

Polynomials

Basic concepts

Terms are mathematical expressions made up of two parts: a real part and a variable part. In a term the real part and the variable part are multiplied together. The real part is a real number, called **coefficient**, the variable part can be made up of a variable raised to a power.

e.g. $3x^2, 5x^3$,

x^2 , **NB** in this example the real part is 1

5, **NB** in this example the variable part is x^0 .

A **polynomial** is a combination of many terms, linked together by additions or subtractions

e.g. $3x^2 + x - 5$

The coefficient of x^0 , -5 in this case, is called **constant term**.

The **degree** of a term is determined by the power of the variable part, e.g. in the term $7x^3$ the power of the variable is 3, that is a third degree term.

The **degree of a polynomial** is the highest degree of its terms. The conventional arrangement of a polynomial requires to write the terms of the polynomial from the highest degree to the lowest.

e.g. $3x^4 + x^3 + 4x^2 + x + 5$, it's a fourth degree polynomial.

How to sum polynomials

Like terms are terms that have the same exponent

e.g. $3x^2, x^2$ are like terms.

Like terms can be summed, the sum of two like terms

is the multiplication between the sum of the coefficients and the variable part.

e.g. $3x^2 + x^2 = 4x^2$

The sum of two polynomials is obtained by summing like terms

e.g. How to sum $3x^3 - x + 3$ with $2x^2 + 3x - 1$?

NB $3x^3 - x + 3 = 3x^3 + 0x^2 - x + 3$

$$2x^2 + 3x - 1 = 0x^3 + 2x^2 + 3x - 1$$

We can write the polynomials in those forms and gather like terms, that we can sum

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

NB We used commutative property and the sum of the terms.