Question number	Scheme	Marks
5 (a)	$(\alpha+\beta)^3 = \alpha^3 + 3\alpha^2\beta + 3\alpha\beta^2 + \beta^3 \Rightarrow \alpha^3 + \beta^3$ $= (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)*$	M1A1 cso [2]
(b)	$\alpha+\beta = -\dfrac{3}{2} \qquad \alpha\beta = \dfrac{6}{2} = 3$ $\left[\alpha^3 + \beta^3 = (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)\right]$ $\alpha^3 + \beta^3 = \left(-\dfrac{3}{2}\right)^3 - 3\times 3\times\left(-\dfrac{3}{2}\right) = \dfrac{81}{8}$	B1 B1 [2]
(c)	$\left(\alpha^2+\beta^2\right)^2 = \alpha^4 + 2\alpha^2\beta^2 + \beta^4 \Rightarrow \alpha^4+\beta^4 = \left(\alpha^2+\beta^2\right)^2 - 2(\alpha\beta)^2 *$	M1A1 cso [2]
(d)	$\alpha^2 + \beta^2 = \left(-\dfrac{3}{2}\right)^2 - 2\times 3 = -\dfrac{15}{4}$ Sum $\quad (\alpha^3 - \beta) + (\beta^3 - \alpha) = \alpha^3 + \beta^3 - (\alpha+\beta) = \dfrac{81}{8} - \left(-\dfrac{3}{2}\right) = \dfrac{93}{8}$ Product $\quad (\alpha^3 - \beta)\times(\beta^3 - \alpha) = (\alpha\beta)^3 - (\alpha^4+\beta^4) + \alpha\beta$ $\qquad\qquad = 27 - \left[\left(-\dfrac{15}{4}\right)^2 - 2\times 3^2\right] + 3 = \dfrac{543}{16}$ Equation $\quad x^2 - \dfrac{93}{8}x + \dfrac{543}{16} = 0 \Rightarrow 16x^2 - 186x + 543 = 0$	B1 B1 M1 A1 M1A1 [6]
		Total 12 marks
(a) **M1** A1 cso **(b)** **B1** **B1** **(c)** **M1** A1 cso	$(\alpha+\beta)^3 = \alpha^3 + 3\alpha^2\beta + 3\alpha\beta^2 + \beta^3$ Obtains the **given** answer with no errors in the working $\alpha+\beta = -\dfrac{3}{2}$ and $\alpha\beta = \dfrac{6}{2} = 3$ $\alpha^3 + \beta^3 = \dfrac{81}{8}$ $\left(\alpha^2+\beta^2\right)^2 = \alpha^4 + 2\alpha^2\beta^2 + \beta^4$ Obtains the **given** answer with no errors in the working	

(d)	
B1	$\alpha^2 + \beta^2 = -\dfrac{15}{4}$ $\left(\text{May be implied by } \alpha^4 + \beta^4 = -\dfrac{63}{16} \right)$
B1	$\left(\alpha^3 - \beta \right) + \left(\beta^3 - \alpha \right) = \dfrac{93}{8}$
M1	$\left(\alpha^3 - \beta \right) \times \left(\beta^3 - \alpha \right) = \left(\alpha\beta \right)^3 - \left(\alpha^4 + \beta^4 \right) + \alpha\beta$
A1	$\left(\alpha^3 - \beta \right) \times \left(\beta^3 - \alpha \right) = \dfrac{543}{16}$
M1	$x^2 - \text{'sum'}\, x + \text{'product'}\, (= 0)$
A1	$16x^2 - 186x + 543 = 0$