Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 2.13 ●●● Demanding

Let $g(x) = \dfrac{x+1}{x^2+3}$, 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]**

MARKSCHEME (a)

$x^2 + 3 > 0$ for all x (no real root) **R1**

$y = 0$ **A1**

Total 2 marks

MARKSCHEME (b)

$g'(x) = \dfrac{(x^2+3) - 2x(x+1)}{(x^2+3)^2}$ **M1**

$-x^2 - 2x + 3 = 0$ **A1**

$x = 1,\ x = -3$ **A1**

Total 3 marks

Note The quotient rule.

MARKSCHEME (c)

$g(1) = \frac{1}{2},\ g(-3) = -\frac{1}{6}$ **(A1)**

$-\frac{1}{6} \le g(x) \le \frac{1}{2}$ **A1**

Total 2 marks

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