

# 6-1: Polynomial Functions

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## LESSON OVERVIEW

<b>Subject(s)</b>	Mathematics
<b>Topic or Unit of Study</b>	Polynomials and Polynomial Functions
<b>Grade/Level</b>	Grade 10
<b>Objective</b>	<ol style="list-style-type: none"> <li>1. Students will be able classify a polynomial by the degree of the polynomial.</li> <li>2. Students will be able to name the of a polynomial with a degree between 0 and 5 and any number of terms.</li> </ol>
<b>Summary</b>	

## IMPLEMENTATION

<b>Learning Context</b>	This is the first lesson of the unit. Students have learned about linear and quadratic equations (which are two types of polynomials we will discuss in this lesson) in previous units and classes.
<b>Teaching Strategies</b>	Direct instruction,
<b>Time Allotment</b>	1 class periods. 50 Mins. per class.
<b>Sample Student Products</b>	
<b>Author's Comments &amp; Reflections</b>	Students may not be familiar with the prefixes and vocabulary in this lesson. The handout is a good starting point to see if students are struggling with the vocabulary, but additional materials may be necessary to bring student comprehension to an acceptable level.

## PROCEDURE

<b>Anticipatory Set</b>	<p><b><u>Introduction</u></b></p> <p>Mathematicians need to classify everything.</p>
<b>Modeling</b>	<p><b><u>Defining the Number of Terms</u></b></p> <p>We classify functions various ways by different criteria.</p>

Monomial → Monocle (one piece of glass)

Binomial → Bicycle (two wheels)

Trinomial → Tricycle (three wheels)

Polynomial → Polygon (derived from "many-angled" in Greek) ,  
Polytheistic (multiple gods/goddesses)

### **The Power of Exponents**

We have seen many different functions and we to the characteristics of a function to gain a deeper understanding of the function. For example, a linear function with a negative slope indicates that the line will point downwards. Let's look at another example. The constant on the right side of the equation of a circle will help us determine the radius of the circle (after taking the square root). In the case of polynomials, we look for how many terms the polynomial has and the exponents in the function.

The number that a variable is raised to, also known as the exponent, is called the degree of the term. We will use this information later to determine the shape of a polynomial. We are so concerned with the degrees of terms that we classify a polynomial by the greatest degree of one of its terms. To determine which term that is, we have put the polynomial into a standard form.

### **Polynomial Function**

A polynomial is a monomial or the sum of monomials. We can write any polynomial function in the following format:

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

where  $n$  is a nonnegative integer and the coefficients  $a_n, \dots, a_0$  are real numbers.

**Observation:** This is just a format, not a formula to enter values into! The complex notation is just to show that the coefficients of each term can be unique, not to assign them values. Note that a coefficient can be zero to cancel out the term and that is how we receive less terms for higher degree polynomials.

**Take Away:** This form shows how the variable  $x$  should be arranged. The highest degree will be in the leftmost spot, followed by the second highest on the right and so on.

**Guided Practice****Worksheet**

*Students will complete the definitions and table on the handout as the teacher models.*

**Create Your Own Polynomial Examples**

*Students will create their own examples in the empty table on the back of the worksheet.*

Directions: Create your own functions of degree 0, 1, 2, 3, 4, and 5 in standard form. Write the vocabulary word corresponding to the number terms. Lastly write the classification of the polynomial in two words (one for the degree, one for the number of terms).

**Degree Classification**

*Students will write the degree of each graph of a polynomial on the back of the worksheet.*

**Independent Practice**

WB pg 407 practice 6-1 problems 3-24

**Closure****Exit Ticket**

**Directions:** Classify the following polynomial by degree and by number of terms.

$$-6x^2 + 1$$

**Answer:** Quadratic binomial

**Attachments:**

1. [classify\\_exit\\_ticket\\_pdf.pdf](#) Exit ticket on a sheet

**Follow-Up****Warm-Up 1**

*This warm-up is for the start of this lesson to get students to start thinking about the topic.*

**Directions:** List as many different types of functions that we have learned about so far (hint: there should be three).

**Possible Answers:**

- Absolute value functions
- Quadratic functions
- Linear function

**Warm-Up 2**

*This warm-up is for the day following this lesson.*

**Directions:** Classify each of the following polynomial by degree and by number of terms.

1.  $5x^3 + 6x + 2$

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

**Answers:**

1. Cubic trinomial
2. Quintic polynomial of four terms

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**MATERIALS AND RESOURCES****Instructional Materials**

Handout with a partially blank table of the different polynomials and graphs of each type.

**Attachments:**

1. [polynomial\\_handout\\_pdf.pdf](#) Polynomial Classification Handout

**Resources**

- Materials and resources:  
Algebra II textbook

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**STANDARDS & ASSESSMENT****Standards**

**Display:**  Collapse All  Expand All

**▼ CA- California K-12 Academic Content Standards**

**▼ Subject:** Mathematics

**▼ Grade:** Grades Eight Through Twelve The standards for grades eight

through twelve are organized differently from those for kindergarten through grade seven. In this section strands are not used for organizational purposes as they are in the elementary grades because the mathematics studied in grades eight through twelve falls naturally under discipline headings: algebra, geometry, and so forth. Many schools teach this material in traditional courses; others teach it in an integrated fashion. To allow local educational agencies and teachers flexibility in teaching the material, the standards for grades eight through twelve do not mandate that a particular discipline be initiated and completed in a single grade. The core content of these subjects must be covered; students are expected to achieve the standards however these subjects are sequenced. Standards are provided for algebra I, geometry, algebra II, trigonometry, mathematical analysis, linear algebra, probability and statistics, Advanced Placement probability and statistics, and calculus. Many of the more advanced subjects are not taught in every middle school or high school. Moreover, schools and districts have different ways of combining the subject matter in these various disciplines. For example, many schools combine some trigonometry, mathematical analysis, and linear algebra to form a precalculus course. Some districts prefer offering trigonometry content with algebra II.

▼ **Area:** Algebra II This discipline complements and expands the mathematical content and concepts of algebra I and geometry. Students who master algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.

**Sub-Strand 3.0:** Students are adept at operations on polynomials, including long division.

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## Assessment Plan

### Assessment/Rubrics

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#### Rubrics:

1. [Textbook Homework Rubric](#)
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