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Factor Theorem | Past Paper Question | C2 OCR June 2012 Q8(i)

Two cubic polynomials are defined by $f(x) = x^3 + (a-3)x + 2b$, $g(x) = 3x^3 + x^2 + 5ax + 4b$, where a and b are constants.

(i) Given that $f(x)$ and $g(x)$ have a common factor of $(x-2)$, show that $a = -4$ and find the value of b. [6]

$\boxed{\text{If } f(x) \text{ is a polynomial and } f(p) = 0, \text{ then } x - p \text{ is a factor of } f(x).}$

Now $f(2) = 0$

$\therefore 2^3 + 2(a-3) + 2b = 0$

$\therefore 8 + 2a - 6 + 2b = 0$

$\therefore 2 + 2a + 2b = 0$ ①

Also $g(2) = 0$

$\therefore 3(2)^3 + (2)^2 + 5a(2) + 4b = 0$

$\therefore 28 + 10a + 4b = 0$

$\therefore 14 + 5a + 2b = 0$ ②

② − ① : $12 + 3a = 0$

$\therefore 3a = -12$

$\therefore a = -4$

Sub $a = -4$ into ①

$\therefore 2 - 8 + 2b = 0$

$\therefore 2b = 6$

$\therefore b = 3$

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