# Marked example 2

Paper 1 style · No calculator

## 2 8 marks AHL 1.11 ●●● Demanding

Let $f(x) = \dfrac{4}{(x+1)(3-x)}$, for $-1 < x < 3$.

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

**(b)** Hence show that $\displaystyle\int_0^k f(x)\,\mathrm{d}x = \ln\left(\frac{3(k+1)}{3-k}\right)$, where $0 < k < 3$. **[4]**

**(c)** Find the value of $k$ for which $\displaystyle\int_0^k f(x)\,\mathrm{d}x = \ln 6$. **[2]**

**MARKSCHEME (a)**

$4 = A(3-x) + B(x+1)$: $A = 1,\ B = 1$ **A1A1**

Total 2 marks

**Note** $f(x) = \frac{1}{x+1} + \frac{1}{3-x}$

**MARKSCHEME (b)**

$[\ln(x+1) - \ln(3-x)]_0^k$ **M1A1**

$= \ln(k+1) - \ln(3-k) - (0 - \ln 3)$ **A1**

$= \ln\left(\frac{3(k+1)}{3-k}\right)$ **A1**

Total 4 marks

**Note** A1 for the minus sign of $-\ln(3-x)$.

**Note** AG.

**MARKSCHEME (c)**

$\frac{3(k+1)}{3-k} = 6,\ 3k + 3 = 18 - 6k$ **M1**

$k = \frac{5}{3}$ **A1**

Total 2 marks



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