Polynomial Addition, Subtraction, and Multiplication

Definitions: A **polynomial** in x is defined as a finite sum of terms of the form ax^n, where a is a real number and is called the **coefficient** of the term, and n is a whole number and is the **degree of the term**.

1. State the coefficient and degree of the term.

$5x^4$ $\frac{2}{7}x$ x^{11} 21

Definitions: If a polynomial has exactly one term, it is called a **monomial**; a two terms polynomial is a **binomial**; and a three term polynomial is a **trinomial**. Typically, we write a polynomial in descending order, starting with the term of largest degree, called the **leading term**. Its coefficient is called the **leading coefficient**. The **degree of the polynomial** is the degree of its highest term, the leading term.

2. Write the given polynomial in descending order, state the leading coefficient and the degree of the polynomial.

$w + 5 - 4w^3 + 7w^5$ $13y - y^2$ $2.5a^5 - a^9 + 2a^4$

Polynomials may have more than one variable, and in such a case, the degree of a term is the sum of the exponents of the variables contained in the term.

3. What is the degree of the following polynomial? $2x^2y^2z^5 - 3xy^5z^5 + 12xyz^{10}$

4. When adding or subtracting polynomials, you combine **like terms**. Simplify the following expressions.

$(11ab - 23b^2) + (7ab - 19b^2)$ $(8y^2 - 4y^3) - (3y^2 - 8y^3)$ $(-8x^3 + 6x + 7) - (-4 - 5x^3)$

$(-2x^2y^2 + 6xy^2 + 7xy) - (5xy^2 - 2xy - 4)$ $(-ab + 5a^2b) + [7ab^2 - 2ab - (7a^2b + 2ab^2)]$

Now on to multiplication. We have already seen our rules of exponents, which we have used to simplify expressions like $(2x^3y^4)(3xy^2) = 6x^4y^6$. We will use that concept, along with the distribution property and the addition/subtraction simplifying we practiced just now to multiply and simplify polynomials.

5. Multiply and simplify the following expressions.

$2m^3n^2(m^2n^3 - 3mn^2 + 4n)$ $3xy - 4x(2x^2y - 5y + 3x^2y^2)$

$(x - 3)(x + 4)$ $(2x + 3y)(5x - y)$ $(w + 4)(w - 4)$

$(x + 7)^2$ $(2x + y)(x^2 - 4xy + 6y^2)$ $(x + 3)(x^2 - 3x + 9)$

6. A box is created from a square piece of cardboard with sides that are 8 inches in length. The box is created by cutting a square from each corner and folding up the sides (see the diagram below). Let x represent the length of the sides of the squares removed from each corner.

   a. Write a function representing the volume of the box.

   b. Find the volume if 1 inch squares are removed from the corners.