Algebra 2 Notes

Name: Key

Section 5.1/5.3 - Polynomials

A monomial is a number or a product of numbers and variables with whole number exponents. A polynomial is a monomial or a sum or difference of monomials. Each monomial in a polynomial is a term. Because a monomial has only one term, it is the simplest type of polynomial.

Polynomials have no variables in denominator or exponents, no roots or absolute vales of variables, and all variables have whole number exponents.

Polynomials:	$3x^4$	$2z^{12}+9z^3$	$\frac{1}{2}a^7$	$0.15x^{101}$	$3t^2-t^3$
NOT Polynomials:	3^x	$\lvert 2b^3-6b \rvert$	$\frac{8}{5y^2}$	$\frac{1}{2}\sqrt{x}$	$m^{0.75}-m$

The ________________ is the ________________ of the exponents of the variables.

Example 1: Identify the degree of each monomial.

a. x^4	b. $12x^0$	c. $4a^2b^1$	d. $5x^3y^4z^1$
		$2+1$	$3+4+1$
$\boxed{4}$	$\boxed{0}$	$\boxed{3}$	$\boxed{8}$

The degree of a polynomial is given by the term with the highest degree. A polynomial with one variable is in standard form when its terms are written in descending order by degree. So, in standard form, the degree of the first term indicates the degree of the polynomial, and the leading coefficient is the coefficient of the first term.

degree of the polynomial

leading coefficient

$$5x^3+8x^2+3x^1-17x^0$$

Degree of Term: 3 2 1 0

A polynomial can be classified by its number of terms. A polynomial with two terms is called a binomial, and a polynomial with three terms is called a trinomial. A polynomial can also be classified by its degree.

Classifying Polynomials be Degree		
Name	Degree	Example
Constant	0	-9
Linear	1	$x-4$
Quadratic	2	x^2+3x-1
Cubic	3	x^3+2x^2+x+1
Quartic	4	$2x^4+x^3+3x^2+4x-1$
Quintic	5	$7x^5+x^4-x^3+3x^2+2x-1$

Example 2: Rewrite each polynomial in standard form. Then identify the leading coefficient, degree, and number of terms. Name the polynomial.

a. $2x+4x^2-1$	b. $7x^3-11x+x^5-2$	c. $4x-2x^3+2$
Standard Form: $4x^2+2x-1$	Standard Form: $x^5+7x^3-11x-2$	Standard Form: $-2x^3+4x+2$
Leading Coefficient: 4	Leading Coefficient: 1	Leading Coefficient: -2
Degree: 2	Degree: 5	Degree: 3
Number of Terms: 3	Number of Terms: 4	Number of Terms: 3
Name the polynomial: quadratic trinomial	Name the polynomial: quintic polynomial w/ 4 terms	Name the polynomial: cubic trinomial

To add or subtract polynomials, combine like terms. You can add or subtract horizontally or vertically.

Example 3: Add or subtract. Write your answer in standard form.

a. $(3x^2+7+x)+(14x^3+2+x^2-x)$	b. $(1-x^2)-(3x^2+2x-6)$
$3x^2+x^2+7+2+x+-x+14x^3$ $\boxed{14x^3+4x^2+9}$	$1-x^2-3x^2-2x+6$ $\boxed{-4x^2-2x+7}$

A polynomial function is a function whose rule is a polynomial.

Example 4: Medical Application

Cardiac output is the amount of blood pumped through the heart. The output is measured by a technique called dye dilution. A doctor injects dye into a vein near the heart and measures the amount of dye in the arteries. The cardiac output of a particular patient can be approximated by the function $f(t)=0.0056t^3-0.\cancel{1}22t^2+2.33t$, where t represents time (in seconds after injection, $0 \le t < 23$) and $f(t)$ represents the concentration of dye (in milligrams per liter).

(a) Evaluate $f(t)$ for $t=0$ and $t=3$.

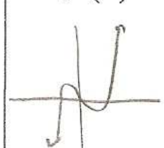
(b) Describe what the value of the function from part (a) represent.

$f(0)=0$ Concentration of dye, 0mg/L in artery at start

$f(3)\approx 5.1612$ Concentration of dye, 5.1612mg/L in artery after 3s.

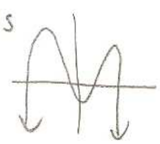
Example 5: Graph each polynomial function on a calculator. Describe the graph and identify the number of real zeros.

a. $f(x)=x^3-x$



From left to right, the graph increases, decreases slightly, and then increases again. It crosses the x-axis 3 times, so there appears to be 3 real zeros.

b. $h(x)=-x^4+8x^2-1$



From left to right, the graph alternately increases and decreases, changing direction 3 times. It crosses x-axis 4 times, so there appears to be 4 real zeros