Question	Scheme	Marks	AOs
14(a)	Uses or implies $h = 0.5$	B1	1.1b
	For correct form of the trapezium rule =	M1	1.1b
	$\frac{0.5}{2}\{3+2.2958+2(2.3041+1.9242+1.9089)\}=4.393$	A1	1.1b
		(3)	
(b)	Any valid statement reason, for example • Increase the number of strips • Decrease the width of the strips • Use more trapezia	B1	2.4
		(1)	
(c)	For integration by parts on $\int x^2 \ln x \, dx$	M1	2.1
	$= \frac{x^3}{3}\ln x - \int \frac{x^2}{3}\,dx$	A1	1.1b
	$\int -2x+5\,dx = -x^2+5x \quad (+c)$	B1	1.1b
	All integration attempted and limits used Area of $S = \int_1^3 \frac{x^2 \ln x}{3} - 2x + 5\,dx = \left[\frac{x^3}{9}\ln x - \frac{x^3}{27} - x^2 + 5x\right]_{x=1}^{x=3}$	M1	2.1
	Uses correct ln laws, simplifies and writes in required form	M1	2.1
	Area of $S = \frac{28}{27} + \ln 27 \quad (a=28, b=27, c=27)$	A1	1.1b
		(6)	
			(10 marks)

Question 14 continued

Notes:

(a)

B1: States or uses the strip width $h = 0.5$. This can be implied by the sight of $\frac{0.5}{2}\{...\}$ in the trapezium rule

M1: For the correct form of the bracket in the trapezium rule. Must be y values rather than x values $\{\text{first } y \text{ value} + \text{last } y \text{ value} + 2\times(\text{sum of other } y \text{ values})\}$

A1: 4.393

(b)

B1: See scheme

(c)

M1: Uses integration by parts the right way around.

Look for $\int x^2 \ln x \, dx = Ax^3 \ln x - \int Bx^2 \, dx$

A1: $\frac{x^3}{3}\ln x - \int \frac{x^2}{3}\, dx$

B1: Integrates the $-2x+5$ term correctly $= -x^2 + 5x$

M1: All integration completed and limits used

M1: Simplifies using ln law(s) to a form $\frac{a}{b} + \ln c$

A1: Correct answer only $\frac{28}{27} + \ln 27$