Name _____ Date _____ Period____

Advanced Algebra Classifying Polynomials Learning Task

Previously, you have learned about linear functions, which are first degree polynomial functions that can be written in the form $f(x) = a_1x^1 + a_0$ where a_1 is the slope of the line and a_0 is the y-intercept (Recall: $y = mx + b$, here m is replaced by a_1 and is b replaced by a_0.) Also, you have learned about quadratic functions, which are 2nd degree polynomial functions and can be expressed as $f(x) = a_2x^2 + a_1x^1 + a_0$.

These are just two examples of polynomial functions; there are countless others. A polynomial is a mathematical expression involving a sum of nonnegative integer powers in one or more variables multiplied by coefficients. A polynomial in one variable with constant coefficients can be written in the form $a_nx^n + a_{n-1}x^{n-1} + \ldots + a_2x^2 + a_1x^1 + a_0$ where $a_n \neq 0$ the exponents are all whole numbers, and the coefficients are all real numbers.

1. What are whole numbers?

2. What are real numbers?

3. Decide whether each function below is a polynomial. If it is, write the function in standard form. If it is not, explain why.
   a. $f(x) = 5x^3 + 4x^2 + 8x + 2$

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

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

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

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

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

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4. Polynomials can be classified by the number terms as well as by the degree of the polynomial. The degree of the polynomial is the same as the term with the highest degree. Complete the following chart. **Make up your own functions for the last three rows.**

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