

Chapter P: Fundamental Concepts of Algebra 1

P.4: Polynomials:

Definition of a polynomial in x :

A polynomial in x is an algebraic expression of the form

$$a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} \dots + a_1 x^1 + a_0$$

*Where a_n, a_{n-1}, \dots, a_0 are real numbers, $a_n \neq 0$, and n is a nonnegative integer. The polynomial is of **degree n** , a_n is **leading coefficient**, and a_0 is the **constant term**.*

*The **degree of polynomial** is the greatest degree of all the terms.*

*A polynomial that has exactly **one term** is called a **monomial**.*

*A polynomial that has **two terms** is called a **binomial**.*

*A polynomial that has **three terms** is called a **trinomial**.*

Example 1: Is the algebraic expression a polynomial? If it is, write the polynomial in standard form and find the degree of polynomial:

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

2) $2x + 3x^{-1} - 5$

3) $\frac{2x+3}{x}$

4) $\sqrt{8}x^3 + 15x^4 + 91$

5) $x^{\frac{2}{3}} + 1$

Adding and Subtracting Polynomials:

Polynomials are added and subtracted by combining like terms

Example 2: *Perform the indicated operations write the resulting polynomial in standard form and indicate its degree*

$$12)(18x^4 - 2x^3 + 8 - 7x) - (6x^3 + 9x^4 - 5x + 7) =$$

$$14)(8x^2 + 7x - 5) - (3x^2 - 4x) - (-6x^3 - 5x^2 + 3) =$$

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Multiplying Polynomials:

*Multiply each term of one polynomial by each term of the other polynomial.
Then Combine like terms.*

Example3: Find each product

$$17)(2x - 3)(x^2 - 3x + 5)$$

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

Special Products:

$(A - B)(A + B) = A^2 - B^2$	35) $(5 - 7x)(5 + 7x) =$
$(A + B)^2 = A^2 + 2AB + B^2$	43) $(2x + 3)^2 =$
$(A - B)^2 = A^2 - 2AB + B^2$	47) $(4x^2 - 1)^2 =$
$(A + B)^3 = A^3 + 3A^2B + 3AB^2 + B^3$	53) $(x + 2)^3 =$
$(A - B)^3 = A^3 - 3A^2B + 3AB^2 - B^3$	57) $(3x - 4)^3 =$

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Polynomial in Two Variables:

Polynomial in two variables x and y contains the sum of one or more monomials in the form ax^ny^m . a is the coefficient. The exponents, m and n represent whole numbers

The degree of the monomial ax^ny^m is $m + n$.

The degree of Polynomial in two variables: is the highest degree of all its terms.

Example4: Is the algebraic expression a polynomial? If it is, find the degree of polynomial:

a) $3x^2y^3 + 2x^2y + 1$

c) $2x^2y + 3x^4y^{\frac{1}{2}} - 5$

b) $3x^2y^{-1} + 3x^2y$

d) $3x^5y^3 + 2x^9y + 1$

Example5: Perform the indicated operations. Indicate the degree of the resulting polynomials.

62) $(7x^4y^2 - 5x^2y^2 + 3xy) + (-18x^4y^2 - 6x^2y^2 - xy)$

66) $(5x^4y^2 + 6x^3y - 7y) - (3x^4y^2 - 5x^3y - 6y + 8x)$

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Example6: Find the product:

$$67) (x + 5y)(7x + 3y)$$

$$77) (x - y)(x^2 + xy + y^2)$$

$$75) (x^2y^2 - 3)^2$$

$$3) (5x + 3y)^2$$

$$71) (3xy - 1)(5xy + 2)$$

$$81) (7xy^2 - 10y)(7xy^2 + 10y)$$