Exercise 2

Paper 1 style · No calculator

2 8 marks AHL 1.11 ●●● Demanding

Let $f(x) = \dfrac{6}{(x+2)(4-x)}$, for $-2 < x < 4$.

(a) Express $f(x)$ in partial fractions. **[2]**

(b) Hence show that $\displaystyle\int_0^k f(x)\,\mathrm{d}x = \ln\left(\frac{2(k+2)}{4-k}\right)$, where $0 < k < 4$. **[4]**

(c) Find the value of k for which $\displaystyle\int_0^k f(x)\,\mathrm{d}x = \ln 5$. **[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)

$6 = A(4-x) + B(x+2)$: $A = 1,\ B = 1$ — A1A1

Total 2 marks

Note $f(x) = \frac{1}{x+2} + \frac{1}{4-x}$

MARKSCHEME (b)

$[\ln(x+2) - \ln(4-x)]_0^k$ — M1A1

$= \ln(k+2) - \ln(4-k) - (\ln 2 - \ln 4)$ — A1

$= \ln\left(\frac{2(k+2)}{4-k}\right)$ — A1

Total 4 marks

Note AG.

MARKSCHEME (c)

$\frac{2(k+2)}{4-k} = 5,\ 2k+4 = 20-5k$ — M1

$k = \frac{16}{7}$ — A1

Total 2 marks