Advanced Algebra: Polynomial Activity **Name ________________________________**

Vocabulary

Variable: a letter or symbol that represents a unknown value

Coefficient: a number that is multiplied by a variable (appears in front of the variable)

Exponent: a number indicating repeated multiplication of the base to which it is attached

Term: a coefficient multiplied with variables raised to exponents

Expression: a string of terms connected by addition or subtraction

Degree: the highest exponent within the terms of an expression

Monomial: a single term expression

Polynomial: any expression involving two or more terms with all whole number exponents and real number coefficients

Standard Form: a polynomial expression where exponents are in DESCENDING order (ex: $3x^4 - 5x^3 + x^2 + 4x - 7$)

A. Determine whether each function below is a polynomial. If it is, explain how you know AND re-write the function in standard from. If it is NOT a polynomial, explain why.

1) $f(x) = 2x^3 + 5x^2 + 4x + 8$

2) $f(x) = 2x^2 + x^{-1}$

3) $f(x) = 5 - x + 7x^3 - x^2$

4) $f(x) = \frac{2}{3}x^2 - x^4 + 5 + 8x$

5) $f(x) = 2\sqrt{x}$

6) $f(x) = \frac{1}{3x^2} + \frac{6}{x} - 2$

B. Polynomials can be classified by the number of terms as well as by the degree of the polynomial **(constant, linear, quadratic, cubic, quartic, quintic, etc.)** Complete the following chart and create three of your OWN polynomials for the last three rows.

Polynomial	**# of Terms**	**Type of Expression**	**Degree**	**Classification**
$f(x) = 2$		monomial		constant
$f(x) = 3x - 1$		binomial		linear
$f(x) = x^2 - 2x + 1$		trinomial		quadratic
$f(x) = 8x^3 + 125$		binomial		cubic
$f(x) = x^4 + 10x^2 + 16$		trinomial		quartic
$f(x) = -x^5$		monomial		quintic

C. When adding or subtracting polynomials, COMBINE LIKE TERMS. Find the sum or difference for each of the following polynomials.

1) $\begin{array}{r} 5x^2 + 2x - 8 \\ +\ 3x^2 - 7x - 1 \end{array}$

2) $\begin{array}{r} 2x^2 - 2x + 7 \\ -\ x^2 + 2x + 1 \end{array}$

3) $(7x - 5) + (2x + 8)$

4) $(2a^2 - 5a + 1) + (a^2 + 3a)$

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

6) $(5x^2 + 2xy - 7y^2) - (3x^2 - 5xy + 2y^2)$

7) Bob owns a small music store. He keeps inventory on his xylophones by using $\boldsymbol{x}^2$ to represent his professional grade xylophones, $\boldsymbol{x}$ to represent xylophones he sells for recreational use, and constants to represent the number of xylophones instructional manuals he keeps in stock. For example, if Bob had 7 professional grade xylophones, 3 recreational xylophones, and 2 manuals we would represent that as $7x^2 + 3x + 2$.

If the polynomial $5x^2 + 2x + 4$ represents the inventory he has on display in his shop and $3x^2 + 6x + 1$ represents the inventory he has stored in the back room, what is the polynomial that represents the TOTAL inventory he currently has in stock?

8) Suppose a band director makes an order for 6 professional grade xylophones, 13 recreational xylophones, and 5 instruction manuals.

a) What expression would represent this order?

b) What polynomial would represent the inventory at Bob's store AFTER the order was filled? (Use answer to #7 to help)

D. When multiplying polynomials, use DISTRIBUTION. Find the product of the following polynomials.

1) $3x(2x^2 + 8x + 9)$

2) $-2x^2(5x^2 - x - 4)$

3) $(2x + 7)(2x - 5)$

4) $(4x - 7)(3x - 2)$

5) $(x - 3)(2x^2 + 3x - 1)$

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

7) $(4x - 7y)(4x + 7y)$

8) $(3x - 4)^2$

9) $(x - 1)^3$

10) $(x + 1)^4$

Closure Property: An operation between two specific types of numbers or expressions that results in that same type of number or expression.

Example: The set of **integers** is **CLOSED** under the operation of **addition** because if you add two integers you always get another integer. **BUT**…the set of integers is **NOT CLOSED** under the operation of **division** because if you divide two integers, you do not always get another integer.

Look at all your answers to part C.

Are the operations of addition and subtraction CLOSED under the set of polynomials? Explain why or why not.

Look at all your answers to part D.

Is the operation of multiplication CLOSED under the set of polynomials? Explain why or why not.

Think of a set of numbers (other than integers) that are CLOSED under one operation but NOT CLOSED under a different operation? Explain in words what you came up with and provide an example for each.