INDIAN INSTITUTE OF TECHNOLOGY MADRAS

सिद्धिर्भवति कर्मजा

IIT Madras

ONLINE DEGREE

Polynomia

Algebra with Polynomia

Polynomials in One Variable

Description: As seen earlier, the polynomial of degree n, is represented as

$$a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0.$$

This expression can be treated as a function from IR $\longrightarrow$ IR.

That is, the domain of $p(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$ is IR, and the range depends on the function.

Addition of Polynomials

Add the following polynomials:

1. $p(x) = x^2+4x+4,\ q(x) = 10$
2. $p(x) = x^4+4x,\ q(x) = x^3+1$
3. $p(x)= x^3+2x^2+x,\ q(x)= x^2+2x+2$

$p(x) = 1x^2+4x+4$
$q(x) = 0x^2+0x+10$

$p(x)+q(x) = x^2+4x+14$

$p(x) = 1x^4+0x^3+0x^2+4x+0$
$q(x) = 0x^4+x^3+0x^2+0x+1$

$p(x)+q(x) = x^4+x^3+4x+1$

$p(x) = 1x^3+2x^2+x+0$
$q(x) = 0x^3+x^2+2x+2$

$p(x)+q(x) = x^3+(2+1)x^2+(1+2)x+2 = x^3+3x^2+3x+2$

$$Let\ p(x) = \sum_{k=0}^{n} a_k x^k,\ and\ q(x) = \sum_{j=0}^{m} b_j x^j.\ Then$$

$$p(x) + q(x) = \sum_{k=0}^{m \vee n} (a_k + b_k) x^k.$$

Subtraction of Polynomials

Subtract the following polynomials:

1. $p(x) = x^2+4x+4,\ q(x) = 10$
2. $p(x) = x^4+4x,\ q(x) = x^3+1$
3. $p(x)= x^3+2x^2+x,\ q(x)= x^2+2x+2$

$$\begin{aligned} p(x) &= 1x^2+4x+4 \\ -q(x) &= -0x^2-0x-10 \end{aligned}$$

$p(x)-q(x) = x^2+4x-6$

$$\begin{aligned} p(x) &= 1x^4+0x^3+0x^2+4x+0 \\ -q(x) &= -0x^4- x^3-0x^2-0x-1 \end{aligned}$$

$p(x)+q(x) = x^4-x^3+4x-1$

$$\begin{aligned} p(x) &= 1x^3+2x^2+ x+0 \\ -q(x) &= -0x^3-1x^2-2x-2 \end{aligned}$$

$p(x)-q(x) = x^3+(2-1)x^2+(1-2)x-2 = x^3+x^2-x-2$

$$Let\ p(x) = \sum_{k=0}^{n} a_k x^k,\ and\ q(x) = \sum_{j=0}^{m} b_j x^j.\ Then$$

$$p(x) - q(x) = \sum_{k=0}^{m \vee n} (a_k - b_k) x^k.$$