Marked example 1

Paper 1 style · No calculator

1 7 marks AHL 2.12 ●●○ Typical

Let $P(x) = 2x^3 + ax^2 + bx - 6$, where $a, b \in \mathbb{R}$. The polynomial $x - 2$ is a factor of $P(x)$, and when $P(x)$ is divided by $x + 1$ the remainder is -6.

(a) Find the value of a and the value of b. **[4]**

(b) Hence show that the equation $P(x) = 0$ has exactly one real root. **[3]**

MARKSCHEME (a)

$P(2) = 0$: $16 + 4a + 2b - 6 = 0$ **M1**

$P(-1) = -6$: $-2 + a - b - 6 = -6$ **M1**

$2a + b = -5$ and $a - b = 2$ **A1**

$a = -1,\ b = -3$ **A1**

Total 4 marks

Note Using the factor theorem.

Note Using the remainder theorem.

MARKSCHEME (b)

$P(x) = (x - 2)\left(2x^2 + 3x + 3\right)$ **M1A1**

$\Delta = 9 - 24 = -15 < 0$: the quadratic has no real root, so $x = 2$ is the only real root **R1**

Total 3 marks

Note M1 for dividing by $x - 2$ or comparing coefficients.

Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization. © 2026 Hence