

Further Pure Mathematics 1

Complex Numbers Unit 4

Hints

Exercise 2G

Question 1 Hint level 2

Substitute $z = 2 + j$ into the cubic expression. You should get zero, showing that $2 + j$ is a root.

Since $2 + j$ is a root, its conjugate $2 - j$ is also a root. This means that $(z - 2 - j)$ and $(z - 2 + j)$ are both factors. Multiply out $(z - 2 - j)(z - 2 + j)$ to get a quadratic expression which is a factor of the cubic expression, and then find the remaining linear factor by inspection or polynomial division. This linear factor gives the third root.

Question 3 Hint level 2

Substitute $z = 1 - j$ into the cubic equation. Simplify and equate real and imaginary parts to find the values of p and q .

Since $1 - j$ is a root, its conjugate $1 + j$ is also a root. This means that $(z - 1 + j)$ and $(z - 1 - j)$ are both factors. Multiply out $(z - 1 + j)(z - 1 - j)$ to get a quadratic expression which is a factor of the cubic expression, then find the remaining linear factor by inspection or polynomial division. This linear factor gives the third root.

Question 4 Hint level 2

Since $3 + 2j$ is a root, so is its conjugate $3 - 2j$. So $(z - 3 - 2j)(z - 3 + 2j)$ is a factor of the quartic. Multiply this out and simplify. As the equation is a quartic, then there must be another quadratic factor. Find this by inspection or polynomial division, then use the quadratic formula to solve this quadratic and find the other two roots.