Exercise 2

Paper 1 style · No calculator

2 7 marks AHL 2.13 ●●● Demanding

Let $g(x) = \dfrac{x-1}{x^2+8}$, for $x \in \mathbb{R}$.

(a) Explain why the graph of g has no vertical asymptote, and write down the equation of its horizontal asymptote. **[2]**

(b) Find the x-coordinates of the stationary points of the graph of g. **[3]**

(c) Hence find the range of g. **[2]**

The markscheme is on the next page: try the question first. 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.
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MARKSCHEME (a)

$x^2 + 8 > 0$ for all x (no real root) — R1

$y = 0$ — A1

Total 2 marks

MARKSCHEME (b)

$g'(x) = \dfrac{(x^2+8) - 2x(x-1)}{(x^2+8)^2}$ — M1

$-x^2 + 2x + 8 = 0$ — A1

$x = 4,\ x = -2$ — A1

Total 3 marks

MARKSCHEME (c)

$g(4) = \frac{1}{8},\ g(-2) = -\frac{1}{4}$ — (A1)

$-\frac{1}{4} \leq g(x) \leq \frac{1}{8}$ — A1

Total 2 marks