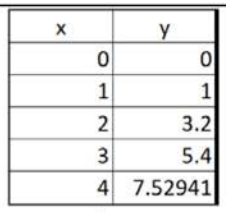
Q	Marking instructions	AO	Mark	Typical solution
14 (a)(i)	States correct number of ordinates	1.2	B1	5
14 (a)(ii)	Obtains at least 4 correct y values (condone 7.5... for y_4) and correct h	1.1b	B1	
	Substitutes their y values into trapezium rule with correct number of strips. Condone missing 0 May see working on graph 0.5+2.1+4.3+6.4647. (Exact value 1136/85)	1.1a	M1	$Area = \frac{1}{2}\times 1\times\left(0+7.529+2\left(1+3.2+5.4\right)\right)$ $=13.36$
	Obtains correct area NMS correct answer award full marks **CAO**	1.1b	A1	
14(b)	Selects substitution $u = x^2+1$ or $u = x^2$ and obtains $\frac{\mathrm{d}u}{\mathrm{d}x} = 2x$ or writes the integrand in the form $Ax+\frac{Bx}{x^2+1}$	3.1a	M1	$u = x^2+1 \Rightarrow \frac{\mathrm{d}u}{\mathrm{d}x} = 2x$ $\int_1^{17} \frac{2x^3}{u}\times\frac{1}{2x}du$ $=\int_1^{17}\frac{x^2}{u}du$ $=\int_1^{17}\frac{u-1}{u}du$ $=\int_1^{17}1-\frac{1}{u}du$ $=\left[u-\ln u\right]_1^{17}$ $=\left(17-\ln 17\right)-\left(1-\ln 1\right)$ $=16-\ln 17$
	Obtains $\int_1^{17}1-\frac{1}{u}du$ OE Or $\int_0^4 2x-\frac{2x}{x^2+1}\mathrm{d}x$ Ignore limits	1.1b	A1	
	Integrates their expression obtaining an ln term correctly.	1.1a	M1	
	Obtains fully correct integral $u-\ln u$ or $x^2-\ln\left(x^2+1\right)$ Condone missing limits.	1.1b	A1	
	Completes fully correct argument Substituting correct limits for their method to show the correct required result with correct notation with **AG**	2.1	R1	
14(c)	Explains that as n increases the approximation found will tend to the value of $\int_0^4\frac{2x^3}{x^2+1}\mathrm{d}x$ OE	2.4	E1	$\text{Area}\rightarrow 16-\ln 17$
	Total		**10**	