5.1 Polynomial Functions   Algebra 2 THOMPSON

Degree	Name Using Degree	Polynomial Example	Number of Terms	Name Using Number of Terms
0	constant	6	1	monomial
1	linear	$x + 3$	2	binomial
2	quadratic	$3x^2$	1	monomial
3	cubic	$2x^3 - 5x^2 - 2x$	3	trinomial
4	quartic	$x^4 + 3x^2$	2	binomial
5	quintic	$-2x^5 + 3x^2 - x + 4$	4	polynomial of 4 terms

1. Classify the polynomial by degree and by number of terms.

   $6x^3$

   The polynomial is a   cubic   monomial.

2. Write the polynomial in standard form. Then classify it by degree and by number of terms.

   $5x^3 - 3 + 4x^2$

   Write the polynomial in standard form. Choose the correct answer below.

   Standard form is highest exponent to lowest

   - A. $5x^3 - 3 + 4x^2$
   - ✔ B. $5x^3 + 4x^2 - 3$
   - C. $-3 + 5x^3 + 4x^2$
   - D. $-3 + 4x^2 + 5x^3$

   Classify the polynomial.   **Degree is highest exponent: cubic**

   The polynomial is a   cubic   trinomial   . **3 terms – trinomial**

3. Write the polynomial in standard form. Then classify the polynomial by degree and by number of terms.
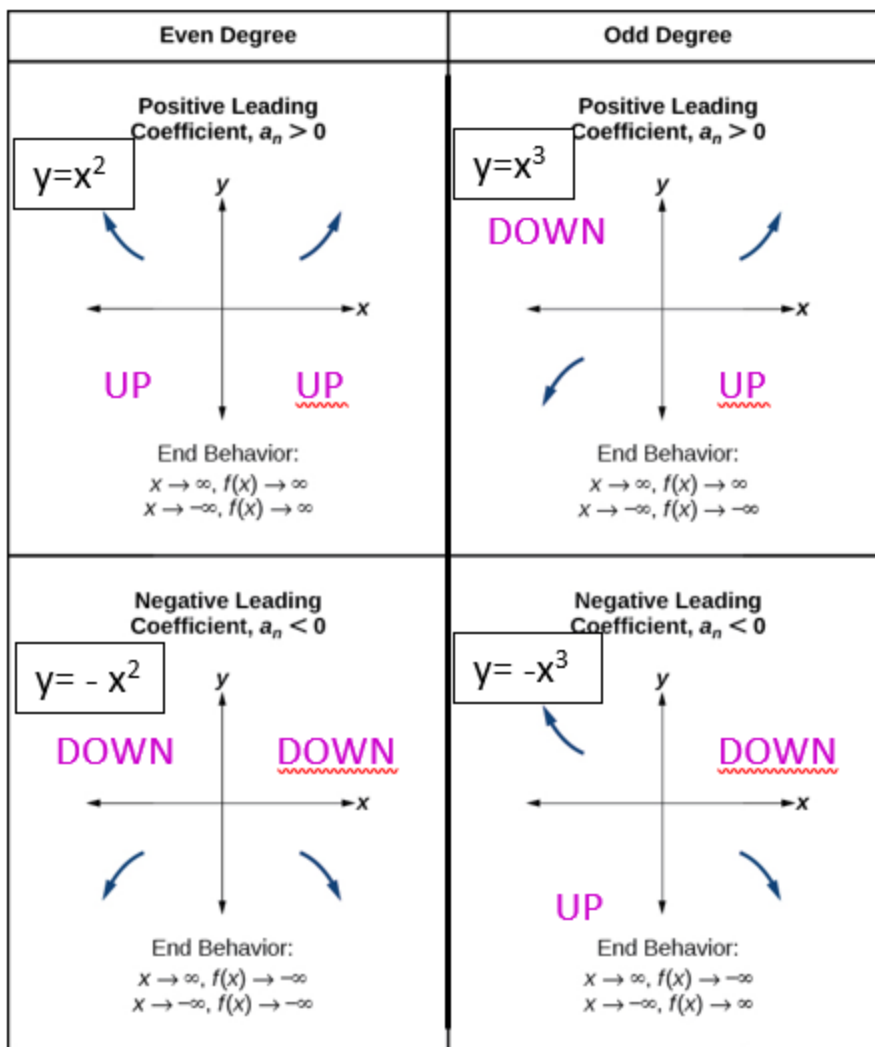
   $5x^2 + 4x^2 - 7x^2$ **combine like terms**

   Write the polynomial in standard form.

   $2x^2$ (Simplify your answer.)

   Classify the polynomial.   **Degree is highest exponent: quadratic**
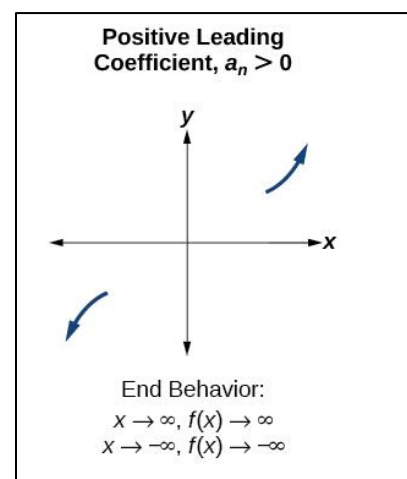
   The polynomial is a quadratic monomial.   **1 term – monomial**

Even Degree	Odd Degree

Even Degree

Positive Leading Coefficient, $a_n > 0$

$y = x^2$

UP   UP

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow \infty$
$x \rightarrow -\infty, f(x) \rightarrow \infty$

Odd Degree

Positive Leading Coefficient, $a_n > 0$

$y = x^3$

DOWN

UP

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow \infty$
$x \rightarrow -\infty, f(x) \rightarrow -\infty$

Negative Leading Coefficient, $a_n < 0$

$y = -x^2$

DOWN   DOWN

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow -\infty$
$x \rightarrow -\infty, f(x) \rightarrow -\infty$

Negative Leading Coefficient, $a_n < 0$

$y = -x^3$

DOWN

UP

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow -\infty$
$x \rightarrow -\infty, f(x) \rightarrow \infty$

4. Determine the end behavior of the graph of the given polynomial function.

$y = 7x^{11} - 5x^8 + 4x^5 + 5$

Choose the correct answer below.

○ up and up   Highest degree is odd
○ up and down   and positive in front of that term
☑ down and up
○ down and down

Positive Leading Coefficient, $a_n > 0$

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow \infty$
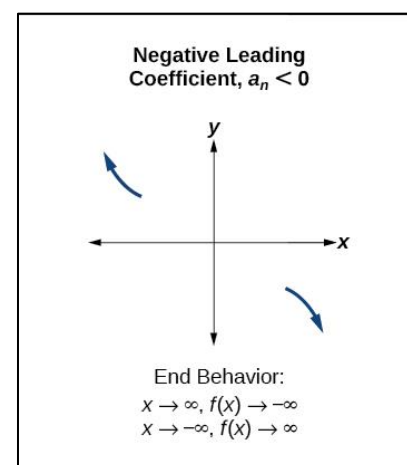$x \rightarrow -\infty, f(x) \rightarrow -\infty$

5. Determine the end behavior of the graph of the given polynomial function.

$y = -2x^5 - 6x^4 + 6x^2 + 1$

Choose the correct answer below.

○ up and up   Highest degree is odd
○ down and down   and negative in front of that term
☑ up and down
○ down and up

Negative Leading Coefficient, $a_n < 0$

End Behavior:
$x \rightarrow \infty, f(x) \rightarrow -\infty$
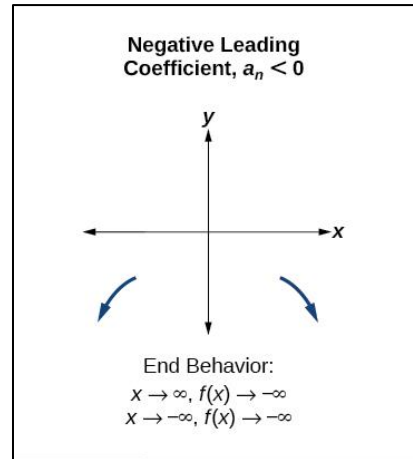$x \rightarrow -\infty, f(x) \rightarrow \infty$

6. Determine the end behavior of the graph of the polynomial function.

$$y = -7x^6 + 16x^5 - 10$$

Choose the correct end behavior below.

Highest degree is even

and negative in front of that term

- ○ A. Down and Up
- ○ B. Up and Up
- ✔ C. Down and Down
- ○ D. Up and Down

Negative Leading Coefficient, $a_n < 0$

End Behavior:
$x \to \infty, f(x) \to -\infty$
$x \to -\infty, f(x) \to -\infty$

7. Describe the shape of the graph of the cubic function by determining the end behavior and number of turning points.

$$y = 4x^3 - 2x - 1$$

What is the end behavior of the graph of the function?

turning points are one less than degree

unless the polynomial is missing the x term

- ○ A. Up and Up
- ✔ B. Down and Up
- ○ C. Up and Down
- ○ D. Down and Down
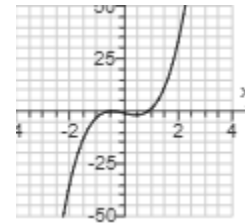
How many turning points are there in the graph of the function?

2 (Type a whole number.)

8. Describe the shape of the graph of the cubic function by determining the end behavior and number of turning points.

$$y = 2x^3$$

What is the end behavior of the graph of the function?

turning points are one less than degree

unless the polynomial is missing the x term

*No x term therefore no turning points

- ○ down and down
- ✔ down and up
- ○ up and up
- ○ up and down
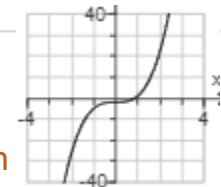
How many turning points are there?

0 (Type a whole number.)

9. Describe the shape of the graph of the cubic function by determining the end behavior and number of turning points.

$y = -4x^3$

What is the end behavior of the graph of the function?

✔ up and down

○ up and up

○ down and down

○ down and up

turning points are one less than degree
unless the polynomial is missing the x term
*No x term therefore no turning points

How many turning points are there?

0 (Type a whole number.)

10-11. Classify the polynomial by degree and by number of terms.

6   no x terms; therefore number is a constant

The polynomial is a constant monomial.

12-16). Write the polynomial in standard form. Then classify it by degree and by number of terms.

$4x^3 - 3 + 8x^2$

⋯

Write the polynomial in standard form. Choose the correct answer below.

★A. $4x^3 + 8x^2 - 3$

○ B. $-3 + 4x^3 + 8x^2$

○ C. $-3 + 8x^2 + 4x^3$

○ D. $4x^3 - 3 + 8x^2$

Classify the polynomial.

The polynomial is a   cubic   trinomial   .

17. Describe the shape of the graph of the cubic function by determining the end behavior and number of turning points.

$$y = 2x^3 - 3x - 3$$

What is the end behavior of the graph of the function?

○ A. Up and Up

⊛ B. Down and Up

○ C. Down and Down

○ D. Up and Down

How many turning points are there in the graph of the function?

2 (Type a whole number.)   degree – 1 with more than one term

18-19. Describe the shape of the graph of the cubic function by determining the end behavior and number of turning points.

$$y = 2x^3$$

What is the end behavior of the graph of the function?

⊛ down and up

○ up and down

○ down and down

○ up and up

How many turning points are there?

0 (Type a whole number.)   degree – but only **one term (zero turns)**

20. Classify the polynomial by degree and by number of terms.

18

...

The polynomial is a constant monomial.

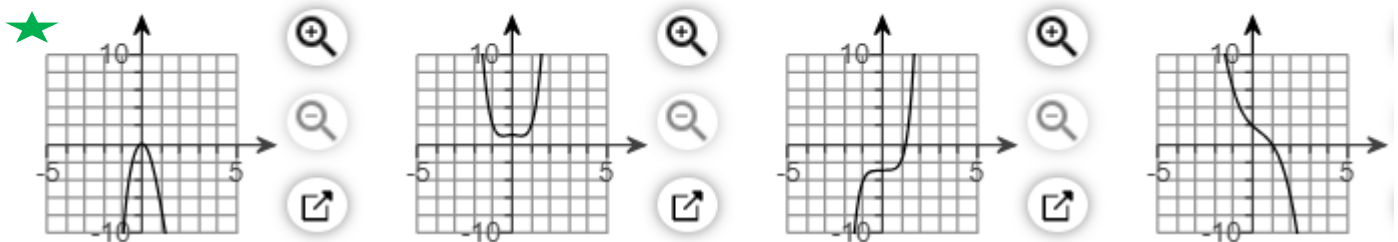**21.** Choose the end behavior diagram that best describes the function.

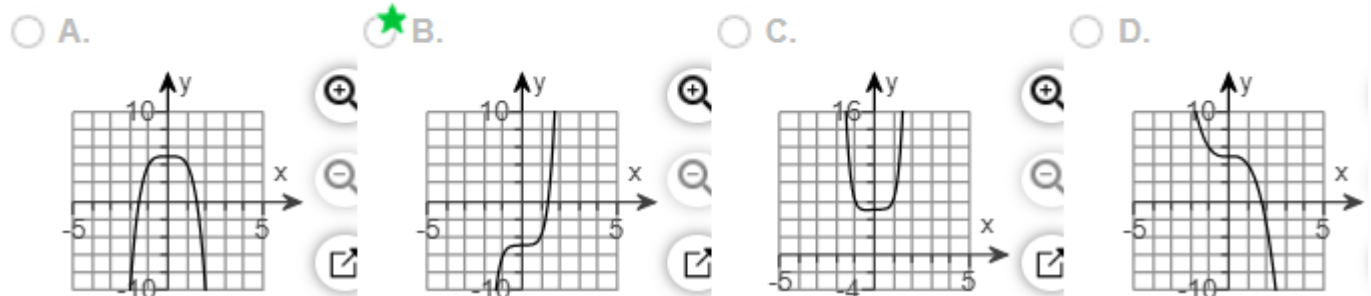$$f(x) = -4.1x^4 + x^6 + 0.6x^7$$

...

Choose the correct diagram below.

A.

★ B.

---
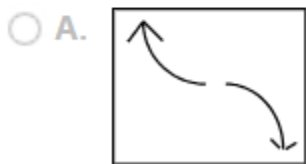
22) Use the leading-term test to match the function $f(x) = -x^6 + 2x^5 - 8x^2$ with one of the following graphs.

★

---

23) Use the leading-term test to match the function $f(x) = x^5 + \frac{1}{11}x - 5$ with one of the given graphs

...

Choose the correct graph below.

A.   ★ B.   C.   D.

24) Solve the following equation.

$$14 = 2 + 6(x - 9)$$

$$14 = 2 + 6x - 54$$

$$66 = 6x$$

The solution set is $\{ 11 \}$.

x-intercept	y-intercept
crosses x-axis	crosses y-axis
set y = 0	set x = 0
(x,0)	(0,y)

25) The points, if any, at which a graph crosses or touches the coordinate axes are called the intercepts.

26) The x-intercepts of the graph of an equation are those x-values for which $y = 0$.

27) Given that the intercepts of a graph are $(-1,0)$ and $(0,8)$, choose the statement that is true.

. . .

Select the correct choice below.

○ A. The x-intercepts are −1 and 8.

★B. The x-intercept is −1, and the y-intercept is 8.

○ C. The y-intercepts are −1 and 8.

○ D. The y-intercept is −1, and the x-intercept is 8.

28) Find the intercepts and graph the equation by plotting points.

$$y = x^2 - 1$$

⭐A. The x-intercept(s) is/are 1, − 1 .
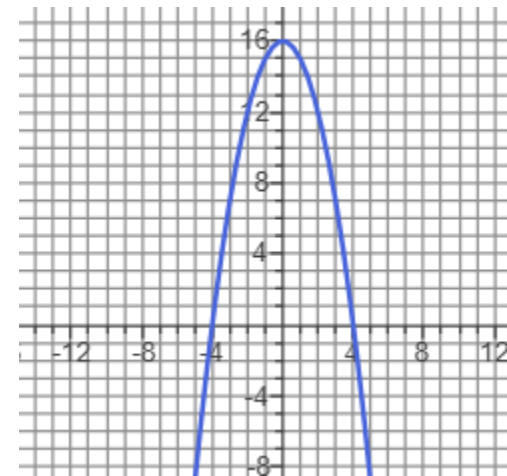
A. The y-intercept(s) is/are − 1 .

Plot intercepts
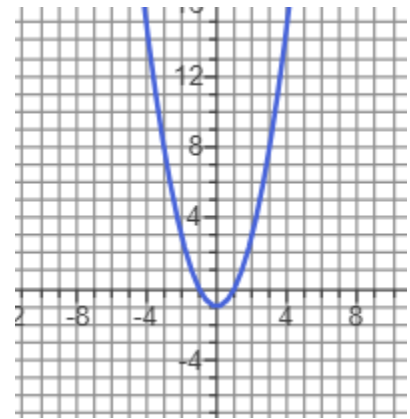
29) Find the intercepts and graph the equation by plotting points.

$$y = -x^2 + 16$$

A. The x-intercept(s) is/are 4, − 4 .
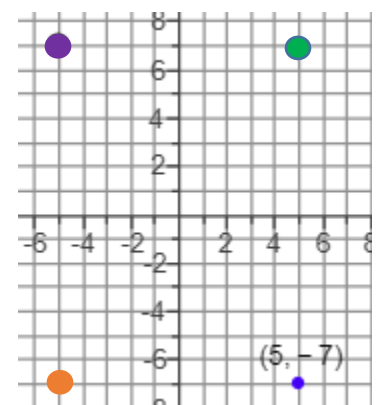
A. The y-intercept(s) is/are 16 .

Plot intercepts

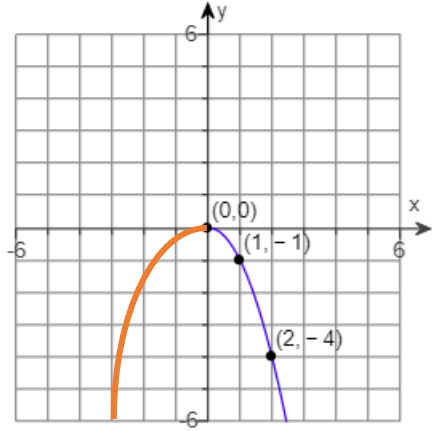**30,31)** Plot the point $(5, -7)$.

(a) Plot the point that is symmetric to $(5, -7)$ with respect to the x-axis. green (5,7)

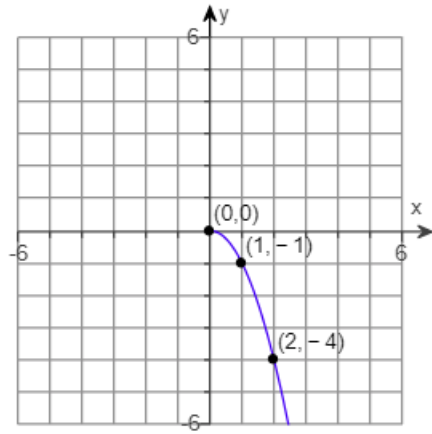**(b)** Plot the point that is symmetric to $(5, -7)$ with respect to the y-axis. orange (-5,-7)

(c) Plot the point that is symmetric to $(5, -7)$ with respect to the origin. purple (-5,7)
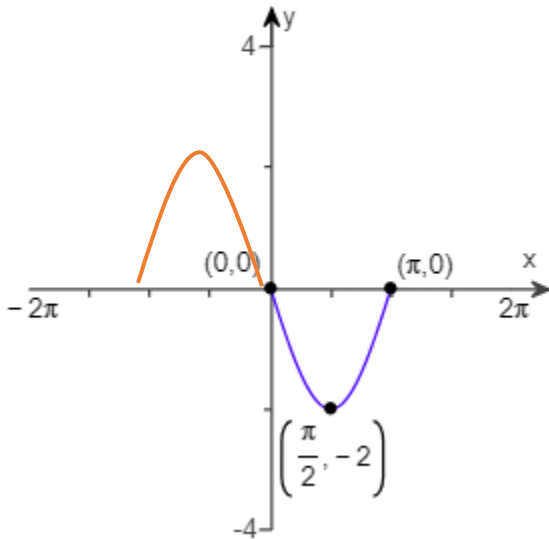
32) Draw a complete graph so that it has y-axis symmetry.

Draw a complete graph so that it has x-axis symmetry.

33) Draw a complete graph so that it has symmetry with respect to the origin.

Draw a complete graph so that it has y-axis symmetry.