

Algebra 2 Reference: Polynomial Basics

Here is an *example polynomial* expression: $6x^3 + 13x^2 - 4$.

Words for describing a polynomial:

- **Degree:** This is the highest power of x in the expression. The example's degree is 3.
- **Leading coefficient:** This is the coefficient on the highest power of x . The example's is 6.
- **Constant term:** This is the term without an x in it. The example's constant term is -4.

Words for **classifying** polynomials by degree and number of terms:

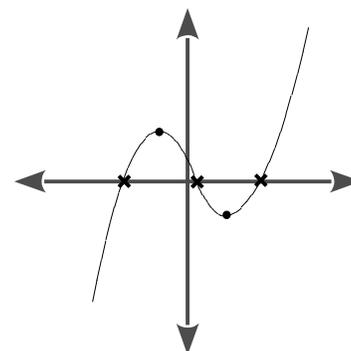
Degree	Name
0	constant
1	linear
2	quadratic
3	cubic
4	quartic

# of terms	Name
1	monomial
2	binomial
3	trinomial

- The example polynomial is a *cubic trinomial*.

Words for parts of the graph:

- **Zero:** Anyplace the graph crosses the x -axis, because $y=0$. This graph has 3 of them, each marked with an X. Also called a **root**.
- **Turning point:** Anyplace the graph changes from going up to going down, or from down to up. This graph has 2 of them, marked with dots.
- **End behavior:** A description of where the graph comes from on the left, and goes to on the right. This graph's end behavior is "down, up".



Relationship between leading term and graph:

- The number of turning points, " T ", depends on the degree, n , of the polynomial. For a polynomial with degree n , the maximum number of turning points is $n-1$. If written with inequalities, you could say: $T \leq n-1$, or $n \geq T+1$.
- Even degree polynomials have matching end behaviors. If the leading coefficient is positive you get "up, up", if it's negative you get "down down".
- Odd degree polynomials have opposite end behaviors. If the leading coefficient is positive you get "down, up", if it's negative you get "up, down".

		Leading Coeff.	
		+	-
Degree	Even	U U	D D
	Odd	D U	U D

Words for classifying highs and lows:

- **Extreme:** A high (**maximum**) or low (**minimum**) point on the graph, found at turning points.
- An **absolute** (or **global**) extreme is the absolute highest or lowest point on an entire graph.
- A **relative** (or **local**) extreme is *any* high/low point at the top or bottom of a turn. Most extremes are relative extremes!

Note! Standard form for polynomials is in order of *decreasing* exponents!

Standard form: $6x^3 + 13x^2 - 4$

Non-standard: $13x^2 + 6x^3 - 4$