

# Polynomials

**Definition:** A polynomial is a formal expression

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0,$$

where the  $a_i$ 's are numbers and  $x$  is a variable.

We call  $f(x)$ :

a complex polynomial,	if all coefficients	$a_i \in \mathbb{C}$ ,
a real polynomial,	” ” ”	$a_i \in \mathbb{R}$ ,
a rational polynomial,	” ” ”	$a_i \in \mathbb{Q}$ ,
an integer polynomial,	” ” ”	$a_i \in \mathbb{Z}$ ,
a modular polynomial,	” ” ”	$a_i \in \mathbb{F}_p$ .

**Notation:** The set of all

complex polynomials	is denoted by $\mathbb{C}[x]$ ,
real polynomials	is denoted by $\mathbb{R}[x]$ ,
rational polynomials	is denoted by $\mathbb{Q}[x]$ ,
integer polynomials	is denoted by $\mathbb{Z}[x]$ ,
modular polynomials	} is denoted by $\mathbb{F}_p[x]$ .
(w.r.t. a fixed $p$ )	

**Convention:** The symbol  $R$  (for ring) will denote any one of the above ( $\mathbb{C}, \mathbb{R}, \mathbb{Q}, \mathbb{Z}, \mathbb{F}_p$ ), whereas the symbol  $F$  (for field) will be used for all the above except  $\mathbb{Z}$ .