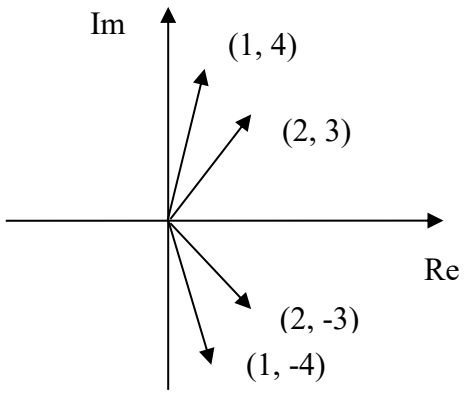
Question Number	Scheme	Notes	Marks
2	$\mathrm{f}(z) = z^4 - 6z^3 + 38z^2 - 94z + 221$ Condone consistent work in x throughout, but mixed variables which are not recovered loses final A mark		
(a)	$z = 2 - 3\mathrm{i}$ (is also a root)		B1
	$\left(z - \left(2 + 3\mathrm{i}\right)\right)\left(z - \left(2 - 3\mathrm{i}\right)\right) = \cdots$ or $\left(2 + 3\mathrm{i}\right) + \left(2 - 3\mathrm{i}\right) = \cdots (4)$ and $\left(2 + 3\mathrm{i}\right)\left(2 - 3\mathrm{i}\right) = \cdots (13)$		M1
	$z^2 - 4z + 13$		A1
	$\dfrac{z^4 - 6z^3 + 38z^2 - 94z + 221}{z^2 - 4z + 13}$ $= az^2 + bz + c$ with $a \neq 0$ or $z^4 - 6z^3 + 38z^2 - 94z + 221 = \left(z^2 - 4z + 13\right)\left(az^2 + bz + c\right) \Rightarrow a = \cdots, b = \cdots, c = \cdots$		M1
	$= z^2 - 2z + 17$		A1
	$z = \dfrac{2 \pm \sqrt{4 - 68}}{2} = \cdots$ or $\left(z - 1\right)^2 + 16 = 0 \Rightarrow z = \cdots$		M1
	$= 1 \pm 4\mathrm{i}$		A1
			(7)
(b)		Accept points, crosses, vectors or coordinates	B1B1ft
			(2)
			Total 9

Notes

(a)

B1: $z = 2 - 3\text{i}$ seen identified as another root anywhere in the solution for (a) or (b). May only be seen at the end but must be written down somewhere in the solution. May only be on the argand diagram for (b) which is ok

M1: Correct attempt at quadratic factor by either finding the product of the two linear factors, or using the sum and product of the known roots.

A1: $z^2 - 4z + 13$ (sight of this quadratic would score first M1A1)

M1: Correct attempt at the other quadratic factor e.g. long division/ comparing coefficients/ synthetic Division/inspection using their quadratic factor to obtain a second quadratic factor. Must be some minimal working shown.

A1: $z^2 - 2z + 17$

M1: Attempt to solve their second 3TQ = 0 (we must see a method here as strict calculator warning- QF or completing the square)

A1: Correct roots.

Note: attempts that solve the quartic on a calculator with no other working score 0

(b)

If no working is shown in (a) they can score both marks in part (b) for plotting their roots correctly.

B1: $2 \pm 3\text{i}$ correctly plotted and labelled. Must be reasonably symmetric about the real axis.

B1ft: Their other conjugate pair correctly plotted and labelled. Must be reasonably symmetric about the real axis.

Note: For part (b) the axes don't need to be labelled, or could be labelled as 'x' and 'y' and the points can be shown with dots/crosses/vector lines/coordinates from the origin but must be clearly indicated. Accept axes labelled numerically as long as the points are identified. Condone (2, 3i) etc.