9.1 Add and Subtract Polynomials

Goal • Add and subtract polynomials.

VOCABULARY:

Factors	THE PARTS OF AN EXPRESSION SEPARATED BY MULTIPLICATION Ex] $-3xy^2$ → 3 FACTORS: $-3, x, y^2$
Terms	THE PARTS OF AN EXPRESSION SEPERATED BY ADDITION (OR SUBTRACTION) Ex] $-x^2+5x+29$ → 3 TERMS: $-x^2, 5x, 29$
Monomial	= 1 TERM. A NUMBER, VARIABLE, OR PRODUCT OF NUMBERS and variables. EXAMPLES: ① 5 ② x ③ $-2xy$
Polynomial	is a SUM OF MONOMIALS Ex] x^2+2x-5 • POLYNOMIAL Can only use operations: +, −, × • THEY CAN NOT HAVE VARIABLES IN THE DENOMINATOR, VARIABLE EXPONENTS, NEGATIVE EXPONENTS.
Binomial	2 MONOMIALS. Ex] $x+1$
Trinomial	3 MONOMIALS.] x^2+x+1
Degree of a polynomial with 1 VARIABLE:	IS THE HIGHEST EXPONENT IN A POLYNOMIAL Ex] $x^{②}+x+1$ DEGREE = 2
Linear	THE DEGREE IS 1: Ex] $x^{1}+1$ (1 is implied) D=1
Quadratic	THE DEGREE IS 2: Ex] x^2+3x+3 D=2
Cubic	THE DEGREE IS 3 Ex] $2x^3+5x^2$ D=3

NOT POLY
$\sqrt{x}$
$|x|$
$\frac{4}{x}$
5^{-x}
x^{-2} $\frac{1}{x^2}$

POLY
$\frac{x}{4} = \frac{1}{4}x$

Example 1 ***Rewrite a polynomial*** (We used to call them EXPRESSIONS)

Write $7 + 2x^4 - 4x$ so that the exponents decrease from left to right. Identify the degree and leading coefficient of the polynomial.

ORDER POLYNOMIALS
① High → Low Exponents
② PUT IN ABC order ex] $x+y+2$
③ Constant last

$7 + 2x^4 - 4x$ (Leading coef, Degree, Constant)

The polynomial can be written as $2x^4 - 4x + 7$. The greatest degree is 4, so the degree of the polynomial is 4, and the leading coefficient is 2.

Your Notes

IN STANDARD FORM

Checkpoint Write the polynomial so that the exponents decrease from left to right. Identify the degree.

	Degree	Leading Coef	Constant
1. $5x + 13 + 8x^3$ $8x^3+5x+13$	$D=3$	$LC=8$	$C=13$
2. $4y^4 - 7y^5 + 2y$ $-7y^5+4y^4+2y$	$D=5$	$LC=-7$	$C=0$ OR NONE

Example 2 *Identify and classify polynomials*

Tell whether the expression is a polynomial. If it is a polynomial, find its degree and classify it by the number of terms. Otherwise, tell why it is not a polynomial.

	Expression	Is it a polynomial?	Classify by degree and number of terms
a.	$-6x^0 = -6$	YES	Constant Monomial
b.	$m^{-3} + 4$	NO NONEGATIVE EXPONENTS	
c.	$-h^3 + 4h^2$	Yes	(D=3) (T=2) CUBIC BINOMIAL
d.	$9 - 5x^4 + 3x$	YES	(T=3) (D=4) TRINOMIAL TO 4TH DEGREE
e.	$2w^3 + 4^w$	No VARIABLE FOR AN EXPONENT	

$x^0 = 1$

Checkpoint Tell whether the expression is a polynomial. If it is a polynomial, find its degree and classify it by the number of terms. Otherwise, tell why it is not a polynomial.

$v^{-2} = \frac{1}{v^2}$

3. $4x - x^7 + 5x^3$ POLYNOMIAL $-x^7+5x^3+4x$ TRINOMIAL (3 terms) to the 7TH degree	4. $v^3 + v^{-2} + 2v$ NOT A POLYNOMIAL v^{-2} has a negative exponent

Your Notes

Example 3 Add polynomials

Find the sum

$(x^2 + x + 8) + (x^2 - x - 1)$

ADD. Group like terms and simplify.

$(x^2 + x + 8) + (x^2 - x - 1)$

mental step → $= (x^2 + x^2) + (x - x) + (8 - 1)$

$= 2x^2 + 7$

Example 4 Subtract polynomials

Find the difference

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

Subtract (multiply everything by -1 in the ()'s)

Remember to multiply *each* term in the polynomial by −1 when you write the subtraction as addition.

$(3x^2 + 6x - 4) + (-1)(x^2 - x - 7)$

$= 3x^2 + 6x - 4 - x^2 + x + 7$

$= 2x^2 + 7x + 3$

$=$ _____

Checkpoint **Find the sum or difference.**

LIKE TERMS

Same variables to the same exponents

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

$12x^4 + 5x^3 - 3x^2 - 1$

6. $(3t^2 - 5t + t^4) - (11t^4 - 3t^2)$

$3T^2 - 5T + T^4 - 11T^4 + 3T^2 =$

$-10T^4 + 6T^2 - 5T$

#TERMS	NAME
1	Monomial
2	Binomial
3	Trinomial
n	Polynomial with "n" terms

DEGREE	NAME
0	Constant ($5x^0 = 5 \cdot 1 = 5$)
1	LINEAR (x^1 ← implied 1)
2	QUADRATIC
3	CUBIC
n	Polynomial to the n^{TH} degree