



# #9747

## ALGEBRA: POLYNOMIALS

CEREBELLUM CORP., 2002

Grade Levels: 11-13+

26 minutes

1 Instructional Graphic Enclosed

### DESCRIPTION

What are polynomials? How are their graphs shaped? Explains how to multiply and factor polynomials using algebraic long division. Tips and shortcuts help simplify this form of algebra. Ends with polynomial graphs and their practical uses in daily life. Program 7 of 7.

### ACADEMIC STANDARDS

#### Subject Area: Mathematics

- ★ Standard: Understands and applies basic and advanced properties of functions and algebra
  - Benchmark: Uses expressions, equations, inequalities, and matrices to represent situations that involve variable quantities and translates among these representations (See Instructional Goals #1, 2, and 3.)
  - Benchmark: Understands basic concepts (e.g., roots) applications (e.g., determining cost, revenue, and profit situations), and solution methods (e.g., factoring, approximation using sign changes) of polynomial equations (See Instructional Goals #7.)
  - Benchmark: Understands the general properties and characteristics of many types of functions (e.g., direct and inverse variation, general polynomial, radical, step, exponential, logarithmic, sinusoidal) (See Instructional Goals #4, 5, and 6.)

### INSTRUCTIONAL GOALS

1. To define polynomial.
2. To point out the standard form for higher-degree polynomials.
3. To demonstrate multiplying polynomial equations using a modified form of the FOIL method.
4. To show what the graphs of even degree and odd degree polynomials look like.
5. To point out the effect of the degree of a polynomial on its graph.
6. To point out the effect of the sign of the leading coefficient of a polynomial on its graph.
7. To list some practical uses of polynomials in industry.

### VOCABULARY

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|------------------------|------------------------|
| 1. constant term       | 7. polynomial function |
| 2. FOIL method         | 8. quadratic equation  |
| 3. leading coefficient | 9. root                |
| 4. linear equation     | 10. standard form      |
| 5. parabola            | 11. y-intercept        |
| 6. polynomial          |                        |

## BEFORE SHOWING

1. Review the themes and plots of the Indiana Jones movies. (*Raiders of the Lost Ark, The Temple of Doom, The Last Crusade*)
  - a. Using the name Indiana Jones, create other names substituting other states and words that rhyme with Jones.
  - b. Explain that the video is a spoof of the Indiana Jones movies.
2. Discuss the importance of learning algebra and how it can be applied to real-life situations.
3. Review using the FOIL method to multiply binomials.
4. Write examples of third degree, fourth degree, and fifth degree polynomials. Discuss possible methods for factoring them.

## DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing two polynomials being multiplied together. Point out that the polynomials can be positioned vertically and multiplied if desired.
3. Pause at the section explaining that large powers of  $x$  have great effect on the graph of the polynomial. Demonstrate why the formula  $y = ax^n$  gives a good idea of what the graph will look like.
4. Pause at the section explaining the effects of the positive and negative values of the leading coefficient on the graph. Write examples on the board then use a graphing calculator to verify the rules.

## AFTER SHOWING

### ► Discussion Items and Questions

1. What does “poly” mean?
2. How are the powers of  $x$  put in order in the standard form for a higher-degree polynomial?
3. What is the leading coefficient in the equation  $-2x^4 + 4x^3 - x^2 + 3x - 5$ ? What is the constant term of this equation?
4. How can one determine if  $(x + 4)$  is a factor of  $(3x^3 + 5x^2 - 4x + 6)$ ?
5. When lining up the terms in the dividend, what is done if a certain power of  $x$  is missing?
6. What shape do even degree polynomials have on a graph? What shape do odd degree polynomials have on a graph?
7. What happens to the graph of odd degree polynomials as the degree becomes higher?
8. What effects will the positive and negative values of the leading coefficient of even degree polynomials have on the graph?
9. What effects will the positive and negative values of the leading coefficient of odd degree polynomials have on the graph?
10. How is the  $y$ -intercept determined from looking at the equation of the graph?
11. What is the  $y$ -intercept if there is no constant in the equation?
12. How does the degree of the polynomial affect the number of possible roots?

### ► Applications and Activities

1. Complete a worksheet that summarizes the content of the video. (See Instructional Graphic.)
2. Design a worksheet consisting of factoring exercises.
  - a. Match higher-degree polynomial equations with their roots.

- b. List higher-degree polynomial equations with factors in multiple-choice format.
  - c. Draw rectangles with their areas written as higher-degree polynomials. Find the length and the width of the rectangles.
3. Program a graphing calculator to find the quotient and remainder when dividing a polynomial of the form  $ax^2 + bx + c$  by a binomial of the form  $x - r$ .
4. Each student receives a division problem. After completing the division problem, write the divisor and quotient with any remainder on a flashcard.
  - a. Exchange flashcards with another student.
  - b. Compute the divisor times the quotient plus the remainder.
  - c. Check this against the previous student's dividend.
5. Research and report on how polynomials are used in designing aerodynamic shapes for aircraft bodies and automobile bodies.

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## RELATED RESOURCES

- [Algebra: A Piece of Cake! Part One #9544](#)
- [Algebra: A Piece of Cake! Part Two #9545](#)
- [Algebra: The Basics #9750](#)
- [Algebra: Functions #9745](#)
- [Algebra: Linear Equations #9746](#)
- [Algebra: Quadratic Equations #9748](#)
- [Algebra: The Quadratic Formula #9751](#)
- [Algebra: Quadratic Roots #9749](#)



## World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

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### • MATH FORUM

<http://www.mathforum.com/>

Contains links to math resources by subject and a question/answer section by Dr. Math. Topics covered in the video are included.

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### • DIVIDING POLYNOMIALS

<http://www.purplemath.com/modules/polydiv.htm>

Includes step-by-step instructions on how to divide a polynomial by a binomial. Some examples have remainders.

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## INSTRUCTIONAL GRAPHICS

### • POLYNOMIALS

# Polynomials

## STANDARD FORM OF POLYNOMIALS

Write each polynomial in order of descending powers:

1.  $8x - 9x^2 + 5 - 2x^5$

2.  $x^2 + 34 + x^7 - x$

3.  $-11x + 5x^3 - 12x^6 + x^8$

4.  $13 + x^4 - 3x^3 + 2x$

5.  $x^5 + 3x^{12} - 7x - 14x^2 + 8$

## FACTORS OF A POLYNOMIAL

Determine if the binomial is a factor of the polynomial:

1. Is  $(x-2)$  a factor of  $(x^3 + 2x^2 - 4x - 8)$ ?

2. Is  $(a-2)$  a factor of  $(a^3 + 8a - 21)$ ?

3. Is  $(4t-3)$  a factor of  $(20t^3 - 27t^2 + t + 6)$ ?