Question Number	Scheme	Marks
2 (a)	$h = 3$	B1
	Area $\approx \frac{3}{2}\{1.3195 + 0.4665 + 2\times(1.0718 + 0.8706 + 0.7071 + 0.5743)\}$	M1
	$= 12.35$	A1
		(3)
(b)	States either 'use more trapezia', or other such as 'make the strip widths narrower'	B1
		(1)
(c)	$\int_{-4}^{11} 2^{3-0.1x}\,\mathrm{d}x = 2^3 \times \int_{-4}^{11} 2^{-0.1x}\,\mathrm{d}x = 8\times'12.35' = 98.8$	M1, A1
		(2)
		(6 marks)

(a)

B1 For $h = 3$ seen anywhere even if it is not later used correctly.
This is implied by sight of $\frac{3}{2}$ in front of the bracket

M1 For a correct content of the bracket within Trapezium Rule, condoning slips.
E.g., missing end bracket(s) or MR on no more than two values
FYI: Area $A \approx \left(\frac{3}{2}\right)\left(1.786 + 2\left[3.2238\right]\right) \Rightarrow \left(\frac{3}{2}\right)\left(8.2336\right) = 12.3504$

A1 awrt 12.35 following the award of M1
Note that the calculator answer for this integral is 12.31

(b)

B1: States any valid method that states or implies thinner strips, more strips, more trapezia, reduce the size of *h* etc.,

We will also condone for the award of this mark;

Use more *y* values
Use more *x* values
Use more *x* and *y* values

(c)

M1: Attempts to use the rule $2^{3-0.1x} = 2^3 \times 2^{-0.1x}$ seen anywhere.

A1: awrt 99 following 8×12.35
Note that the calculator answer is 98.4

Question Number	Scheme	Marks
3.(i)	Sets $f(-2)=0 \Rightarrow 4(-2)^3+6(-2)+k=0 \Rightarrow k=44$	M1, A1
	Attempts $f(5)=4x^3+6x+'44'=4\times5^3+6\times5+'44'=574$	dM1, A1
		(4)
(ii)	Sets $6x^3-15x^2-21x+8=\left(Ax^2+Bx+C\right)(2x+3)+R$	
	And attempts to find values of A, B, C and R via inspection/ substitution etc	M1
	Two correct of A, B, C and R	A1
	$Q(x)=3x^2-12x+\frac{15}{2}$ $\quad R=-\frac{29}{2}$	A1
		(3)
		(7 marks)

(i) M1: Sets $f(\pm2)=0 \rightarrow$ leading to a value for k

Uses Polynomial Division:

$$x+2\overline{)4x^3+0x^2+6x+k} \quad \begin{matrix}4x^2+8x+32\\ \\ \end{matrix} \qquad \text{Rem} = k-44=0 \Rightarrow k=44$$

Allow for $4x^2+\alpha x+\beta$ with a remainder $k\pm\phi=0$

A1: $k=44$ seen or implied

dM1: Attempts $f(\pm5)$ with their value for k leading to a value for the remainder.

Uses Polynomial division

$$x-5\overline{)4x^3+\left(0x^2\right)+6x+'44'} \quad \begin{matrix}4x^2+20x+106\\ \\ \end{matrix} \qquad \text{Rem} = 574 \text{ or Rem} = 530+k$$

Allow for $4x^2+\mu x+\nu$ with a constant remainder

A1: 574

(ii) M1: Full attempt to find both the quotient and remainder.

See main scheme but valid via division. Look for a 3 term quadratic quotient and a constant remainder

Alt - uses polynomial division

Look for a 3-term quadratic quotient and a constant remainder

$$2x+3\overline{)6x^3-15x^2-21x+8} \quad \begin{matrix}3x^2-12x+\frac{15}{2}\\ \\ \end{matrix} \qquad r=-\frac{29}{2}$$

A1: 2 correct terms of the 4 terms in $Q(x)=3x^2-12x+\frac{15}{2}$ and $R=-\frac{29}{2}$

A1: $Q(x)=3x^2-12x+\frac{15}{2}$ and $R=-\frac{29}{2}$ correctly labelled and identified. Allow Quotient (or even Q) in place of Q(x)