Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 1.12 ●●● Demanding

Let $w = 5 - 12\text{i}$.

(a) Find the two square roots of w, giving your answers in the form $a + b\text{i}$, where $a, b \in \mathbb{R}$. **[4]**

(b) Hence solve the equation $z^2 + 3z + 1 + 3\text{i} = 0$. **[3]**

MARKSCHEME (a)

$(a + b\text{i})^2 = 5 - 12\text{i}$: $a^2 - b^2 = 5,\ 2ab = -12$ **M1A1**

$a^2 - \dfrac{36}{a^2} = 5,\ a^4 - 5a^2 - 36 = 0,\ a^2 = 9$ **(M1)**

$3 - 2\text{i}$ and $-3 + 2\text{i}$ **A1**

Total 4 marks

MARKSCHEME (b)

$z = \dfrac{-3 \pm \sqrt{9 - 4(1 + 3\text{i})}}{2} = \dfrac{-3 \pm \sqrt{5 - 12\text{i}}}{2}$ **M1**

$z = \dfrac{-3 \pm (3 - 2\text{i})}{2}$ **(A1)**

$z = -\text{i}$ or $z = -3 + \text{i}$ **A1**

Total 3 marks

Note The discriminant is w: that is the "hence".

Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software.
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