6. $f(z) = 12z^4 + Az^3 + Bz^2 + Cz - 306$

where A, B and C are integers.

Given that $z = 1 + 4i$ is a root of the equation $f(z) = 0$

(a) write down another root of the equation $f(z) = 0$

(1)

(b) Hence determine a quadratic factor of $f(z)$

(2)

Given also that $(3z - 2)$ is a factor of $f(z)$

(c) factorise $f(z)$ completely.

(3)

(d) Determine the value of A, the value of B and the value of C.

(3)

(e) Show all the roots of the equation $f(z) = 0$ on a single Argand diagram.

(2)

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Question 6 continued

(Total for Question 6 is 11 marks)