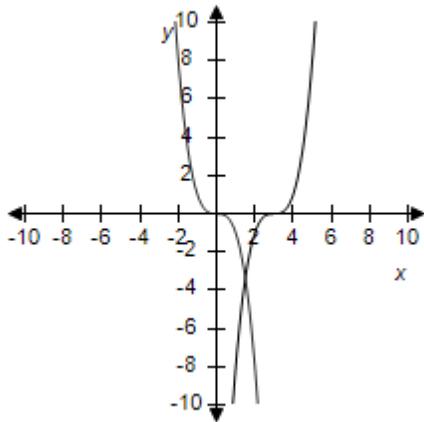
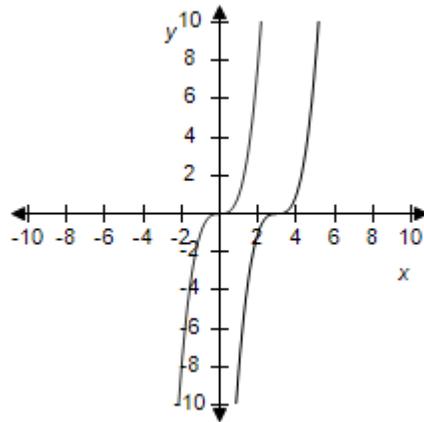


1. Select the graph of  $y = x^3$  and the transformation  $f(x) = (x - 3)^3$ .

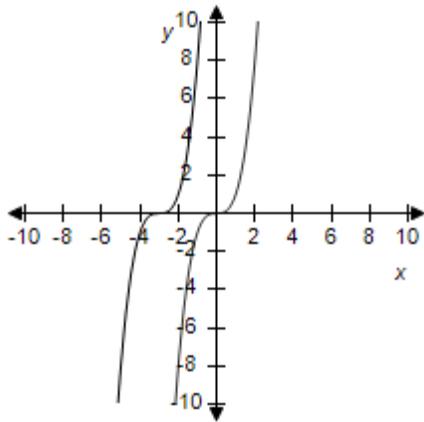
a.



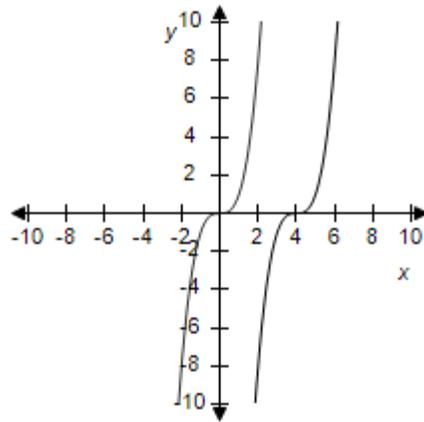
b.



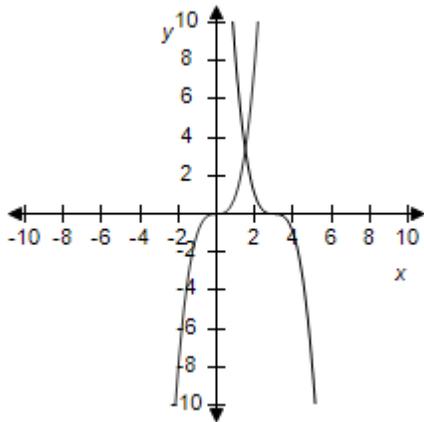
c.



d.

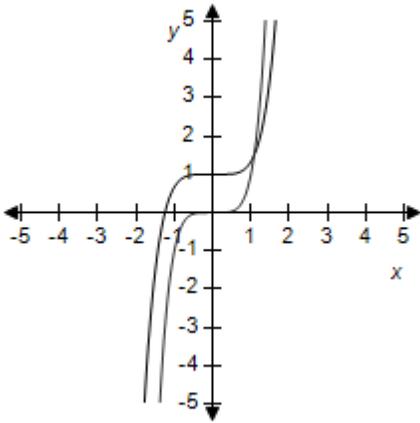


e.

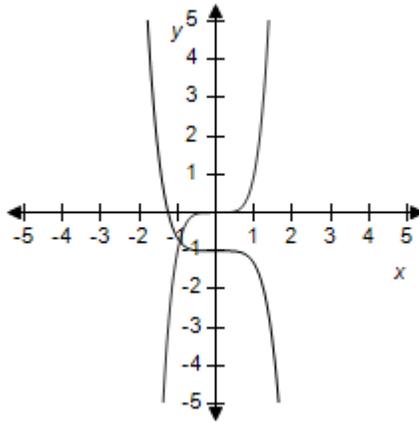


2. Select the graph of  $y = x^5$  and the transformation  $f(x) = 1 - \frac{1}{3}x^5$ .

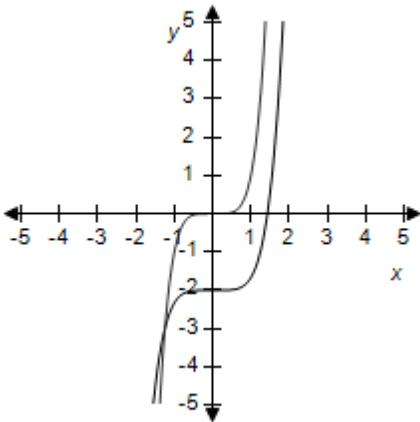
a.



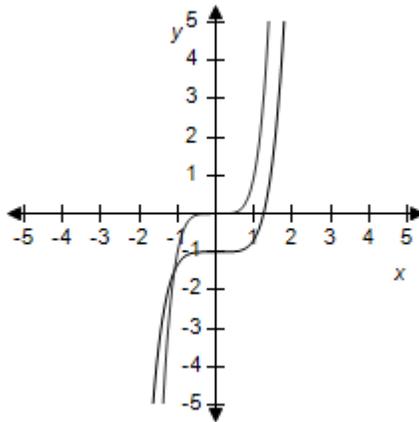
b.



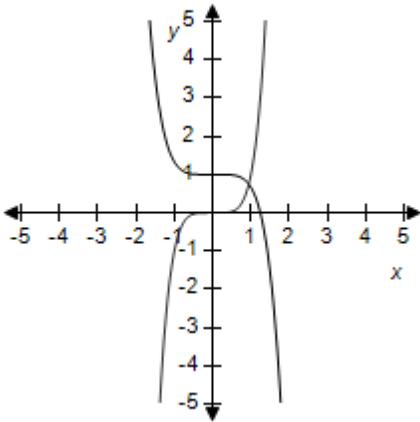
c.



d.

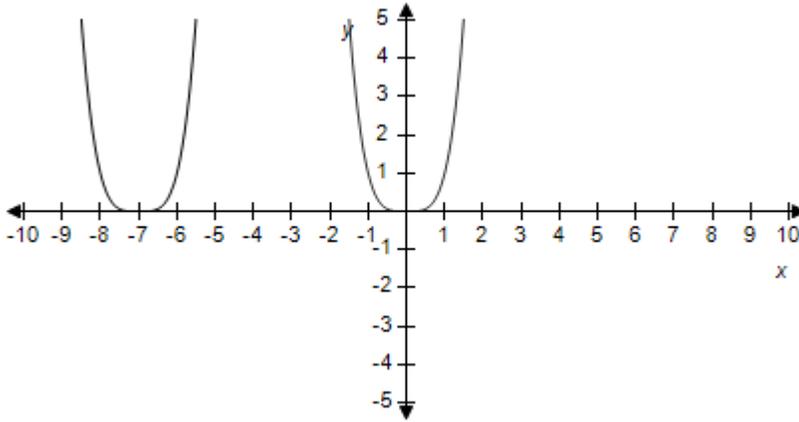


e.

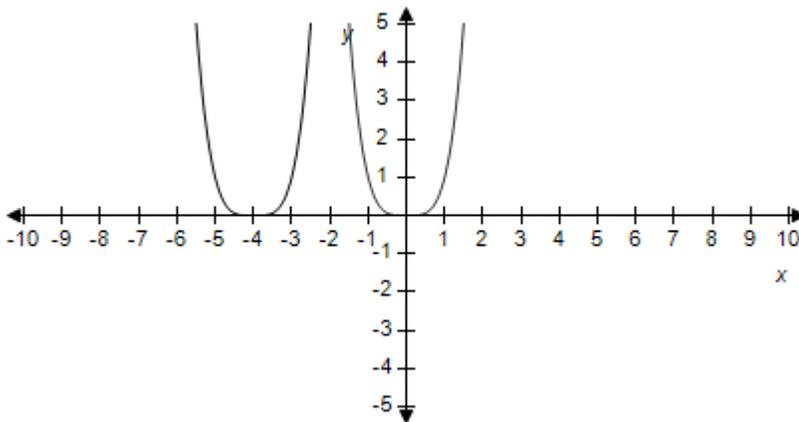


3. Select the graph of  $y = x^4$  and the transformation  $f(x) = (x + 4)^4$ .

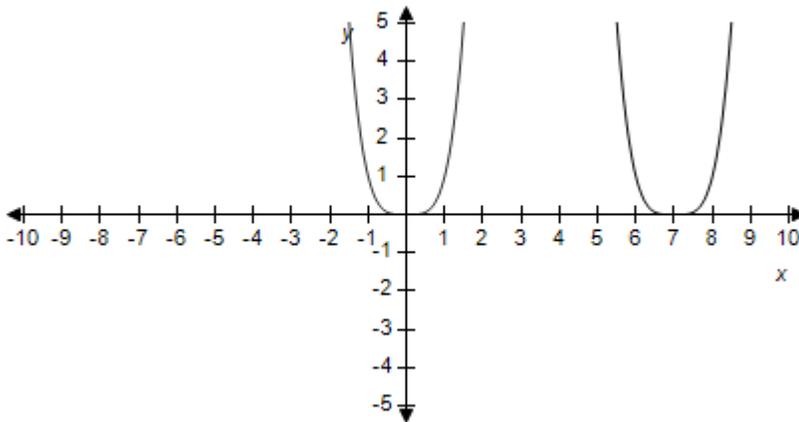
a.



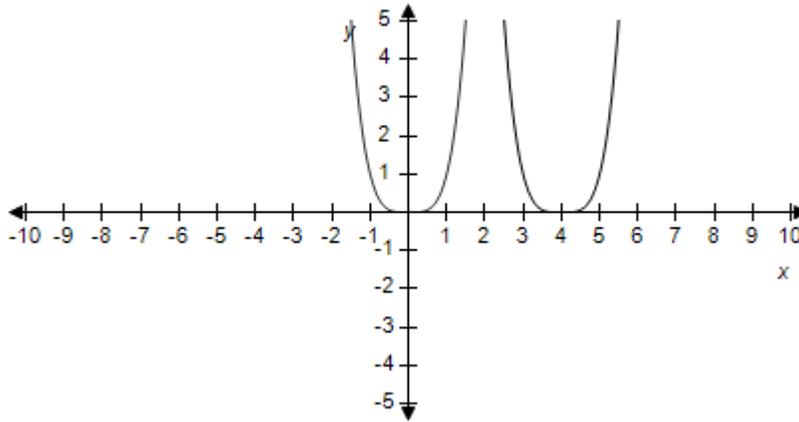
b.



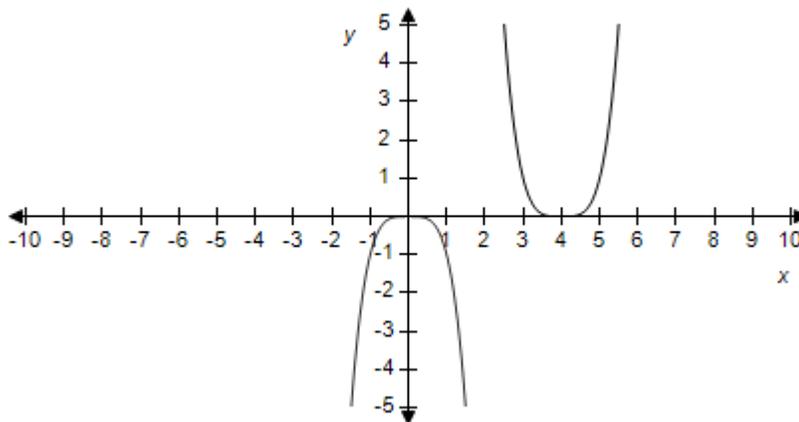
c.



d.



e.



4. Select the correct description of right-hand and left-hand behavior of the graph of the polynomial function.

$$f(x) = \frac{1}{2}x^3 + 3x$$

- a. Rises to the left, falls to the right
- b. Rises to the right, rises to the left
- c. Falls to the left, rises to the right
- d. Falls to the right
- e. Falls to the left, falls to the right

5. Select the correct description of right-hand and left-hand behavior of the graph of the polynomial function.

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

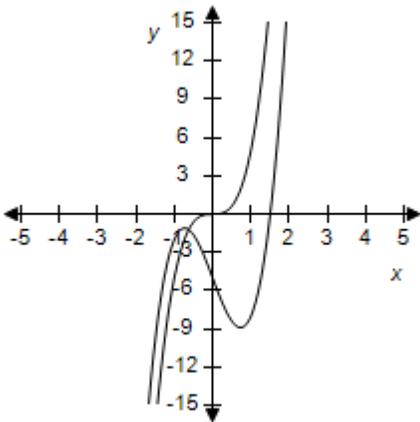
- a. Falls to the left, rises to the right
- b. Falls to the left, falls to the right

- c. Rises to the left, rises to the right
- d. Rises to the left, falls to the right
- e. Falls to the left

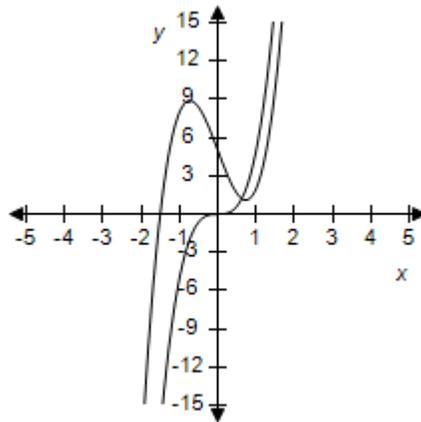
6. Select the correct graph of the functions  $f$  and  $g$  in the same viewing window. Zoom out sufficiently far to show that the right-hand and left-hand behaviors of  $f$  and  $g$  appear identical.

$$f(x) = 5x^3 - 8x + 1, \quad g(x) = 5x^3$$

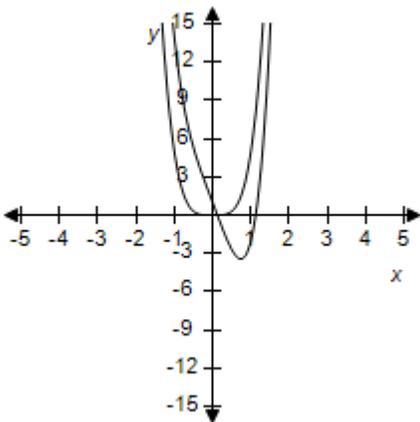
a.



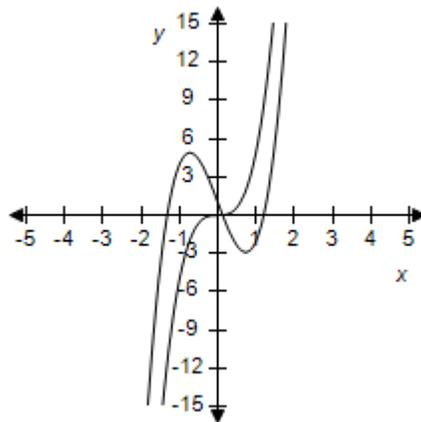
b.



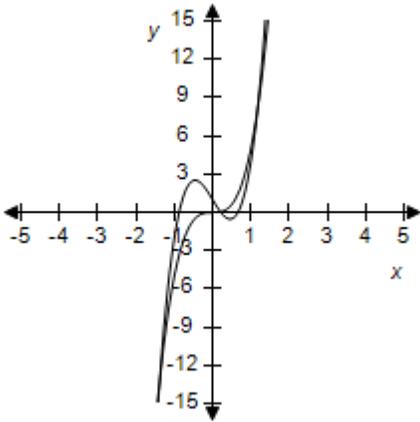
c.



d.



e.



7. Find all the real zeros of the polynomial function.

$$f(x) = x^2 - 9$$

- a.  $-9$
- b.  $3$
- c.  $-3$
- d.  $9$
- e.  $\pm 3$

8. Find all the real zeros of the polynomial function and determine the multiplicity of each zero and the number of turning points of the graph of the function.

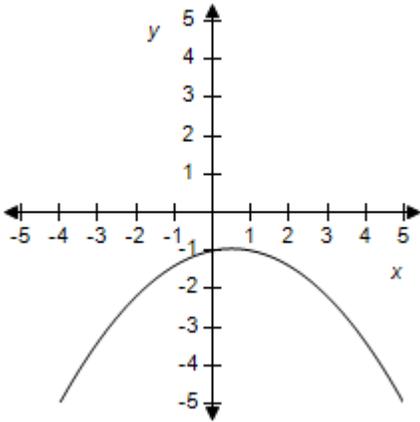
$$h(t) = t^2 - 14t + 49$$

- a. All Real Zeros:  $0, 7$ ; Even multiplicity; number of turning points: 2
- b. All Real Zeros:  $7$ ; Even multiplicity; number of turning points: 1
- c. All Real Zeros:  $0, 49$ ; Odd multiplicity; number of turning points: 2
- d. All Real Zeros:  $0, 1, 7$ ; Even multiplicity; number of turning points: 3
- e. All Real Zeros:  $7$ ; Odd multiplicity; number of turning points: 1

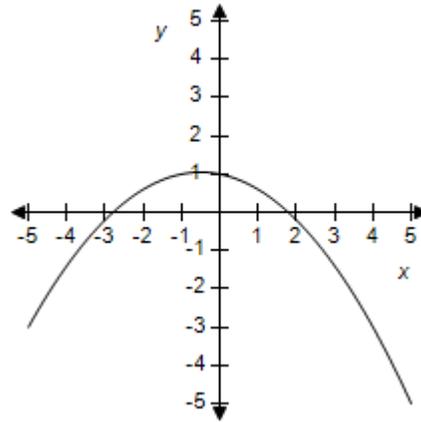
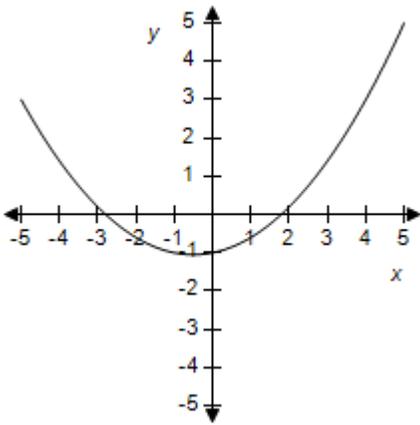
9. Select the correct graph of the function.

$$f(x) = \frac{1}{5}x^2 + \frac{1}{5}x - \frac{5}{5}$$

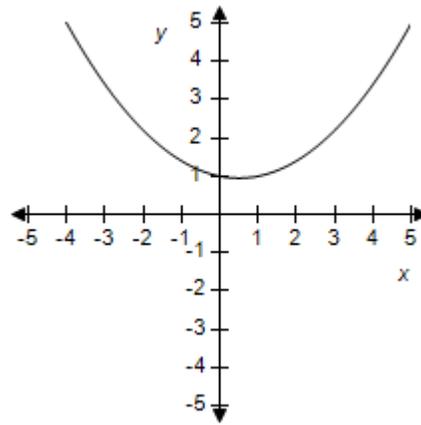
- a.
- b.



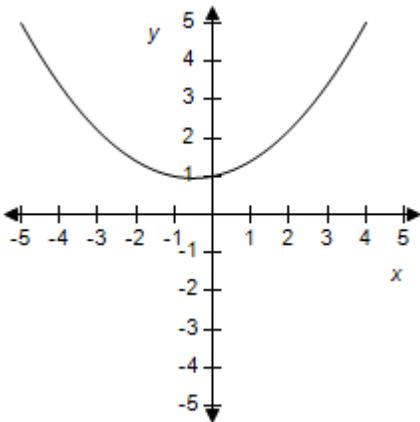
c.



d.



e.



10. Find all the real zeros of the polynomial function.

$$f(x) = x^5 - 18x^3 + 81x$$

a.  $0, \pm\sqrt{9}$

- b.  $0, \sqrt{9}$
- c.  $0, 9$
- d.  $0, -9$
- e.  $0, -\sqrt{9}$

11. Determine the number of turning points of the graph of the function.

$$f(x) = 2x^4 + 4x^2 + 4$$

- a. Number of turning points: 3
- b. Number of turning points: 1
- c. Number of turning points: 5
- d. Number of turning points: 2
- e. Number of turning points: 4

12. Select from the following which is the polynomial function that has the given zeros.

$0, 5$

- a.  $f(x) = x^2 - 5x$
- b.  $f(x) = x^3 + x^2 - 5x$
- c.  $f(x) = x - 5$
- d.  $f(x) = x + 5$
- e.  $f(x) = x^2 + 5x$

13. Select from the following which is the polynomial function that has the given zeros.

$0, -7, -3$

- a.  $f(x) = -x^3 + 10x^2 + 21x$
- b.  $f(x) = x^3 - 10x^2 + 21x$
- c.  $f(x) = x^3 + 10x^2 + 21x$
- d.  $f(x) = x^3 - 10x^2 - 21x$
- e.  $f(x) = x^3 + 10x^2 - 21x$

14. Select from the following which is the polynomial of degree  $n$  that has the given zero(s).

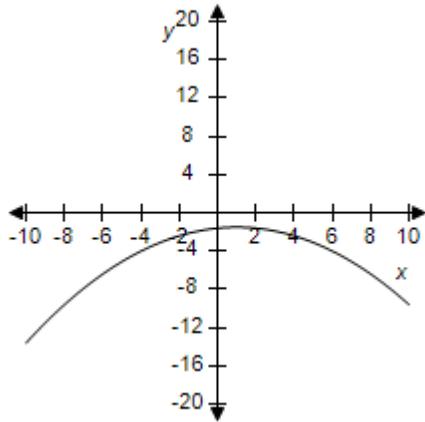
<i>Zero</i>	<i>Degree</i>
$x = -7$	$n = 2$

- a.  $f(x) = x^2 + 14x + 49$
- b.  $f(x) = x^2 - 14x - 49$
- c.  $f(x) = -x^2 + 14x + 49$
- d.  $f(x) = x^2 - 14x + 49$
- e.  $f(x) = x^2 + 14x - 49$

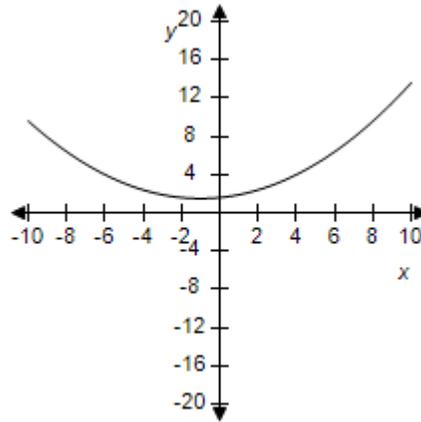
15. Select the graph of the function and determine the zeros of the polynomial.

$$f(t) = \frac{1}{10}(t^2 - 2t + 16)$$

a. No zeros

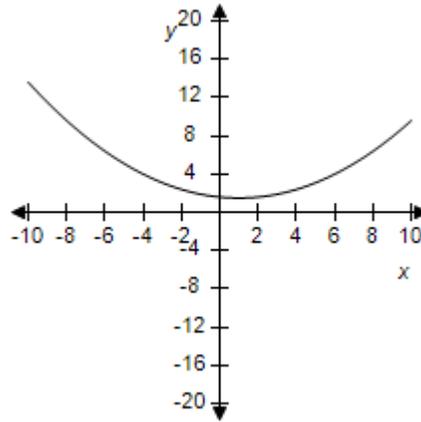
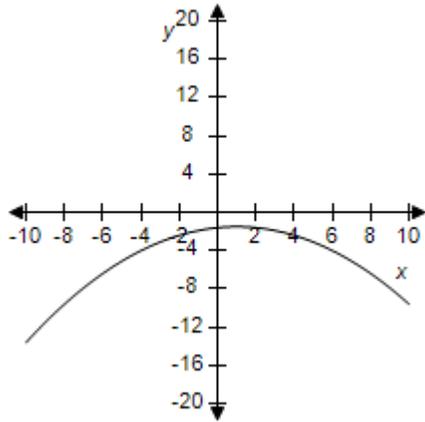


b. No zeros

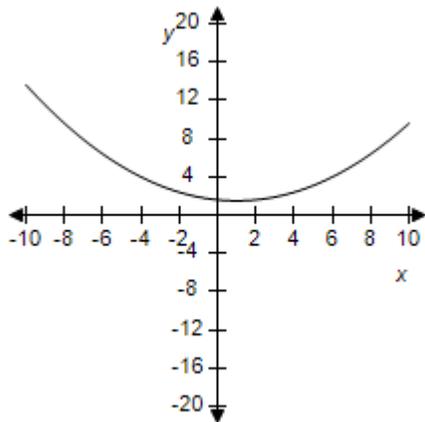


c. 0, 10, -10

d. No zeros



e. 10, -10

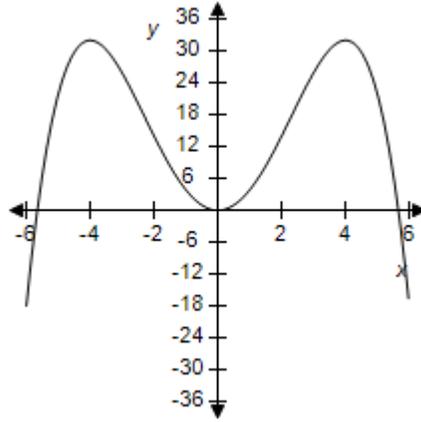
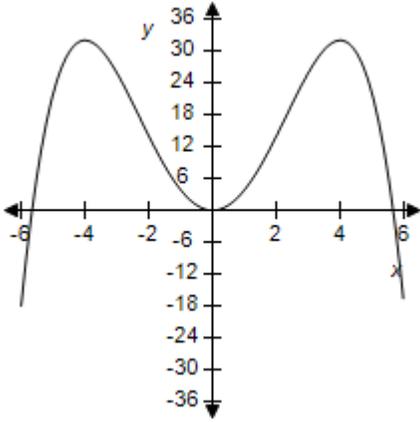


16. Select the graph of the function and use the zero or root feature to approximate the real zeros of the function.

$$f(x) = \frac{1}{8}x^4 - 4x^2$$

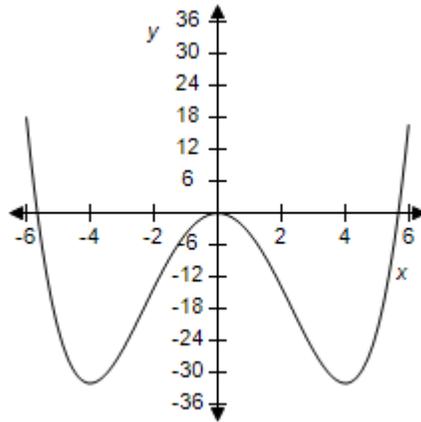
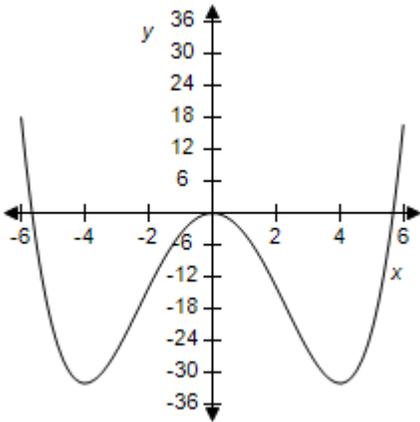
a. Zeros:  $0, -4\sqrt{2}$

b. Zeros:  $0, \pm 4\sqrt{2}$

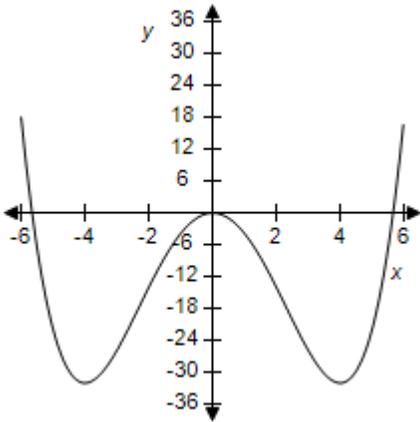


c. Zeros:  $0, -4\sqrt{2}$

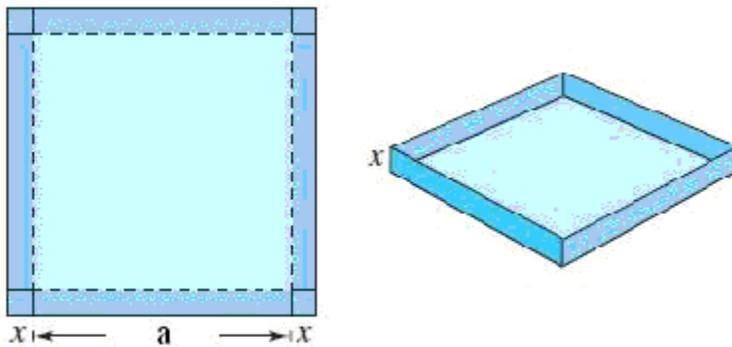
d. Zeros:  $0, \pm 4\sqrt{2}$



e. Zeros:  $0, 4\sqrt{2}$



17. An open box is to be made from a square piece of material, 38 inches on a side, by cutting equal squares with sides of length  $x$  from the corners and turning up the sides (see the figure).



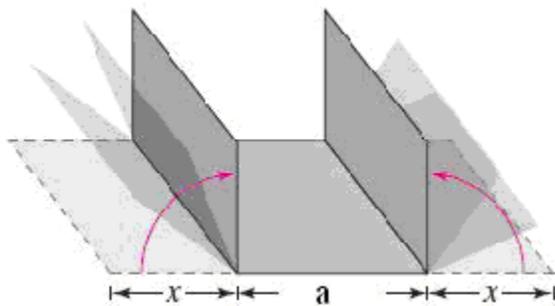
Here,  $a = 38 - 2x$ .

Determine the domain of the following function  $V(x)$ , representing the volume of the box .

$$V(x) = x(38 - 2x)^2$$

- a. Domain:  $0 < x \leq 19$
- b. Domain:  $0 \leq x \leq 38$
- c. Domain:  $0 < x < 38$
- d. Domain:  $0 \leq x \leq 19$
- e. Domain:  $0 < x < 19$

18. A roofing contractor is fabricating gutters from 10-inch aluminum sheeting. The contractor plans to use an aluminum siding folding press to create the gutter by creasing equal lengths for the sidewalls (see the figure).



Here,  $a = 10 - 2x$ , where  $x$  represents the height of the sidewall of the gutter.

Write a function  $A$  that represents the cross-sectional area of the gutter.

- a.  $A = -2x^2 + 10x$
- b.  $A = 10x^2 - 2x$
- c.  $A = -10x - 2x^2$

d.  $A = 2x^2 - 10x$

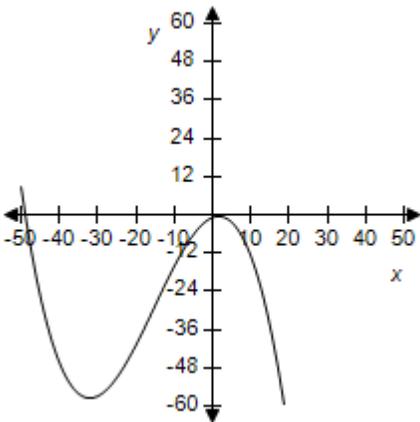
e.  $A = 2x^2 + 10x$

19. The growth of a red oak tree is approximated by the function

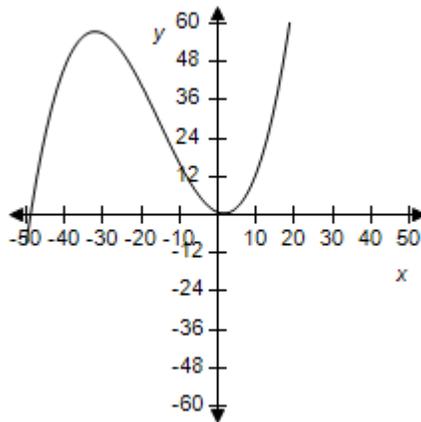
$$G = -0.003t^3 + 0.137t^2 + 0.458t - 0.839$$

where  $G$  is the height of the tree (in feet) and  $t$  ( $2 \leq t \leq 34$ ) is its age (in years).  
Select the correct graph of the function.

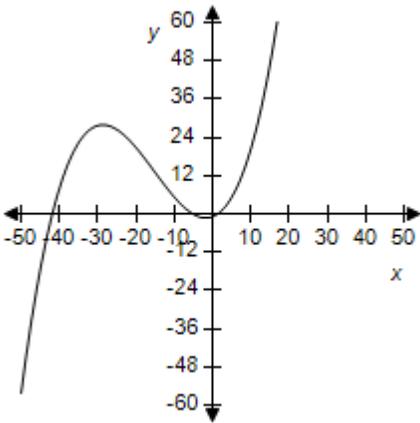
a.



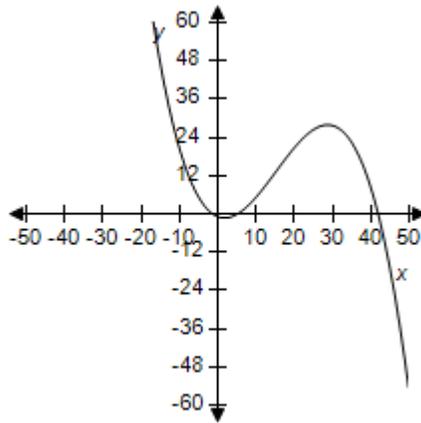
b.



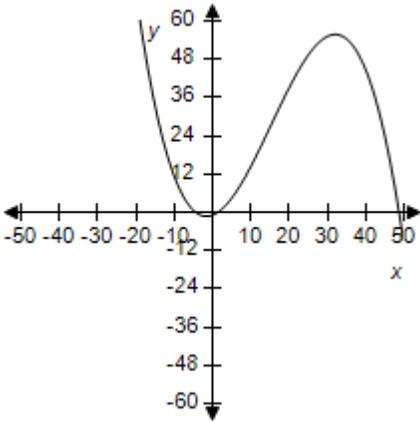
c.



d.



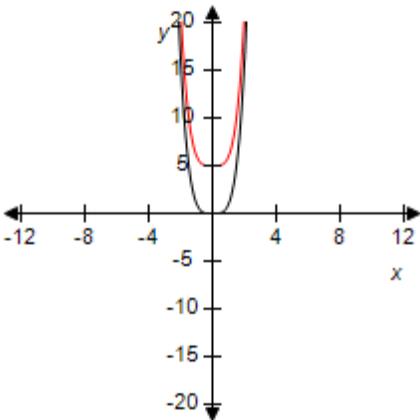
e.



20. Select the correct graph of the function given by  $f(x) = x^4$ . Explain how the graph of function  $g$  differs (if it does) from the graph of function  $f$ .

$$g(x) = f(x) + 5$$

a.



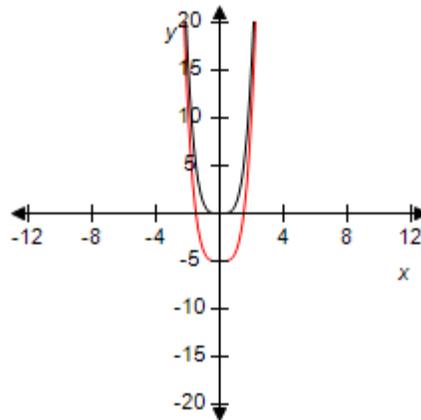
$f =$

$g =$

Vertical shift up 5 units.

c.

b.

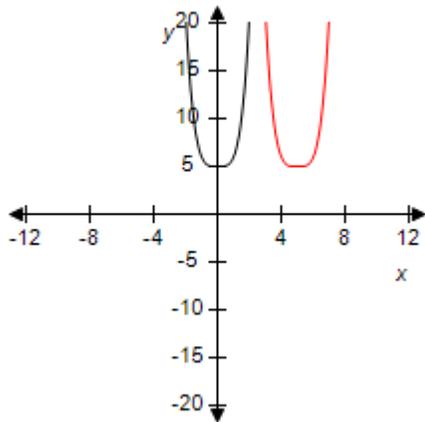


$f =$

$g =$

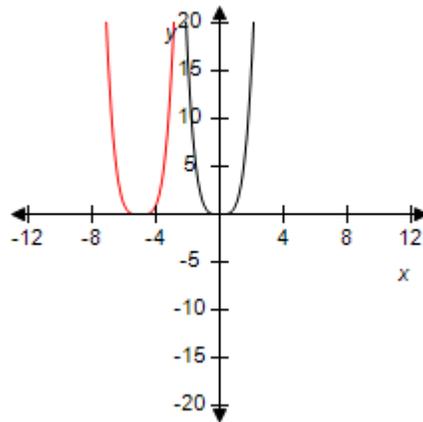
Vertical shift down 5 units.

d.



$f =$    
 $g =$

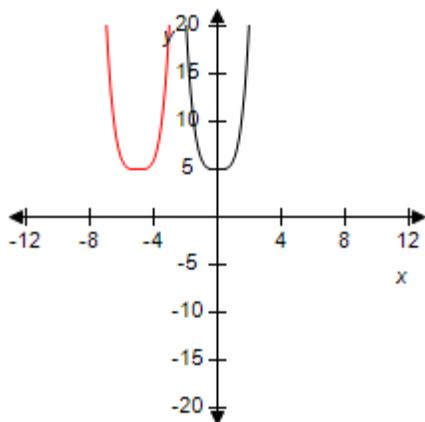
Horizontal shift right <sup>5</sup> units.



$f =$    
 $g =$

Horizontal shift left <sup>5</sup> units.

e.



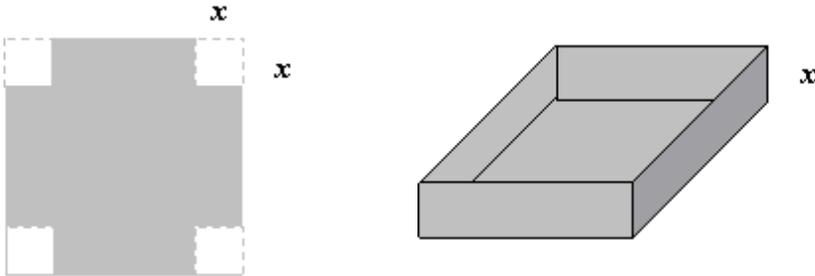
$f =$    
 $g =$

Horizontal shift left <sup>5</sup> units.

21. Describe the right-hand and the left-hand behavior of the graph of  $q(x) = -5x^4 + 12x^3 + 13$ .
- Because the degree is even and the leading coefficient is negative, the graph falls to the left and rises to the right.
  - Because the degree is even and the leading coefficient is negative, the graph rises to the left and falls to the right.
  - Because the degree is even and the leading coefficient is negative, the graph falls to the left and falls to the right.
  - Because the degree is odd and the leading coefficient is negative, the graph rises to the left and rises to the right.

- e. Because the degree is even and the leading coefficient is negative, the graph rises to the left and rises to the right.

22. An open box is to be made from a square piece of cardboard, 33 inches on a side, by cutting equal squares with sides of length  $x$  from the corners and turning up the sides (see the figure below). Determine the function  $V$  in terms of  $x$  that represents the volume of the box.



- a.  $V(x) = -4x^3 + 66x^2 - 33x$   
 b.  $V(x) = -2x^3 + 33x^2$   
 c.  $V(x) = 4x^3 - 132x^2 + 1089x$   
 d.  $V(x) = -4x^3 + 66x^2$   
 e.  $V(x) = 4x^3 - 66x^2 + 33x$

23. Tell whether the function  $y = x^5 + 9x^3$  is even or odd. If it is neither, indicate so.

- a. even  
 b. odd  
 c. neither

24. Find all real zeros of the polynomial  $f(x) = x^3 - x^2 - 9x + 9$  and determine the multiplicity of each.

- a.  $x = 3$ , multiplicity 2;  $x = 1$ , multiplicity 1  
 b.  $x = 3$ , multiplicity 1;  $x = -3$ , multiplicity 1;  $x = 1$ , multiplicity 1  
 c.  $x = 1$ , multiplicity 2;  $x = -3$ , multiplicity 1  
 d.  $x = -3$ , multiplicity 1;  $x = -1$ , multiplicity 1;  $x = 1$ , multiplicity 1  
 e.  $x = 1$ , multiplicity 3