental age of 30 and a chronological age of 25 has an IQ of 120. What is the chronological age of a person with a mental age of 48 and an IQ of 150?

A. 144  
B. 100  
C. 50  
D. 40  
E. 32

14. A short airplane trip between two cities took 30 minutes when traveling with the wind. The return trip took 45 minutes when traveling against the wind. If the speed of the plane with no wind is 320 mph, find the total distance travelled round trip.

A. Less than 100 miles  
B. Between 100 and 200 miles  
C. Between 200 and 300 miles  
D. Between 300 and 400 miles  
E. More than 400 miles

15. When an object is dropped from the top of a 144 foot building, the distance of the object above the ground  $d$  (in feet) after  $t$  seconds is given by the function  $d(t) = -16t^2 + 144$ . What is the domain of  $d$  and  $d^{-1}$ ?



A. Domain of  $d$ :  $(0, 3)$   
Domain of  $d^{-1}$ :  $(0, 144)$   
B. Domain of  $d$ :  $(-\infty, 144)$   
Domain of  $d^{-1}$ :  $(-\infty, 3)$   
C. Domain of  $d$ :  $(0, 144)$   
Domain of  $d^{-1}$ :  $(0, 3)$   
D. Domain of  $d$ :  $(-\infty, 3)$   
Domain of  $d^{-1}$ :  $(-\infty, 144)$   
E. Domain of  $d$ :  $(-\infty, \infty)$   
Domain of  $d^{-1}$ :  $(-\infty, \infty)$