Classifying Polynomials

Polynomial - The sum or difference of terms (monomials).

How to classify by **TERM**:

<u> Monomial</u> - One term	ex: 4 or -x
<u>Binomial</u> - Two-term	ex: 3x³ – 1
<u> Trinomial</u> - Three-term	ex: x³ + x - 2
Polynomial - more than 3 terms	ex: x ³ + 2x ² + x + 1

Degree of a polynomial - The largest exponent of its terms.

How to classify by **DEGREE**:

<u>Linear</u> – 1 st degree	ex: 3x	
<u>Quadratic</u> – 2 nd degree	ex: 3x ²	
<u>Cubic</u> – 3 rd degree	ex: 2x ³	
<u>Quartic</u> – 4 th degree	ex: 2x ⁴	
<u> Constant Term</u> - Number	ex: 5	
(a constant term has a degree of zero)		

Polynomial	Leading Coefficient	Classify by Degree	Classify by Term
5x	5	Linear	Monomial
$-x^{3} + 2$	-1	Cubic	Binomial
$7x^4 + 2x^3 - 3x + 1$	7	Quartic	Polynomial
-12	-12	Constant	Monomial
$2x^2 - 3x + 1$	2	Quadratic	Trinomial

Standard Form & Coefficients

Standard form of a polynomial - terms written in decreasing order according to exponents.

 $-4x^2 + x^3 + 3$ \longrightarrow in standard form is: $x^3 - 4x^2 + 3$

The <u>coefficients</u> are 1, -4, and 3.

1 is the leading coefficient.

The leading coefficient will be first when the polynomial is written in standard form.

Practice:

Write the polynomial: $x - 4x^3 + x^4 + 3$ in standard form. List the coefficients and the leading coefficient.

Standard Form $x^4 - 4x^3 + x + 3$ Coefficients 1, -4, 1, 3 L.Coeff. 1

Rewrite the polynomials in standard form (if necessary). Identify the leading coefficient, and classify the polynomial by degree and by number of terms.

	Ex1) $4 - x + 2x^{2}$	Ex2) $2x + 4 - x^3$
St. Form	$2x^2 - x + 4$	$-x^{3}+2x+4$
L. Coeff.	2	-1
By degree	Quadratic	Cubic
By Terms	Trinomial	Trinomial
	Ex3) -5	Ex4) $-x^2 + 3x^4 - 8 + 2x^3$
St. Form	-5	$3x^4 + 2x^3 - x^2 - 8$
L. Coeff.	-5	3
By degree	Constant	Quartic
By Terms	Monomial	Polynomial

Combining Like Terms

When combining like terms, add or subtract the coefficients, leaving the exponents the same. Make sure when writing out your answer that it is in standard form.

Ex5)
$$-4x^3 + 7x - 8 + 2x^3 - 11x$$

 $-4x^3 + 2x^3 + 7x - 11x - 8$
 $-2x^3 - 4x - 8$
Ex6) $8x - 4x^2 + 1 + 4x^2 - 8x$
 $-4x^2 + 4x^2 + 8x - 8x + 1$
1

Ex7)
$$4x^4 - 6x + 11x + x^4 - 10$$

 $4x^4 + x^4 - 6x + 11x - 10$
 $5x^4 + 5x$
Ex8) $-x + 7x^2 + x - 2$
 $7x^2 - x + x - 2$
 $7x^2 - 2$

Adding Polynomials without Grouping

When adding polynomials combine like terms and write your answer in standard form.

Ex9)
$$(3x + 7x^2 + 1) + (1 + 2x - 5x^2)$$
Ex10) $(6x^2 - 3x^3 - 2x^2) + (x^3 + 2x^2 + 1)$ $-5x^3 + 7x^2 + 5x + 2$ $-2x^3 + 6x^2 + 1$ Ex11) $(6a + 6a^4 + a^3) + (3a^3 - 5a^4 - 6a)$ Ex12) $(x^4 + 2x^3 + 3) + (8 - 2x^3 + 2x^4)$ $a^4 + 4a^3$ $3x^4 + 11$

Note: If the coefficients combine to be zero, you do not write the variable (0 multiplied by a variable is 0)

Distributing Practice

Ex13) -(x + 4) ex14) -2(x + 3) ex15) -(-x + 6)-x - 4 -2x - 6 x - 6

When subtracting polynomials it is important to remember to distribute the negative to all terms in the proceeding set of parenthesis. When working a subtraction problem, we will distribute the negative first and then combine like terms.

Ex16) $(2x^3 + 3x - 4) - (5 - 6x + 3x^3)$ Distribute the negative to the 2^{nd} set of parenthesis $(2x^3 + 3x - 4) - (5 - 6x + 3x^3)$ Switch the signs for all terms in the 2^{nd} set of parenthesis $(2x^3 + 3x - 4) - (5 - 6x + 3x^3)$ Note: The problem becomes an addition problem $-x^3 + 9x - 9$ Combine like terms for your answer

Find the difference. Write the answer in standard form.

Ex17)
$$(4x^2 - 3) - (2x^2 + 6)$$

 $(4x^2 - 3) + (-2x^2 - 6)$
 $2x^2 - 9$
Ex18) $(-3x^3 + 7) - (5x^2 - x^3)$
 $(-3x^3 + 7) + (-5x^2 + x^3)$
 $-2x^3 - 5x^2 + 7$

Ex19)
$$(9x^3 - 3x^2 - 1) - (9x^4 + 5x^2 + 19)$$

 $(9x^3 - 3x^2 - 1) + (-9x^4 - 5x^2 - 19)$
 $-9x^4 + 9x^3 - 8x^2 - 20$
Ex20) $(6x - 4x^2 + 17x^3) - (-8x^3 + 5x^2 - 11x)$
 $(6x - 4x^2 + 17x^3) + (8x^3 - 5x^2 + 11x)$
 $25x^3 - 9x^2 + 17x$