Polynomials

The Basics: $P(x) = \sum_{r=0}^{n} a_k x^k = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$, where $a_0, a_1, \ldots, a_n$ are constants and $a_n \neq 0$.

Terminology: $a_n x^n$ ... leading term

a_n ... leading coefficient

n ... degree i.e. $\deg P(x) = n$

A polynomial of degree zero ($\deg P(x) = 0$) is called the *zero polynomial*: $Z(x) = 0$.

A polynomial of degree one ($\deg P(x) = 1$) is called a *constant polynomial*: $Z(x) = a_0 \neq 0$.

A polynomial of degree two ($\deg P(x) = 2$) is called a *linear polynomial*: $Z(x) = a_1 x + a_0$, $a_1 \neq 0$.

(Its graph is a staight line, hence the word *linear*.)

A polynomial of degree three ($\deg P(x) = 3$) is called a *quadratic polynomial*: $Z(x) = a_2 x^2 + a_1 x + a_0$, $a_2 \neq 0$.

(Its graph is a parabola.)

$P(x)$ is a *monic polynomial* if the leading coefficient $a_n = 1$.

Note: A monic polynomial represents a class of polynomials with their coefficient in ratio.

e.g. $8x^3 + 4x^2 - 2x + 6$ is in the same class as $4x^3 + 2x^2 - x + 3$,

as the monic polynomial for both are $x^3 + \frac{1}{2}x^2 - \frac{1}{4}x + \frac{3}{4}$.

Identically Equal Polynomials: