

Polynomial.

Algebraic expression containing many terms of the form cx^n , n being a non-negative integer is called a polynomial. i.e., $f(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \dots + a_{n-1}x^{n-1} + a_nx^n$, where x is a variable, $a_0, a_1, a_2, \dots, a_n$ are constants and $a_n \neq 0$

Example: $4x^4 + 3x^3 - 7x^2 + 5x + 3$, $3x^3 + x^2 - 3x + 5$.

(1) **Real polynomial:** Let $a_0, a_1, a_2, \dots, a_n$ be real numbers and x is a real variable.

Then $f(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \dots + a_nx^n$ is called real polynomial of real variable x with real coefficients.

Example: $3x^3 - 4x^2 + 5x - 4$, $x^2 - 2x + 1$ etc. are real polynomials.

(2) **Complex polynomial:** If $a_0, a_1, a_2, \dots, a_n$ be complex numbers and x is a varying complex number.

Then $f(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \dots + a_nx^n$ is called complex polynomial of complex variable x with complex coefficients.

Example: $3x^2 - (2 + 4i)x + (5i - 4)$, $x^3 - 5ix^2 + (1 + 2i)x + 4$ etc. are complex polynomials.

(3) **Degree of polynomial:** Highest power of variable x in a polynomial is called degree of polynomial.

Example: $f(x) = a_0 + a_1x + a_2x^2 + \dots + a_{n-1}x^{n-1} + a_nx^n$ is a n degree polynomial.

$f(x) = 4x^3 + 3x^2 - 7x + 5$ is a 3 degree polynomial.

$f(x) = 3x - 4$ is single degree polynomial or linear polynomial.

$f(x) = bx$ is an odd linear polynomial.

A polynomial of second degree is generally called a quadratic polynomial. Polynomials of degree 3 and 4 are known as cubic and biquadratic polynomials respectively.

(4) **Polynomial equation:** If $f(x)$ is a polynomial, real or complex, then $f(x) = 0$ is called a polynomial equation.