

| Question | Scheme | Marks | AOs |
|----------|--|----------|-------------|
| 15 | $\ln(3^x - 1) - \ln 3 = \ln(3^x + 5) - \ln(3^x - 1)$ $\frac{(3^x - 1)}{3} = \frac{(3^x + 5)}{(3^x - 1)}$ | M1 | 3.1a |
| | $(3^x - 1)^2 = 3(3^x + 5) \Rightarrow (3^x)^2 - 5(3^x) - 14 = 0$ | M1 A1 | 2.1 1.1b |
| | $(3^x)^2 - 5(3^x) - 14 = 0 \Rightarrow 3^x = 7 \Rightarrow x = \dots$ | M1 | 1.1b |
| | $3^x = 7 \Rightarrow x = \log_3 7 \text{ o.e. only}$ | A1 | 2.3 |
| | | (5) | |

(5 marks)

Notes

M1: Recognises the arithmetic sequence property to form an equation connecting the terms and then applies the subtraction rule of logarithms to eliminate the ln's

M1: Forms a 3TQ equation in 3^x

A1: Correct 3TQ

M1: Solves their 3TQ in 3^x and solves for x using logs appropriately, ignore any reference to -2

A1: Cao. Allow equivalent exact answers e.g. $\frac{\ln 7}{\ln 3}$, $\frac{\log 7}{\log 3}$ and no other solutions