Example 3

Factorise $f(x) = 2x^3 + x^2 - 13x + 6$. and Solve.

① guess to find Solution and Related factor.

$f(1) = 2(1)^3 + (1)^2 - 13(1) + 6$
$= 2 + 1 - 13 + 6 = -4 \neq 0$
$f(2) = 2(2)^3 + (2)^2 - 13(2) + 6$
$= 16 + 4 - 26 + 6 = 0$ ✓
$\Rightarrow$ $x = 2$ is a Soln
$\Rightarrow$ $(x-2)$ is a factor

② Divide

$$x-2 \overline{)\, 2x^3 + x^2 - 13x + 6}$$
$$2x^2 + 5x - 3$$
$$\mp 2x^3 \pm 4x^2$$
$$5x^2 - 13x$$
$$\mp 5x^2 \pm 10x$$
$$-3x + 6$$
$$\pm 3x \mp 6$$

③ factorise quadratic $2x^2 + 5x - 3$
$(2x - 1)(x + 3)$

④ Solns?

3 FACTORS are: $(x-2)(2x-1)(x+3)$
3 Solns are: $x = 2$, $x = \frac{1}{2}$, $x = -3$

12. Use the *factor theorem* to factorise fully each of the following:

(v) $2x^3 - 3x^2 - 8x - 3$ (vi) $2x^3 - 3x^2 - 12x + 20$.

(vi)

guess $x=2$

$f(x) = 2x^3 - 3x^2 - 12x + 20$
$f(2) = 2(2)^3 - 3(2)^2 - 12(2) + 20 = 0$ ✓
$\Rightarrow$ $x = 2$ is a solution
$\Rightarrow$ $(x-2)$ is a factor

divide

$$x-2 \overline{)\, 2x^3 - 3x^2 - 12x + 20}$$
$$2x^2 + x - 10$$
$$\mp 2x^3 \pm 4x^2$$
$$x^2 - 12x$$
$$\mp x^2 \pm 2x$$
$$-10x + 20$$
$$\pm 10x \mp 20$$

factorise

$2x^2 + x - 10$
$(2x+5)(x-2)$ are other 2 factors

Solutions $\Rightarrow$ $x = 2$, $x = -5/2$, $x = 2$