MIND MAP

POLYNOMIALS

POLYNOMIALS

Polynomials are algebraic expressions made up of one or more terms of a particular type.

Standard form

The terms with highest degree first then at the last constant term.

$f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} +$
$\ldots\ldots + a_{n-2}x^2 + a_{n-1}x + a_n$

Coefficients

a_0, a_1, a_2, a_n are Real Numbers

$a_0 \neq 0$

n is whole number

Leading Coefficient

a_0 is a leading coefficient.

A real number α is a zero of the polynomial $p(x)$ if $p(\alpha) = 0$.

If $x = \alpha$ is such that $p(\alpha) = 0$, then $x = \alpha$ is said to be a root of polynomial equation $p(x) = 0$

- Graph of $p(x)$ will cut the x axis at $x = \alpha$
- α is taken as root of any linear polynomial.

- α, β are taken as roots of any quadratic polynomial.
- In case of cubic polynomial, The roots are taken as α, β, γ

Linear Polynomial

$P(x) = ax + b$

$$x = -\frac{b}{a} = -\frac{\text{Constant Term}}{\text{Coefficient of x}}$$

Quadratic Polynomial

$P(x) = ax^2 + bx + c$

Sum of the zeros

$$= -\frac{b}{a} = -\frac{\text{Coeff of x}}{\text{Coeff of } x^2}$$

Product of the zeros

$$= \frac{c}{a} = \frac{\text{Cons. term}}{\text{Coeff. of } x^2}$$

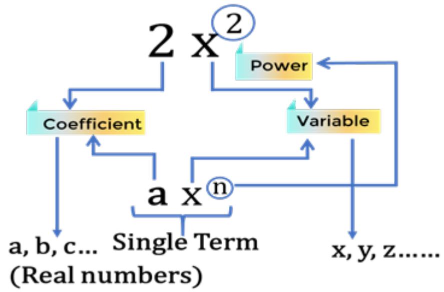
leading coefficient

$ax^2 + bx + c$

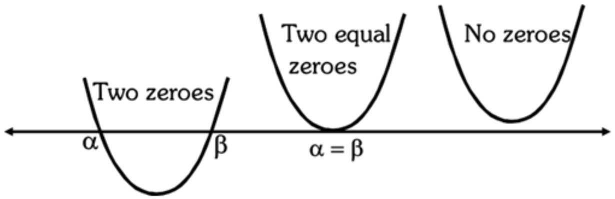
coefficient of x

absolute term

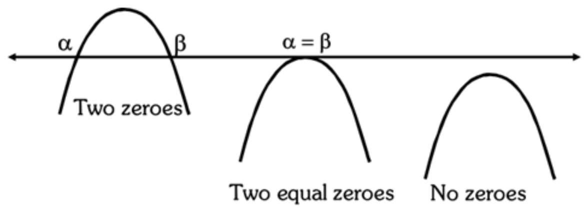
Where a, b, c $\in$ R, $a \neq 0$



Case I $a > 0$ (Mouth upward)



Case II $a < 0$ (Mouth downward)



Cubic Polynomial

$P(x) = ax^3 + bx^2 + cx + d$

Sum of the zeros $= \dfrac{-b}{a}$

$\alpha\beta + \beta\gamma + \gamma\alpha = \dfrac{c}{a}$

Product of the zeros $\alpha\beta\gamma = \dfrac{-d}{a}$

MIND MAP

POLYNOMIALS

Polynomials
- Poly (Many)
- Nomials (Terms)

Type Of Polynomials

1. By Number of Non Zero Terms

- **Monomial** – Single term Polynomial
  Ex: x, 2, x^2, $4x^3$
- **Binomial** – Two terms Polynomial
  Ex: $z + 4$, $x^2 + 1$, $x + y$, $x^3 + 3x^2$
- **Trinomial** – Three terms Polynomial
  Ex: $x^2 + x + 1$, $x^2 + 2xy + y^2$, $x + y + z$

2. By Number of Distinct Variable

- **Univariate** – Single Variable Polynomial
  Ex: $x + 9$, $x^3 + 3x^2$
- **Bivariate** – Two Variable Polynomial
  Ex: $x + y + 9$, $x^2 + 2xy + y^2$
- **Trivariate** – Three Variable Polynomial
  Ex: $x + y + z + 9$, $x^2 + y^2 + z^2 + 2xy + 2yz + 2xz$

3. By Degree

- **Constant Polynomial** – Polynomial of degree 0
  Ex: 2, 3, 5 … $2 = 2x^0$
- **Linear Polynomial** – Polynomial of degree 1
  Ex: $x + 2$, $y + 5$, $3u + 4$
- **Quadratic Polynomial** – Polynomial of degree 2
  Ex: $2x^2 + 5$, $x^2 + 2/7x$, $5x^2 + 2x + \pi$
- **Cubic Polynomial** – Polynomial of degree 3
  Ex: $8x^3$, $2x^3 + x + 1$, $6 - x^3$

Algebraic Identities

Identity I : $(x + y)^2 = x^2 + 2xy + y^2$

Identity II : $(x - y)^2 = x^2 - 2xy + y^2$

Identity III : $x^2 - y^2 = (x + y)(x - y)$

Identity IV : $(x + a)(x + b) = x^2 + (a + b)x + ab$

Identity V : $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

Identity VI : $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

Identity VII : $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$

Identity VIII : $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$