Question Number	Scheme	Marks
10 **(a)**	$\alpha + \beta = \dfrac{5}{2} \qquad \alpha\beta = \dfrac{1}{2}$	B1
	$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = \left(\dfrac{5}{2}\right)^2 - 2 \times \dfrac{1}{2} = \dfrac{21}{4}$	M1A1 (3)
(b)	$\alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2 = \left(\dfrac{21}{4}\right)^2 - 2 \times \left(\dfrac{1}{2}\right)^2$	M1
	$= \dfrac{433}{16} \qquad \text{\Large *}$	A1 (2)
(c)	$\left(\alpha^2 + \dfrac{1}{\alpha^2}\right) + \left(\beta^2 + \dfrac{1}{\beta^2}\right) = \alpha^2 + \beta^2 + \dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2}$	
	$= \alpha^2 + \beta^2 + \dfrac{\beta^2 + \alpha^2}{\alpha^2\beta^2}, \quad = \dfrac{21}{4} + \dfrac{\frac{21}{4}}{\left(\frac{1}{2}\right)^2} = \dfrac{105}{4}$	M1,A1
	$\left(\alpha^2 + \dfrac{1}{\alpha^2}\right)\left(\beta^2 + \dfrac{1}{\beta^2}\right) = \alpha^2\beta^2 + \dfrac{\beta^2}{\alpha^2} + \dfrac{\alpha^2}{\beta^2} + \dfrac{1}{\alpha^2\beta^2}$	M1
	$\alpha^2\beta^2 + \dfrac{\beta^4 + \alpha^4}{\alpha^2\beta^2} + \dfrac{1}{\alpha^2\beta^2} = \left(\dfrac{1}{2}\right)^2 + \dfrac{433}{16} \times \left(\dfrac{2}{1}\right)^2 + \left(\dfrac{2}{1}\right)^2 = \dfrac{225}{2} \quad$ oe	M1A1
	$x^2 - \text{sum} \times x + \text{product} \ (= 0) \qquad x^2 - \dfrac{105}{4}x + \dfrac{225}{2} \ (= 0)$	M1
	$4x^2 - 105x + 450 = 0$	A1 (7)
		[12]

Question Number	Scheme	Marks
11 **(a)**	$r = 2$	B1 (1)
(b)	$(x-1)(x-3)(x+2) = x^3 + px^2 + qx + 6$	
	$(x^2 - 4x + 3)(x+2) = x^3 - 2x^2 - 5x + 6$	M1
	$p = -2, \quad q = -5$	A1A1 (3)
(c)	$y = x^3 - 2x^2 - 5x + 6$	
	$\dfrac{dy}{dx} = 3x^2 - 4x - 5$	M1
	$x = 2 \quad \dfrac{dy}{dx} = 12 - 8 - 5 = -1$	A1ft
	y-coord of B is $8 - 8 - 10 + 6 = -4$	B1ft
	Equation tangent: $y + 4 = -1(x-2)$ $\quad (y = -x - 2)$	M1A1 (5)
(d)	A is $(-2, 0)$	B1ft
	$0 + 4 = -1(-2 - 2)$ $\therefore$ passes through A	B1ft (2)
(e)	area $= \displaystyle\int_{-2}^{2} \left\{ \left(x^3 - 2x^2 - 5x + 6 \right) - (-x - 2) \right\} dx$	M1
	$\displaystyle\int_{-2}^{2} \left(x^3 - 2x^2 - 4x + 8 \right) dx$	
	$= \left[\dfrac{1}{4}x^4 - \dfrac{2}{3}x^3 - 2x^2 + 8x \right]_{-2}^{2}$	M1A1ft
	$= 4 - \dfrac{16}{3} - 8 + 16 - \left(4 + \dfrac{16}{3} - 8 - 16 \right)$	M1dep
	$= 21\dfrac{1}{3}$ (accept awrt 21.3)	A1 (5)
		[16]

Ofqual

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