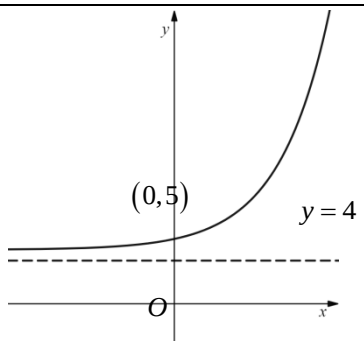
Question Number	Scheme	Marks
6.(a)		
	Shape **or** asymptote	M1
	Intercept	B1
	Fully correct	A1
		(3)
	$h = 0.3$	B1
(b)	Area $\approx \frac{0.3}{2}\left\{0 + 4.3137 + 2\times\left(0.3246 + 0.8629 + 1.6643 + 2.7896\right)\right\}$	M1
	= awrt 2.34	A1
		(3)
(c) (i)	$\int_2^{3.5}\left(2^x + 2x\right)\mathrm{d}x = \int_2^{3.5}\left(2^x - 2x + 4x\right)\mathrm{d}x = 2.34 + \left[2x^2\right]_2^{3.5}$	M1
	$= 2.34 + 16.5 = 18.84$	A1ft
(ii)	$\int_2^{3.5}\left(2^{x+1} - 4x\right)\mathrm{d}x = \int_2^{3.5} 2\left(2^x - 2x\right)\mathrm{d}x = 2\times 2.34 = 4.68$	B1 ft
		(3)
		(9 marks)

(a)

M1: For either the correct shape, an increasing curve in any position in quadrants 1 and 2 **or** for the correct asymptote (labelled in some way at height 4) but must have a curve approaching as an asymptote, not just the line drawn. Be tolerant on "pen slips" approaching the asymptote.

B1: Correct intercept (touching or crossing). Accept 5 on axis, or stated as (0,5). Condone (5,0) on the graph if it is in the right place.

A1: Fully correct. Shape in quadrants 1 and 2 only with the *y* intercept at 5 and asymptote of $y = 4$ clearly drawn on the graph and labelled or stated separately. Be tolerant on "pen slips" approaching the asymptote. If there is conflicting information, what is on the graph takes precedence.

(b)

B1: For $h = 0.3$ This is implied by sight of $\frac{0.3}{2}$ in front of the bracket.

M1: Applies the trapezium rule with correct bracket condoning slips in copying (or even truncating) values. May use separate trapezia. Allow a missing final bracket, but otherwise bracketing must be correct or recovered by correct answer.

A1: awrt 2.34 Note that the calculator answer for this integral is 2.30

(c) (i)

M1: For realising that $\int_2^{3.5}\left(2^x+2x\right)\mathrm{d}x=\int_2^{3.5}\left(2^x-2x+4x\right)\mathrm{d}x=2.34+\left[kx^2\right]_2^{3.5}$ The $4x$ should be seen with an attempt to integrate (increase in power) made (though may be implied).

Could also use answer to (b) and add the area under the trapezium $\frac{1.5}{2}\left(4\times2+4\times3.5\right)$ - may be implied by correct answer after seeing the integral correctly split.

Another alternative is to isolate the $\int_2^{3.5}2^x\mathrm{d}x=\left[x^2\right]_2^{3.5}+\text{"2.34"}$ and use this to find a value for the integral required.

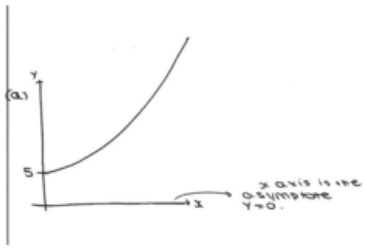
A1ft: $\text{"2.34"}+16.5=18.84$ but follow through on their 2.34 and allow awrt to 3s.f..
There must be a suitable method for this mark to be awarded.
Answer via repeated trapezium rule scores M0A0

(c)(ii)

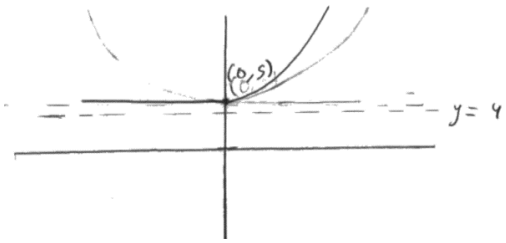
B1 ft: For $2\times$ their $\text{"2.34"}=4.68$ ((awrt to 3s.f.) must be evaluated). Follow through on their answer to (b).

Note: Answer via repeated trapezium rule is permitted to score the B1 as long the answer is twice their (b).

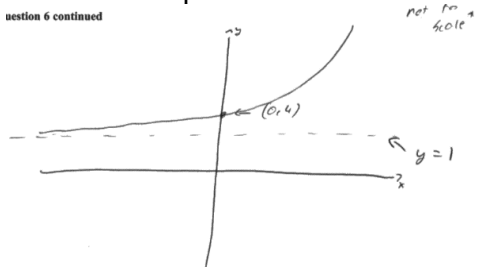
Some examples of graphs for (a):



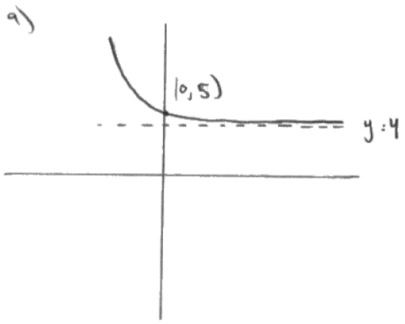
M0B1A0 Not in quadrant 2, but does have correct intercept.



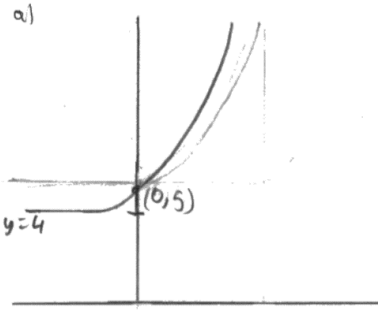
M1B1A0 Does not approach asymptote



M1B0A0 Incorrect intercept and asymptote



M1B1A0 Correct asymptote and intercept



M1B1A0 asymptote not drawn.

Question Number	Scheme	Marks
7 (a)	$x^2+y^2+8x-10y=29$	
	Attempts $(x+4)^2+(y-5)^2...=...$	M1
	Correct centre $(-4,5)$	A1
	Exact radius $\sqrt{70}$	A1
		(3)
(b)	Attempts distance (or distance ^{2}) from $"(-4,5)"$ to $"(5,-8)"$	M1
	Full method. E.g. compares $\sqrt{9^2+13^2}$ to $\left(\sqrt{70}+\sqrt{52}\right)$	dM1
	States that • distance between centres $=\sqrt{250}=15.81$ • sum of radii = $\sqrt{70}+\sqrt{52}=15.58$ Concludes as sum of radii < distance between centres, result proven *	A1*
		(3) **(6 marks)**

(a)

M1: Attempts to complete the square for **both** variables. Look for $(x\pm4)^2,(y\pm5)^2...=...$ or may be implied by $(\pm4,\pm5)$ by inspection from the equation.

A1: $(-4,5)$

A1: $\sqrt{70}$ which may be scored following $(x\pm4)^2+(y\pm5)^2=70$

(b)

M1: Attempts distance (or distance ^{2}) from $"(-4,5)"$ to $"(5,-8)"$ (condone sign errors)

dM1: Full method. E.g. compares their $\sqrt{9^2+13^2}$ to their $\left("\sqrt{70}"+\sqrt{52}\right)$

A1*: Requires correct calculation(s), correct reason and minimal conclusion. Must be evidence to support the inequality – e.g. decimal values – not just the inequality stated. May use the difference between sum of radii and distance between centres.

(b) Alt

M1: Attempts to solve $x^2+y^2+8x-10y=29$ and $x^2+y^2-10x+16y=-37$ forming a linear equation (need not be simplified for this mark)
FYI: Linear equation is $18x-26y=66$ o.e. if the calculations are correct

dM1: Attempts to solves their $18x-26y=66$ simultaneously with either circle equation reaching a 3 term quadratic for either x or y.

A1*: Requires
- correct equations
- correct "solution" stating no roots and concluding no points of intersection and minimal conclusion

E.g. Substitute $y=\dfrac{9x-33}{13}$ into $x^2+y^2+8x-10y=29$ gives $250x^2-412x+478=0$

and $"b^2-4ac"=-308256<0$ so no solutions

FYI the equation in y (if correct) is $250y^2+984y+1116=0$