

Student: Cole Lamers
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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 . (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.

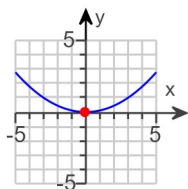
- ☒ True
☐ False

3. Identify the graph of the following quadratic function.

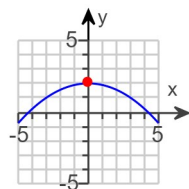
$$y = -\frac{1}{9}x^2$$

Choose the correct graph below.

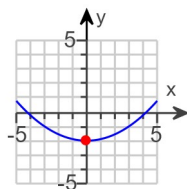
☐ A.



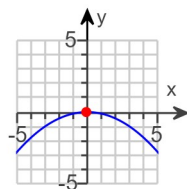
☐ B.



☐ C.



☒ D.

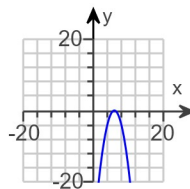


4. Choose the graph that represents the function.

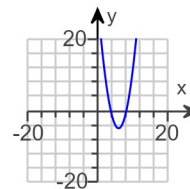
$$f(x) = (x - 6)^2 - 5$$

Choose the correct graph from the choices on the right.

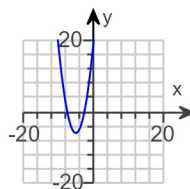
☐ A.



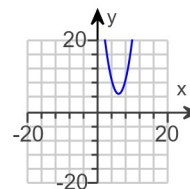
☒ B.



☐ C.



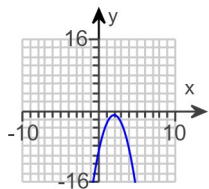
☐ D.



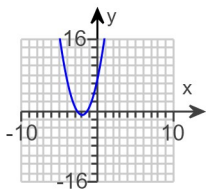
5. Match the function $f(x) = 2(x + 2)^2 - 1$ with its corresponding graph.

Choose the correct graph below.

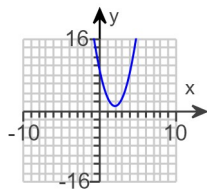
☐ A.



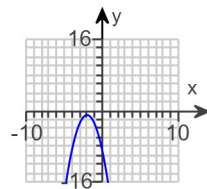
☒ B.



☐ C.



☐ D.



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

$y =$ (Use integers or fractions for any numbers in the expression.)

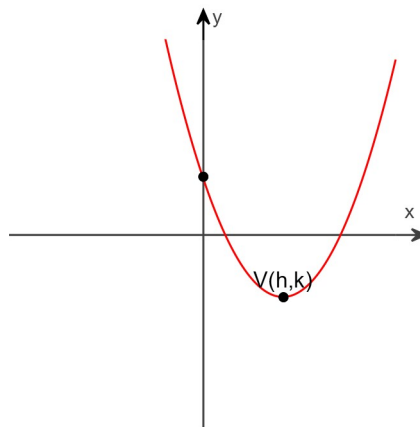
7.

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.

$a > 0$

$b < 0$

$c > 0$



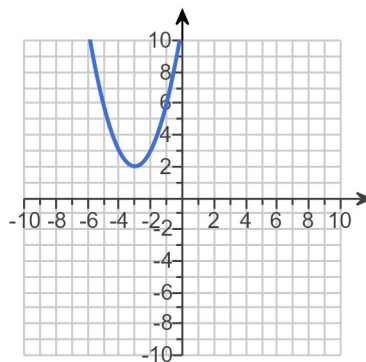
8. Describe how the given function can be obtained from one of the basic graphs. Then graph the function.

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

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

Start with the graph of $f(x) =$. 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.

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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, 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?



$-2x^3$



-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.



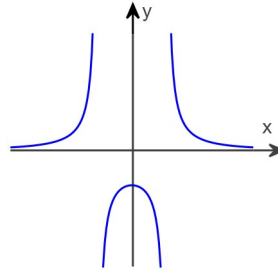
D. The function is not a polynomial function because of the presence of $\sqrt[5]{x^2}$.

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

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

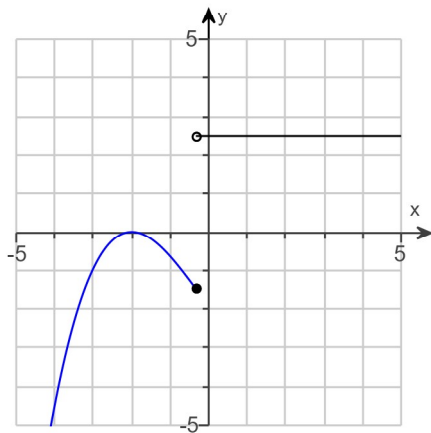
- ☐ A. Polynomial of degree -9
- ☒ B. Not a polynomial because of the negative power of x
- ☐ C. Polynomial of degree 5
- ☐ D. Not a polynomial because of the negative coefficient of x

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.

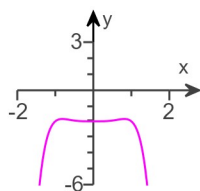
$$f(x) = -x^6 + x^4 - 2$$

The y-intercept is .

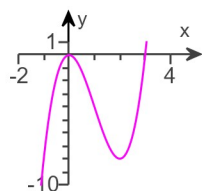
(Type an integer or a decimal.)

Choose the correct graph below.

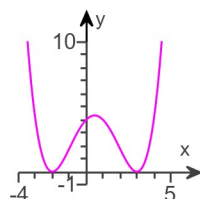
☒ A.



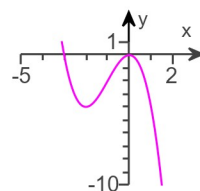
☐ B.



☐ C.



☐ D.

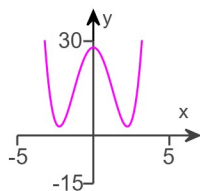


19. Match the following polynomial function with its graph. Use the leading-term test and the y-intercept.

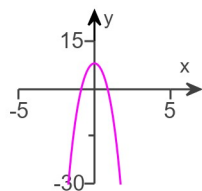
$$f(x) = x^4 - 10x^2 + 8$$

Choose the correct graph below.

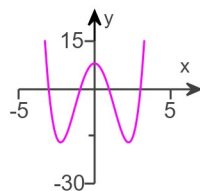
☐ A.



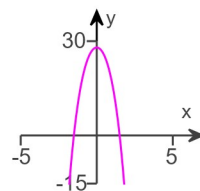
☐ B.



☒ C.



☐ D.



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

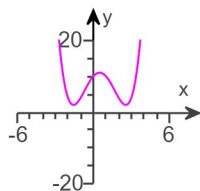
$$f(x) = x^3 + 3x^2 + 6x + 10$$

The y-intercept is .

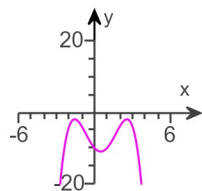
(Type an integer or a decimal.)

Choose the correct graph below.

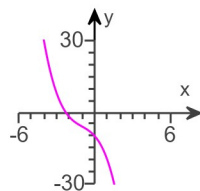
☐ A.



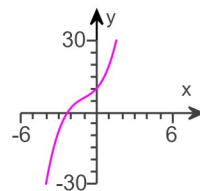
☐ B.



☐ 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 the x-axis at the intercept 5.

The graph 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 .
(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 .
(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 .
(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.

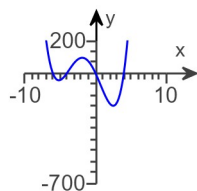
(f) Determine the maximum possible number of turning points.

The maximum possible number of turning points is .

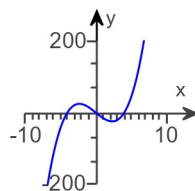
(Type a whole number.)

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

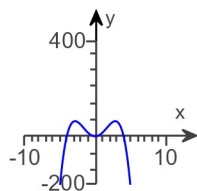
☒ A.



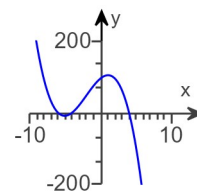
☐ B.



☐ C.



☐ D.



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

[Click here to watch the video.](#)¹

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

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

1: http://mediaplayer.pearsoncmg.com/assets/DcSoPdXwmzuVDS2GB4ane3cnajVwP_fr?clip=3