

STEP II, 2016, Q2

- 2 Use the factor theorem to show that $a + b - c$ is a factor of

$$(a + b + c)^3 - 6(a + b + c)(a^2 + b^2 + c^2) + 8(a^3 + b^3 + c^3). \quad (*)$$

Hence factorise (*) completely.

- (i) Use the result above to solve the equation

$$(x + 1)^3 - 3(x + 1)(2x^2 + 5) + 2(4x^3 + 13) = 0.$$

- (ii) By setting $d + e = c$, or otherwise, show that $(a + b - d - e)$ is a factor of

$$(a + b + d + e)^3 - 6(a + b + d + e)(a^2 + b^2 + d^2 + e^2) + 8(a^3 + b^3 + d^3 + e^3)$$

and factorise this expression completely.

Hence solve the equation

$$(x + 6)^3 - 6(x + 6)(x^2 + 14) + 8(x^3 + 36) = 0.$$



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