POLYNOMIALS
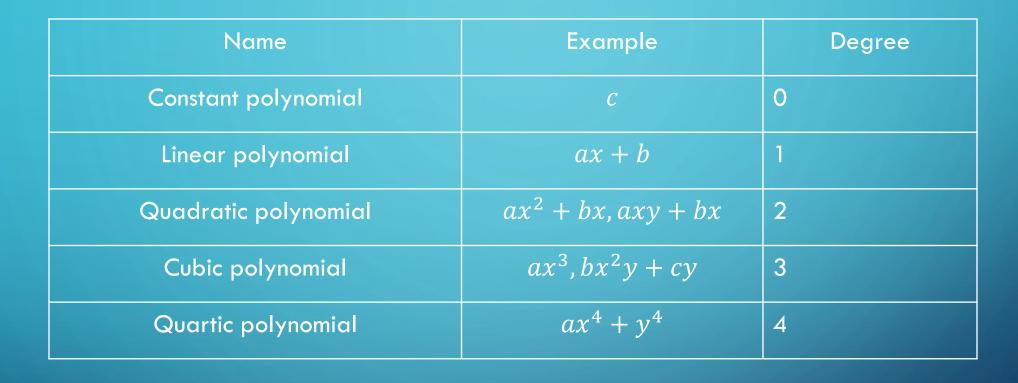
DEBAJYOTI BISWAS

POLYNOMIALS: INTRODUCTION

- A polynomial is an algebraic expression where the possible arithmetic is

1. Addition

2. Subtraction

3. Multiplication

4. Division

5. Natural exponents of the variable.

DEGREE OF THE POLYNOMIAL

- Exponent on the variable in a term is called the degree of that variable in that term.

- The degree of that term is the sum of the degrees of the variables in that term.

- Degree of the zero polynomial is undefined.

- The degree of the polynomial is the largest degree of any one of the terms with non-zero coefficients.

Name	Example	Degree
Constant polynomial	c	0
Linear polynomial	$ax + b$	1
Quadratic polynomial	$ax^2 + bx, axy + bx$	2
Cubic polynomial	$ax^3, bx^2y + cy$	3
Quartic polynomial	$ax^4 + y^4$	4

POLYNOMIALS: INTRODUCTION

- Polynomial of degree n is represented as

  $p(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x^1 + a_0 x^0$, where $a_n \neq 0$

- The expression can be treated as a function from $\mathbb{R} \to \mathbb{R}$, i.e. the domain is $\mathbb{R}$ and the range depends on the function

- Each term in a polynomial is called monomial.

- 2 terms= binomial

- 3 terms=trinomial and so on

- Polynomials in 1 variable➔$x^4 + 1$

- Polynomials in 2 variables➔$x^4 + y^5 + xy$

- Polynomials in 3 variables➔$xyz^4 + x^2 y^5$

POLYNOMIAL ARITHMETIC

If two polynomials are $p(x) = \sum_{k=0}^{n} a_k x^k$ and $q(x) = \sum_{j=0}^{m} b_j x^j$ then-

- Polynomial addition: $p(x) + q(x) = \sum_{k=0}^{mVn}(a_k + b_k)x^k$

- Polynomial subtraction: $p(x) - q(x) = \sum_{k=0}^{mVn}(a_k - b_k)x^k$

- Polynomial multiplication : $p(x) \times q(x) = \sum_{k=0}^{m+n} \sum_{j=0}^{k}(a_j \times b_{k-j})x^k$

- Polynomial division is done with the algo.