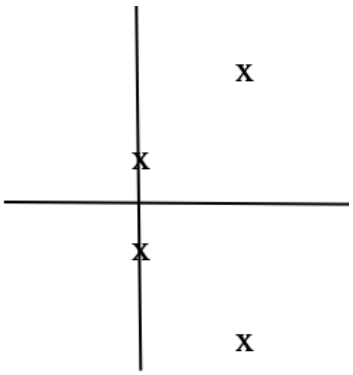
Question Number	Scheme	Notes	Marks
2	$2x^4-8x^3+29x^2-12x+39=0, \quad x=2+3\text{i}$ Condone work in e.g., z throughout		
(a)	2–3i	Correct conjugate	B1
			(1)
(b)	$(x-(2-3\text{i}))(x-(2+3\text{i}))=\ldots \quad \{x^2-4x+13\}$ or $(x-2+3\text{i})(x-2-3\text{i})$ or sum $=4$, product $=13$ $\Rightarrow x^2\pm4x\pm13$ or $x^2\pm13x\pm4$ or $x^2-(2+3\text{i}+2-3\text{i})x+(2+3\text{i})(2-3\text{i})$ $\Rightarrow \ldots \quad \{x^2-4x+13\}$	Attempts to multiply the two correct factors to obtain a 3 term quadratic with real coefficients. Could use $(x-2)^2=(\pm3\text{i})^2$ or $x^2-2ax+a^2+b^2$ with $a=2,\ b=\pm3$ Or uses the correct sum and product of the roots to obtain an expression of the form shown (must be some minimal working – but if just a quadratic is given the next 2 marks are available) or $x^2-(\alpha+\beta)x+\alpha\beta$ to obtain a 3 term quadratic with real coefficients.	M1
	$2x^4-8x^3+29x^2-12x+39\Rightarrow(x^2-4x+13)(2x^2+3)$	Uses their 2 or 3 term quadratic factor with real coefficients to obtain a second 2 or 3 term quadratic of the form $2x^2+\ldots$ by long division, equating coefficients or inspection. Ignore any remainder from long division. Can follow M0	M1
	$2x^2+3(=0)\Rightarrow$ $x=\pm\frac{\sqrt{6}}{2}\text{i}$ or $\pm\text{i}\sqrt{\frac{3}{2}}$ or $\pm\frac{\sqrt{3}}{\sqrt{2}}\text{i}$ or $\sqrt{1.5}\,\text{i}$ $\sqrt{1.5\text{i}}$ is M0 1.2247...i is M1 A0	**d**M1: Solves their second quadratic factor = 0. If 2 term must get one correct non-zero root. (Usual rules if 3TQ and one correct root if no working) Could be inexact. **Requires previous method mark.** A1: Both correct exact roots with "i" **Requires all previous marks.**	**d**M1 A1
	Solving by calculator, sometimes followed by attempts to reconstruct factors. e.g., $\text{f}(x)=(x^2-4x+13)\left(x^2+\frac{3}{2}\right)$ is first M1 only and working for the 3TQ must be seen		**(4)**
(c)		Allow ft on their **answers to (b)** if they are of the form $\pm k\text{i}$ or $\pm k\sqrt{-1},\ k\neq0$ regardless of how they were obtained 1st B1: One of the two pairs of roots in correct positions 2nd B1: Both pairs of roots in correct positions and correct relative to each other for their k Allow any suitable indication of the roots such as vectors. Ignore all labelling and scaling but each pair should be reasonably symmetric in x-axis for any marks (for each pair -distance of one to x-axis not less than $\frac{1}{2}$ of the other)	B1 B1 (ft on (b))
			(2)
			Total 7