

Harder Factor Theorem

(a) Show that $2x - 1$ is a factor of $2x^3 + 5x^2 - 7x + 2$

(b) Show that $3x + 1$ is a factor of $6x^3 + 23x^2 - 38x - 15$

(c) Show that $5x - 2$ is a factor of $5x^3 + 23x^2 + 40x - 20$

(a) Show that $2x + 1$ is a factor of $4x^3 + 4x^2 - 5x - 3$. Hence, fully factorise $4x^3 + 4x^2 - 5x - 3$.

(b) Show that $4x - 1$ is a factor of $4x^3 + 3x^2 - 25x + 6$. Hence, solve $4x^3 + 3x^2 - 25x + 6 = 0$.

(c) Show that $2x - 3$ is a factor of $6x^3 + 25x^2 - 31x - 30$. Hence, solve $6x^3 + 25x^2 - 31x - 30 = 0$.

(a) Given that $2x - 1$ is a factor of $4x^3 - 12x^2 + ax + 12$, find the value of a .

(b) Given that $3x + 2$ is a factor of $6x^3 + bx^2 + 27x + 14$, find the value of b .

(c) Given that $2x - 5$ is a factor of $cx^3 - 29x^2 + 16x - 15$, find the value of c .

(a) Given that both $x - 2$ and $2x + 1$ are factors of $6x^3 - ax^2 - 18x - b$, find the values of a and b .

(b) Given that $x - a$ is a factor of $3x^3 + 2x^2 - 12ax - 8a$, and that a is a non-zero integer, find the value of a .

RED

(a) If $2x - 1$ is a factor then $f\left(\frac{1}{2}\right) = 0$

$$f\left(\frac{1}{2}\right) = 2 \times 0.5^3 + 5 \times 0.5^2 - 7 \times 0.5 + 2 = 0$$

Hence $2x - 1$ is a factor.

(b) If $3x + 1$ is a factor then $f\left(-\frac{1}{3}\right) = 0$

$$f\left(-\frac{1}{3}\right) = 6 \times \left(-\frac{1}{3}\right)^3 + 23 \times \left(-\frac{1}{3}\right)^2 - 38 \times \left(-\frac{1}{3}\right) - 15 = 0$$

Hence $3x + 1$ is a factor.

(c) If $5x - 2$ is a factor then $f\left(\frac{2}{5}\right) = 0$

$$f\left(\frac{2}{5}\right) = 5 \times (0.4)^3 + 23 \times (0.4)^2 + 40 \times (0.4) - 20 = 0$$

Hence $5x - 2$ is a factor.

YELLOW

(a) $f\left(-\frac{1}{2}\right) = 4 \times (-0.5)^3 + 4 \times (-0.5)^2 - 5 \times (-0.5) - 3 = 0$

$$(x - 1)(2x + 1)(2x + 3)$$

(b) $f\left(\frac{1}{4}\right) = 4 \times (0.25)^3 + 3 \times (0.25)^2 - 25 \times (0.25) + 6 = 0$

$$(x + 3)(x - 2)(4x - 1)$$

(c) $f\left(\frac{3}{2}\right) = 6 \times (1.5)^3 + 25 \times (1.5)^2 - 31 \times (1.5) - 30 = 0$

$$(x + 5)(2x - 3)(3x + 2)$$

GREEN

(a) $a = -19$

(b) $b = 13$

(c) $c = 10$

PURPLE

(a) $a = 1, b = 8$

(b) $a = 4$