Question Number	Scheme	Notes	Marks
3	Score B0 in (a) if the roots $\frac{1\pm\sqrt{14}\,\mathrm{i}}{3}$ are seen and then answers are just written down. The three subsequent method marks require use of the relevant identities. If not, a maximum of 0000010 is likely.		
(a)	$3x^2-2x+5=0\Rightarrow$ $\alpha+\beta=\frac{2}{3},\quad \alpha\beta=\frac{5}{3}$	Both values correct. Consider in order presented if not labelled	B1
			(1)
(b)	$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=\left("\frac{2}{3}"\right)^2-2\left("\frac{5}{3}"\right)=\ldots$	**Uses** correct identity with their sum and product to obtain a value for $\alpha^2+\beta^2$	M1
	$=-\frac{26}{9}$	Correct value **from correct sum and product**	A1
			(2)
(c)	The work for the first two marks may be embedded within a quadratic expression/equation		
	$\alpha+\frac{1}{\alpha}+\beta+\frac{1}{\beta}=\alpha+\beta+\frac{\alpha+\beta}{\alpha\beta}="\frac{2}{3}"+\frac{"\frac{2}{3}"}{"\frac{5}{3}"}=\ldots\left(\frac{16}{15}\right)$	Obtains a **value** for the new sum from a <u>correct numerical expression (which could be implied)</u> with their sum and product. Allow use of equivalent numerical expressions following use of e.g. $\frac{\alpha\beta(\alpha+\beta)+\alpha+\beta}{\alpha\beta}$	**1st** M1 (Sum)
	$\left(\alpha+\frac{1}{\alpha}\right)\left(\beta+\frac{1}{\beta}\right)=\alpha\beta+\frac{\alpha}{\beta}+\frac{\beta}{\alpha}+\frac{1}{\alpha\beta}=\alpha\beta+\frac{\alpha^2+\beta^2}{\alpha\beta}+\frac{1}{\alpha\beta}$ $="\frac{5}{3}"+\frac{"-\frac{26}{9}"}{"\frac{5}{3}"}+\frac{1}{"\frac{5}{3}"}=\ldots\left(\frac{8}{15}\right)$	Obtains a **value** for the new product via a <u>correct numerical expression (which could be implied)</u> with their sum, product and answer to (b) which may have been reattempted. Allow use of equivalent numerical expressions following use of e.g $\frac{(\alpha\beta)^2+\alpha^2+\beta^2+1}{\alpha\beta}$	**2nd** M1 (Product)
	$x^2-"\frac{16}{15}"x+"\frac{8}{15}"\ \{=0\}$	Correctly applies x^2 – (their **new** sum)x + their **new** product with **values** to obtain a 3TQ. Not dependent. Accept appropriate values for p, q and r for this mark.	M1
	$15x^2-16x+8=0$	Correct equation – not just values for p, q and r. Terms in any order but must have "=0". Allow any integer multiple. Must come from $\alpha+\beta=\frac{2}{3},\quad \alpha\beta=\frac{5}{3}$ Condone a different variable (e.g., z)	A1
			(4)
			Total 7