Polynomials and Rational Functions (C)

A polynomial in the variable z is an expression of the form

 $a_0 + a_1 z + a_2 z^2 + \dots + a_N z^N$

where a_0, a_1, \dots, a_N are complex numbers. The numbers a_0, a_1, \dots, a_N are called the **coefficents** of the polynomial. a_0 is called the constant, and A_N is called the leading coefficient, provided $A_N \neq 0$. The convention is not to write any term in the polynomial whose coefficient is unless all the coefficients are zero, in which case we write , and call this polynomial the **zero** polynomial. If p(z) is a polynomial other than the zero polynomial, the highest power of the variable is called the degree of the polynomial. non-zero onstants are regarded as polynomials of degree . The degree of the zero polnomial is taken to be $-\infty$, so that degrees add when polynomials are multiplied. A polynomial whose lead coefficient is 1 is called a **monic** polynomial. A polynomial whose coefficients are all real numbers is called a **real** polynomial.

A **rational function in the variable** *z* is the ratio of two polynomials in *z*. The values of *z* which make the denominator of the rational function equal to are called the **poles** or **singularities** of the rational function. The values which make the rational function equal to are called its **roots** or **zeros**. A rational function whose numerator and denominator are polnomials of degree 1 or less are called **fractional linear transformations**. Of course, every polynomial is a rational function.