FP1 Roots & Coefficients of Equations Answers

(b)(i)	Other root is $\sqrt{5}$ + i	B1	1	
(ii)	Sum of roots is $2\sqrt{5}$	B1		
	Product is 6	M1A1	3	
(iii)	$p = -2\sqrt{5}$, $q = 6$	B1 B1√	2	ft wrong answers in (ii)

1(a)	$\alpha + \beta = 2$, $\alpha\beta = \frac{2}{3}$	B1B1	2	**SC** 1/2 for answers 6 and 2
(b)(i)	$(\alpha+\beta)^3 = \alpha^3+3\alpha^2\beta+3\alpha\beta^2+\beta^3$	B1	1	Accept unsimplified
(ii)	$\alpha^3 + \beta^3 = (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)$	M1		
	Substitution of numerical values	m1		
	$\alpha^3 + \beta^3 = 4$	A1	3	convincingly shown AG
(c)	$\alpha^3\beta^3 = \frac{8}{27}$	B1		
	Equation of form $px^2 \pm 4px + r = 0$	M1		
	Answer $27x^2 - 108x + 8 = 0$	A1√	3	ft wrong value for $\alpha^3\beta^3$
	Total		**9**	

3(a)	$\alpha + \beta = -2$, $\alpha\beta = \frac{3}{2}$	B1B1	2	
(b)	Use of expansion of $(\alpha+\beta)^2$	M1		
	$\alpha^2 + \beta^2 = (-2)^2 - 2\left(\frac{3}{2}\right) = 1$	m1A1	3	convincingly shown (**AG**); m1A0 if $\alpha + \beta = 2$ used
(c)	$\alpha^4 + \beta^4$ given in terms of $\alpha+\beta$, $\alpha\beta$ and/or $\alpha^2+\beta^2$	M1A1		M1A0 if num error made
	$\alpha^4 + \beta^4 = -\frac{7}{2}$	A1	3	OE
	Total		**8**	

4(a)	$\alpha + \beta = \frac{1}{2}$, $\alpha\beta = 2$	B1B1	2	
(b)	$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$	M1		
	$\ldots = \frac{\frac{1}{2}}{2} = \frac{1}{4}$	A1	2	Convincingly shown (AG)
(c)	Sum of roots = 1	B1F		PI by term $\pm x$; ft error(s) in (a)
	Product of roots = $\frac{16}{\alpha\beta} = 8$	B1F		ft wrong value of $\alpha\beta$
	Equation is $x^2 - x + 8 = 0$	B1F	3	ft wrong sum/product; "= 0" needed
	Total		**7**	