7: $f(z) = Pz^4 - 36z^3 + Qz^2 + 192z + 68$

where P and Q are real constants.

Given that $3 + 5i$ 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, with real coefficients, of $f(z)$

(2)

(c) Determine the value of P and the value of Q.

(5)

Without using a calculator,

(d) determine the other roots of the equation $f(z) = 0$ giving your answers in simplest form.

(2)

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Question 7 continued

(Total for Question 7 is 10 marks)