

**Student:** Cole Lamers  
**Date:** 06/21/19

**Instructor:** Kelly Galarneau  
**Course:** CA&T Internet (70263)  
Galarneau

**Assignment:** 3.1, 3.2 Quadratic and  
Polynomial Functions

1. In the following exercise, find the coordinates of the vertex for the parabola defined by the given quadratic function.

$$f(x) = 4(x - 5)^2 + 3$$

The vertex is  (5,3). (Type an ordered pair.)

2. The graph of  $f(x) = -2(x + 3)^2 - 5$  opens down. State whether the statement is true or false.

Choose the correct answer below.

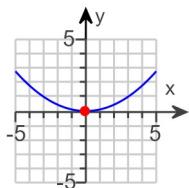
- True  
 False

3. Identify the graph of the following quadratic function.

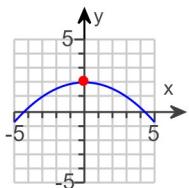
$$y = -\frac{1}{9}x^2$$

Choose the correct graph below.

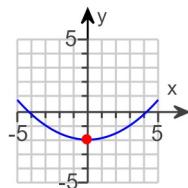
A.



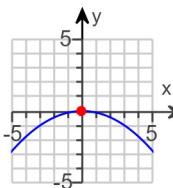
B.



C.



D.



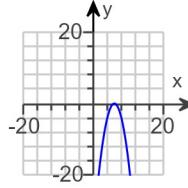
4.

Choose the graph that represents the function.

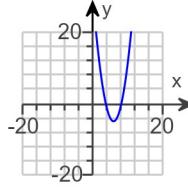
$$f(x) = (x - 6)^2 - 5$$

Choose the correct graph from the choices on the right.

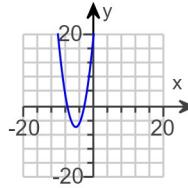
A.



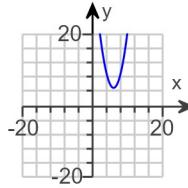
B.



C.



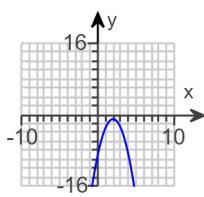
D.



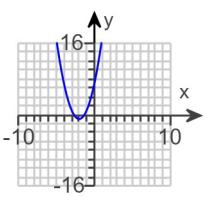
5. Match the function  $f(x) = 2(x + 2)^2 - 1$  with its corresponding graph.

Choose the correct graph below.

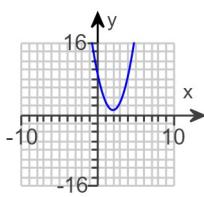
A.



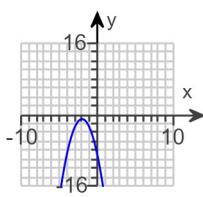
B.



C.



D.



6. Find a quadratic function of the form  $y = ax^2$  that passes through the point  $(3, 27)$ .

$$y = \underline{\hspace{2cm}} 3x^2 \underline{\hspace{2cm}} \text{(Use integers or fractions for any numbers in the expression.)}$$

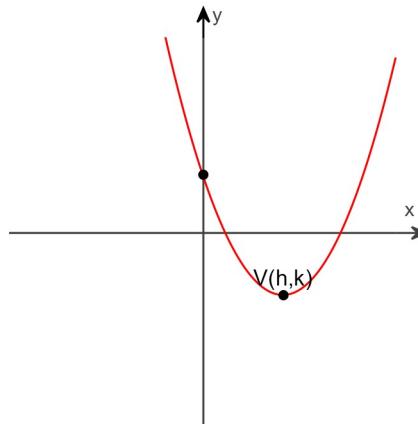
7.

The graph of  $y = ax^2 + bx + c$  is given. Find the signs of  $a$ ,  $b$ , and  $c$  and state which (if any) are zero.

$$a > 0$$

$$b < 0$$

$$c > 0$$



8.

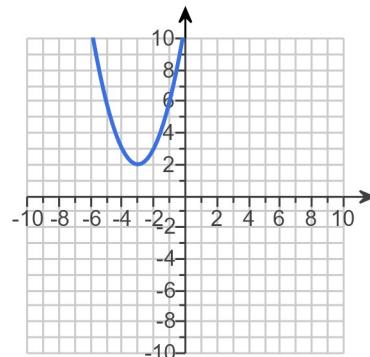
Describe how the given function can be obtained from one of the basic graphs. Then graph the function.

$$g(x) = (x + 3)^2 + 2$$

Describe how the given function can be obtained from one of the basic graphs.

Start with the graph of  $f(x) = \underline{\hspace{2cm}} x^2 \underline{\hspace{2cm}}$ . Shift it left 3 units and then shift it up 2 units.

Use the graphing tool to graph the equation.



9. Consider the polynomial  $f(x) = 2x^5 - 3x^4 + x - 6$ . Write the degree of this polynomial, its leading term, its leading coefficient and its constant term.

The degree of the given polynomial is .

The leading term is .

The leading coefficient is .

The constant term is .

10. The behavior of the function  $y = f(x)$  as  $x \rightarrow \infty$  or  $x \rightarrow -\infty$  is called the \_\_\_\_\_ of the function.

The behavior of the function  $y = f(x)$  as  $x \rightarrow \infty$  or  $x \rightarrow -\infty$  is called the end behavior of the function.

11. The graph of a polynomial function of degree  $n$  has, at most, \_\_\_\_\_ turning points.

The graph of a polynomial function of degree  $n$  has, at most,  $(n-1)$  turning points.

12. Determine the leading term, the leading coefficient, and the degree of the polynomial.

$$g(x) = -2x^3 - 6$$

What is the leading term of the polynomial?

- A.  $-2x^3$   
 B.  $-6$

The leading coefficient of the polynomial is .

The degree of the polynomial is .

13. Explain why the given function is not a polynomial function.

$$f(x) = x^3 + 5|x| - 8$$

Choose the correct answer below.

- A. The function is not a polynomial function because of the presence of a negative constant.  
 B. The function is not a polynomial function because of the presence of  $|x|$ .  
 C. The function is not a polynomial function because the leading coefficient is 1.  
 D. The function is not a polynomial function because the graph is not a continuous curve.

14. Explain why the following function is not a polynomial function.

$$f(x) = 9x^4 + 5\sqrt[5]{x^2}$$

Choose the correct answer below.

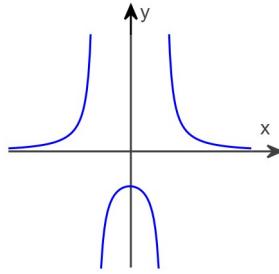
- A. The function is not a polynomial function because there is no  $x$  term.  
 B. The function is not a polynomial function because of the presence of  $9x^4$ .  
 C. The function is not a polynomial function because there is no constant term.  
 D. The function is not a polynomial function because of the presence of  $\sqrt[5]{x^2}$ .

15. Determine whether the function is a polynomial function. If it is, state the degree. If it is not, tell why not.

$$f(x) = 5x + x^{-9}$$

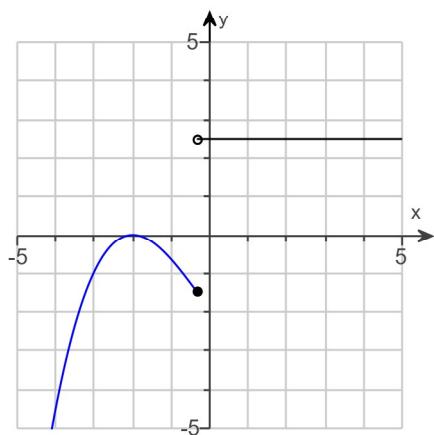
- A. Polynomial of degree  $-9$
- B. Not a polynomial because of the negative power of  $x$
- C. Polynomial of degree  $5$
- D. Not a polynomial because of the negative coefficient of  $x$

16. Is the graph on the right the graph of a polynomial function?



- Yes
- No

17. Explain why the given graph cannot be the graph of a polynomial function.



Choose the correct answer below.

- A. The function is not a polynomial function because the graph has a curve.
- B. The function is not a polynomial function because the graph has a straight line.
- C. The function is not a polynomial function because the graph is not continuous.
- D. The function is not a polynomial function because the graph is continuous.

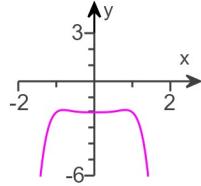
18. Match the following polynomial function with its graph. Use the leading-term test and the y-intercept.

$$f(x) = -x^6 + x^4 - 2$$

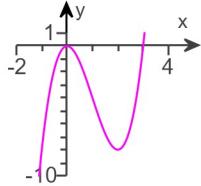
The y-intercept is -2.  
(Type an integer or a decimal.)

Choose the correct graph below.

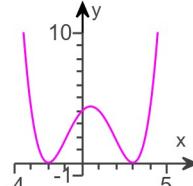
A.



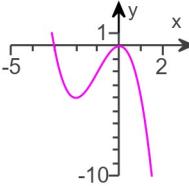
B.



C.



D.

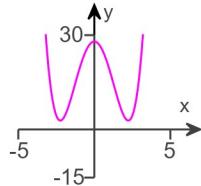


19. Match the following polynomial function with its graph. Use the leading-term test and the y-intercept.

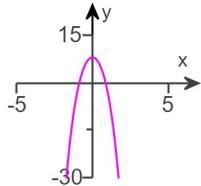
$$f(x) = x^4 - 10x^2 + 8$$

Choose the correct graph below.

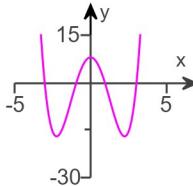
A.



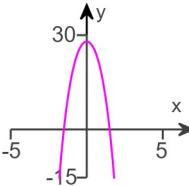
B.



C.



D.



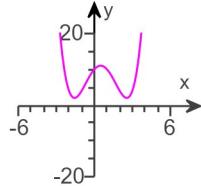
20. Match the polynomial function with its graph. Use the leading-term test and the y-intercept.

$$f(x) = x^3 + 3x^2 + 6x + 10$$

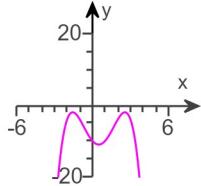
The y-intercept is 10.  
(Type an integer or a decimal.)

Choose the correct graph below.

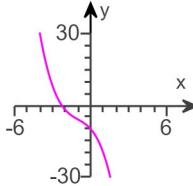
A.



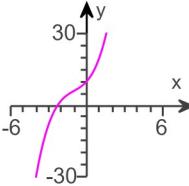
B.



C.



D.



21. For the given polynomial function complete parts (a) through (c).

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

- (a) Find the real zeros of the polynomial function and state the multiplicity for each zero.

The real zero(s) of the polynomial function is/are  .

(Type an integer or a simplified fraction. Type each solution only once. Use a comma to separate answers as needed.)

What is the multiplicity of the smallest x-intercept?

(Type a whole number.)

What is the multiplicity of the largest x-intercept?

(Type a whole number.)

- (b) State whether the graph crosses or touches but does not cross the x-axis at each x-intercept.

What is the graph's behavior at the smallest x-intercept?

- The graph crosses the x-axis.  
 The graph touches but does not cross the x-axis.

What is the graph's behavior at the largest x-intercept?

- The graph crosses the x-axis.  
 The graph touches but does not cross the x-axis.

- (c) What is the maximum possible number of turning points?

(Type a whole number.)

22. For the polynomial function  $f(x) = (x - 5)^3(x + 9)^2$ , (a) find each real zero and its multiplicity, (b) state whether the graph crosses, or touches but does not cross, the x-axis at each x-intercept. (c) What is the maximum number of turning points?

- (a) Find each real zero and its multiplicity.

Find the zeros of f.

(Use a comma to separate answers as needed.)

Find the multiplicity of 5.

Find the multiplicity of -9.

- (b) State whether the graph crosses, or touches but does not cross, the x-axis at each x-intercept.

The graph crosses the x-axis at the intercept 5.

The graph touches the x-axis at the intercept -9.

- (c) State the maximum number of turning points.

The maximum number of turning points on the graph is .

23. (a) Find the real zeros for the given polynomial function and state the multiplicity for each zero and (b) state whether the graph crosses or touches but does not cross the x-axis at each x-intercept. (c) What is the maximum possible number of turning points?

$$f(x) = x^3 - 9x^2 + 18x$$

(a) What are the zeros of the function?

- A. There is one real zero with multiplicity \_\_\_\_\_ at  $x =$  \_\_\_\_\_.
- B. There are two real zeros. The zero at  $x =$  \_\_\_\_\_ has multiplicity 1 and the zero at  $x =$  \_\_\_\_\_ has multiplicity 2.
- C. There are two real zeros with multiplicity 1 at  $x =$  \_\_\_\_\_.  
(Use a comma to separate answers as needed.)
- D. There are three real zeros with multiplicity 1 at  $x =$  .  
(Use a comma to separate answers as needed.)
- E. There are no real zeros.

(b) Where does the graph cross the x-axis?

- A.  $x =$    
(Use a comma to separate answers as needed.)
- B. The graph does not cross the x-axis.

Where does the graph touch but not cross the x-axis?

- A.  $x =$  \_\_\_\_\_  
(Use a comma to separate answers as needed.)
- B. There are no points where the graph touches but does not cross the x-axis.

(c) What is the maximum possible number of turning points?

24. For the given polynomial function  $f$  complete parts (a) through (g).

$$f(x) = x(x + 4)(x - 4)(x + 6)$$

(a) Describe the end behavior of  $f$ . Choose the correct answer below.

- A. The graph falls to the left and rises to the right.
- B. The graph rises to the left and falls to the right.
- C. The graph rises to the left and to the right.
- D. The graph falls to the left and to the right.

(b) Find the real zeros of  $f$ . Determine whether the graph of  $f$  crosses or touches but does not cross the  $x$ -axis at each  $x$ -intercept. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The real zeros of  $f$  are  $-6, -4, 0, 4$ .  
(Type an integer or a simplified fraction. Type each solution only once. Use a comma to separate answers as needed.)
- B. The function  $f$  has no real zeros.

What is the graph's behavior at the smallest  $x$ -intercept? Choose the correct answer below.

- The graph crosses the  $x$ -axis.  
 The graph touches but does not cross the  $x$ -axis.  
 The function  $f$  has no real zeros.

What is the graph's behavior at the next smallest  $x$ -intercept? Choose the correct answer below.

- The graph touches but does not cross the  $x$ -axis.  
 The graph crosses the  $x$ -axis.  
 The function  $f$  has no real zeros.

What is the graph's behavior at the next smallest  $x$ -intercept? Choose the correct answer below.

- The graph crosses the  $x$ -axis.  
 The graph touches but does not cross the  $x$ -axis.  
 The function  $f$  has no real zeros.

What is the graph's behavior at the other  $x$ -intercept? Choose the correct answer below.

- The graph touches but does not cross the  $x$ -axis.  
 The graph crosses the  $x$ -axis.  
 The function  $f$  has no real zeros.

(c) Use the zeros of  $f$  and test numbers to find the intervals over which the graph of  $f$  is above or below the  $x$ -axis. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The graph of  $f$  is above the  $x$ -axis on the interval  $(-\infty, -6) \cup (-4, 0) \cup (4, \infty)$ .  
(Type your answer in interval notation.)
- B. The graph of  $f$  is not above the  $x$ -axis.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The graph of  $f$  is below the  $x$ -axis on the interval  $(-6, -4) \cup (0, 4)$ .  
(Type your answer in interval notation.)

The graph of  $f$  is not below the  $x$ -axis.

(d) Determine the  $y$ -intercept.

The  $y$ -intercept is .

(Simplify your answer. Type an integer or a fraction.)

(e) Find any symmetries of the graph of the function.

- The graph has origin symmetry.
- The graph has no symmetries.
- The graph has  $y$ -axis symmetry.

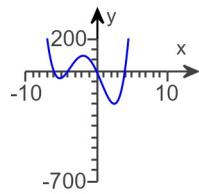
(f) Determine the maximum possible number of turning points.

The maximum possible number of turning points is .

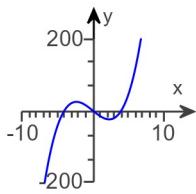
(Type a whole number.)

(g) Sketch the graph of  $f$ . Choose the correct graph below.

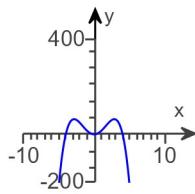
A.



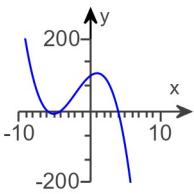
B.



C.



D.



---

25. Watch the video and then solve the problem given below.

[Click here to watch the video.<sup>1</sup>](#)

Use the leading-term test to determine the end behavior of the graph of  $f(x) = -3x^4 + 7x^3 - 5x^2 - 8x + 11$ .

---

$y \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $y \rightarrow -\infty$  as  $x \rightarrow \infty$ .

---

1: [http://mediaplayer.pearsoncmg.com/assets/DcSoPdXwmzuVDS2GB4ane3cnajVwP\\_fr?clip=3](http://mediaplayer.pearsoncmg.com/assets/DcSoPdXwmzuVDS2GB4ane3cnajVwP_fr?clip=3)