M9

Unit 4: Polynomials

4.1 Terminology, Definitions, and Concepts

- A polynomial is an algebraic expression that consists of a term or several terms added together.

- A term is an expression that consists of a real number coefficient multiplied by one or more variables, and the variable(s) is (are) raised to a non-negative integral exponent.

- _____ is the pattern every term has to follow.

- Some polynomials have specific names based on the number of terms they contain.

Examples: Determine the number of terms in each polynomial:

	x^2	x^2+3x	x^5+3x-2	x^5+3x^2-2x+1
Number of terms				
Specific name				N/A
	polynomial	polynomial	polynomial	polynomial

<u>Vocabulary and Definitions</u>

1. Real number = a number that can be plotted on a horizontal number line.

- When inputted in the calculator, a real number does not give an "error" message. It is any number "legal" in high school.

- The set of real numbers has a special symbol: _____

2. Variable = a value represented by any letter of the English alphabet, most often the lower case "x" that can be replaced (substituted) by any real number.

- In a single polynomial, each variable is represented by a different letter.

Examples: Determine the number of variables in each polynomial:

Polynomial	$x^2 + x - y$	$-2a + 3b + a$	$-b + c$	$-2 + 3x^5 + x^3$
Number of variables				

3. Coefficient = a real number that is in front of a variable and multiplies the variable.

Example 1: Circle the coefficient(s) in each polynomial:

$2x$	$2x^4 + 45x$	$-x^4 + 7$	$-0.6x^3 + 5x + 1$	$8a^3 + 5x$

Example 2: Write each term separately and then write what the value of each coefficient.

Polynomial	$-x^4 + 5x$	$-x^4 - 6$	$0.3x^2 - 5x$	$8\pi - x$
Individual terms separated by commas				
List of coefficients separated by commas				

4. Integral = an adjective form of the noun "integer"; = having the form of an integer.

5. Non-negative = positive OR zero.

6. Constant Term = a term that does not have a variable.

- Note that the constant term meets the requirements of the definition (pattern) required for any term of a polynomial. How?

_____ =_____ =_____

- This term is called "the constant term" or the "constant" because it **<u>remains unchanged</u>** regardless of what value is substituted in for the variable.

Example: Circle the constant term in each polynomial; then write the constant term.

Polynomial	$-x^4+5x$	$-x^4-6$	$0.3x+1-5x$	$6+8\pi-x$
Constant term				

7. Degree of a term = <u>the sum of all exponents of each variable in a single term.</u>

- If a variable does not have an exponent, the exponent and the degree are equal to one.

- A constant term has a degree of zero.

Examples: Determine the degree of each term:

Term	$-x^4$	$45x^4yz$	$-75x$	6
Degree				
Term	$0.7x^9yz^3$	$\frac{1}{3}xy$	$-3abc^9$	-5^4
Degree				

8. Degree of a polynomial = the highest degree of a term.

Examples: Determine the degree of each polynomial

Polynomial	$-3x+4$	x^4+3z	$-7x^5+x^{13}$	$6x-0.5x^3$
Degree of the polynomial				
Polynomial	$7x^9+x$	$\frac{1}{3}x+\frac{6}{17}x^2$	-3	$3x+x^7-x^9$
Degree of the polynomial				

9. Leading term = term with the highest degree.

Examples: Determine the leading terms of each polynomial:

Polynomial	$-3x+4$	x^2+3x^5	$-7x^5+x^3$	$6x^8-0.5x^5$
Leading term				
Polynomial	$7x^9+9x^{12}$	$\frac{1}{3}x+\frac{6}{17}x^2$	$3x+x^2$	$3x+x^2-x^7$
Leading term				

10. Leading coefficient = coefficient of the leading term.

Examples: Determine the leading coefficient for each polynomial:

Polynomial	$-3x+4$	x^2+3x^5	$-7x^5+x^3$	$6x^8-0.5x^5$
Leading coefficient				
Polynomial	$7x^9+9x^{12}$	$\frac{1}{3}x+\frac{6}{17}x^2$	$3x+x^2$	$3x+x^2-x^7$
Leading coefficient				

11. Standard Form = a form of a polynomial in which the terms are written in the descending order of their degree = the leading term is written first followed by a term with the second highest degree; if the polynomial has a constant term different from zero, the constant term is always written last.

Examples: Write each polynomial in **<u>standard form</u>**, rearrange the terms of each polynomial if necessary.

Polynomial	$-3x+4$	x^2+3x^5	$-7x^5+x^3-1$	$6x^8-0.5x^5$
Standard form				
Polynomial	$7x^9+9x^{12}$	$\frac{1}{3}x+x^2$	$3x+x^2+4$	$3x+x^2-x^7$
Standard form				