

Chapter 02

POLYNOMIALS

Example:

Use the factor theorem to factorise completely

$$(x^3 + x^2 - 4x - 4).$$

Solution:

$$\text{Let } f(x) = x^3 + x^2 - 4x - 4$$

The constant term in $f(x)$ is '-4'

Its factors are 1, -1, 2, -2, and -4.

By trail and error method,

$$f(2) = 2^3 + 2^2 - 4(2) - 4 = 0$$

$$\therefore (x-2) \text{ is a factor of } f(x) = x^3 + x^2 - 4x - 4$$

On dividing $f(x)$ by $(x-2)$ we get,

$$\text{Quotient} = (x^2 + 3x + 2)$$

$$\therefore x^3 + x^2 - 4x - 4 = (x-2)(x^2 + 3x + 2)$$

$$= (x-2)(x^2 + 2x + x + 2)$$

$$= (x-2)(x(x+2) + 1(x+2))$$

$$= (x-2)((x+2)(x+1))$$

$$\text{Hence, } x^3 + x^2 - 4x - 4 = (x+1)(x-2)(x+2).$$

$$\begin{array}{r} x^2 + 3x + 2 \\ x-2 \overline{) x^3 + x^2 - 4x - 4} \\ \underline{x^3 - 2x^2} \\ 3x^2 - 4x - 4 \\ \underline{3x^2 - 6x} \\ 2x - 4 \\ \underline{2x - 4} \\ 0 \end{array}$$