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Factor Theorem | Past Paper Question | OCR C2 June 2013 Q9(ii)

$$f(x) = 4x^3 - 7x - 3$$

$$\therefore f\left(-\frac{1}{2}\right) = 4\left(-\frac{1}{2}\right)^3 - 7\left(-\frac{1}{2}\right) - 3 = 0$$

$\therefore 2x+1$ is a factor of $f(x)$

$$\therefore 4x^3 - 7x - 3 \equiv (2x+1)(ax^2+bx+c)$$

Compare

coefficients x^3 : $4 = 2a \Rightarrow a = 2$

constants: $-3 = c \Rightarrow c = -3$

x terms: $-7 = 2(-3) + b \Rightarrow b = -1$

$$\therefore f(x) \equiv (2x+1)(2x^2-x-3)$$

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

If $f(x)$ is a polynomial and $f\left(\frac{b}{a}\right) = 0$,
then $(ax-b)$ is a factor of $f(x)$.

$$\begin{array}{r} 2x^2 - x - 3 \\ 2x+1 \overline{) 4x^3 + 0x^2 - 7x - 3} \\ \underline{-4x^3 + 2x^2} \\ -2x^2 - 7x \\ \underline{-2x^2 - x} \\ -6x - 3 \\ \underline{-6x - 3} \\ 0 \end{array}$$

$\therefore 2x+1$ is a factor of $f(x)$

$$\begin{aligned} 4x^3 - 7x - 3 &\equiv (2x+1)(2x^2-x-3) \\ &\equiv (2x+1)(2x-3)(x+1) \end{aligned}$$

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