Many Terms (handwritten)

17.1 Understanding Polynomial Expressions → No = sign

Polynomial (highlighted)

Essential Question: What are polynomial expressions, and how do you simplify them?

→ *1 term held together by mult.* (handwritten)

⊘ Explore   Identifying Monomials

A **monomial** is an expression consisting of a number, variable, or product of numbers and variables that have whole number exponents. *Terms* of an expression are parts of the expression separated by plus signs. (Remember that $x - y$ can be written as $x + (-y)$.) A monomial cannot have more than one term, and it cannot have a variable in its denominator. Here are some examples of monomials and expressions that are not monomials.

Monomials					Not Monomials				
4	x	$-4xy$	$0.25x^3$	$\dfrac{xy}{4}$	$4 + x$	$x - 1$	$0.7x^{-2}$	$0.25x^{-1}$	$\dfrac{y}{x^3}$

→ yx^{-3} (handwritten)

Not whole #s (handwritten, pointing to $0.7x^{-2}$)

Use the following process to determine if $5ab^2$ is a monomial.

(A) $5ab^2$ has ___1___ term(s), so it ___is___ be a monomial.

(B) Does $5ab^2$ have a denominator?

___No___

(C) If possible, split it into a product of numbers and variables.

$5ab^2 = 5 \cdot \boxed{a} \cdot \boxed{b^2}$ → *3 factors* (handwritten)

(D) List the numbers and variables in the product.

Numbers: $\boxed{5}$ Variables: $\boxed{a, b}$

(E) Check the exponent of each variable. Complete the following table.

Variable	Exponent
a^1	1
b^2	2

(F) The exponents of the variables in $5ab^2$ are all ___whole___ *#s*.
Therefore, $5ab^2$ ___is___ a monomial.

(G) Is $\dfrac{5}{k^2}$ a monomial?

_____ $5k^{-2}$ No b/c -2 is not a whole # _____

→ highest exponent pg 807
or sum of
exponents

Example 1 Classify each polynomial by its degree and the number of terms.

Ⓐ $7x^2 - 5x^3y^3$ → *binomial*

Find the degree of each term by adding the exponents of the variables in that term. The greatest degree is the degree of the polynomial. The degree of the term $-5x^3y^3$ is 6, which you obtain by adding the exponents of x and y: $6 = 3 + 3$. Numbers have degree 0.

Degree is 2 →

$7x^2 - 5x^3y^3$ → *Degree* $3 + 3 = 6$

Degree : 6 $7x^2$ has degree 2, and $-5x^3y^3$ has degree $6 = 3 + 3$.

Binomial   There are two terms.

Ⓑ $3^2 + 2n^3 + 8n$ → *trinomial*

$3^2 + 2n^3 + 8n$

Degree: *3* 3^2 has degree *2* , $2n^3$ has degree *3* , and $8n$ has degree *1* .

Trinomial   There are *3* terms.

Reflect

3. What is the degree of $5x^0y^0 + 5$? → *binomial*
   Degree zero ← $5x^0$ → *degree of zero*

4. Is $5x^0y^{0.5} + 5$ a polynomial? Justify your answer.
   → *Exponent ≠ whole #'s*

Your Turn

Classify each polynomial by its degree and the number of terms.

5. $3x^2y^2 + 3xy^2 + 5xy$

Degree: 4
# of terms: 3 (trinomial)

6. $8ab^2 - 3a^2b$

Binomial — 2 terms
Degree : 3

⊘ Explain 2 Writing Polynomials in Standard Form

The terms of a polynomial may be written in any order, but when a polynomial contains only one variable there is a standard form in which it can be written.

The **standard form of a polynomial** containing only one variable is written with the terms in order of decreasing degree. The first term will have the greatest degree, the next term will have the next greatest degree, and so on, until the final term, which will have the lowest degree.

When written in this form, the coefficient of the first term is called **the leading coefficient**.

$5x^4 + 4x^2 + x - 2$ is a 4th degree polynomial written in standard form. It consists of one variable, and its first term is $5x^4$. The leading coefficient is 5 because it is in front of the highest-degree term.

Example 2 Write each polynomial in standard form. Then give the leading coefficient.

(A) $20x - 4x^3 + 1 - 2x^2$

Find the degree of each term and then arrange them in descending order of their degree.

$$20x - 4x^3 + 1 - 2x^2 = -4x^3 - 2x^2 + 20x + 1$$

Degree: $\;\;1\;\;\;\;3\;\;\;\;0\;\;\;\;2\;\;\;\;\;\;\;\;3\;\;\;\;2\;\;\;\;1\;\;\;\;0$

The standard form is $-4x^3 - 2x^2 + 20x + 1$. The leading coefficient is -4.

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(B) $|z^3 - |z^6 + 4z \longrightarrow$ **trinomial**

Find the degree of each term and then arrange them in descending order of their degree.

$$z^3 - z^6 + 4z^1 = \boxed{}\;\boxed{}\;\boxed{}$$

Degree: $\boxed{3}\;\boxed{6}\;\boxed{1}$

The standard form is $\underline{-z^6 + z^3 + 4z}$. The leading coefficient is $\boxed{-1}$.

Your Turn

Write each polynomial in standard form. Then give the leading coefficient.

7. $10 - 3x^2 + x^5 + 4x^3$

$1x^5 + 4x^3 - 3x^2 + 10$

L.C.

8. $18y^5 - 3y^8 + 10y$

$\boxed{-3}y^8 + 18y^5 + 10y$

LC.

9. $10x + 13 - 15x^2$

$\boxed{-15}x^2 + 10x + 13$
$\rightarrow$ leading coeff.

10. $-3b^2 + 2b - 7 + 6b^3 + 12b^4 + 7$
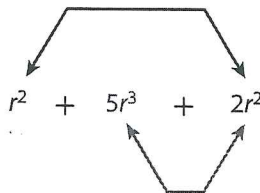
$\boxed{12}b^4 + 6b^3 - 3b^2 + 2b$
$\rightarrow$ L.C

🔑 Explain 3 Simplifying Polynomials

Polynomials are simplified by combining like terms. Like terms are monomials that have the same variables raised to the same powers. Unlike terms have different powers.

Like Terms:
- Same variable
- Same power

$$r^2 \;+\; 5r^3 \;+\; 2r^2$$

Unlike Terms:
- Different power