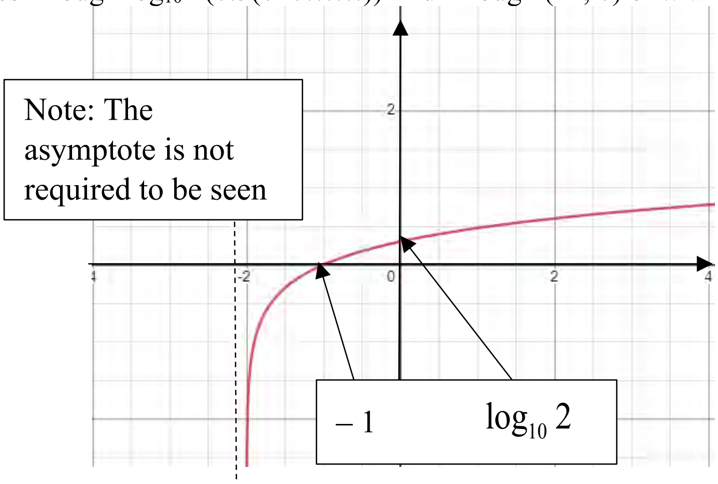
Question number	Scheme		Marks
7 (a)	Shape of the curve, **crossing** negative x-axis and positive y-axis with the asymptotic nature of the curve shown.		B1
	passes through $\log_{10}2$ (0.3(010……)) **and** through (–1, 0) on x-axis		B1 [2]
			
(b)	$\left(2\log_a 4 + 2\log_a 4^2\right)$ $2\log_a 4 + 4\log_a 4$	or $(2\log_a 2^2 + 2\log_a 2^4)$ $4\log_a 2 + 8\log_a 2$	M1
	$\log_a 4 = \frac{1}{6}$	or $\log_a 2 = \frac{1}{12}$ oe	dM1
	$a^{\frac{1}{6}} = 4$	or $a^{\frac{1}{12}} = 2$	
	$a = 4096$		A1
	ALT		
	$(2)\log_a 64 = 1 \Rightarrow \log_a 64 = \frac{1}{2}$		[M1
	$\Rightarrow a^{\frac{1}{2}} = 64$		dM1
	$\Rightarrow a = 4096$		A1] [3]
(c)	$\log_q 16 \to \frac{\log_2 16}{\log_2 q}$	$\log_2 q \to \frac{\log_q q}{\log_q 2}$ or $\frac{1}{\log_q 2}$	M1
	$\left(5\frac{\log_2 16}{\log_2 q} + 4\log_2 q = 24\right)$ $20 + 4(\log_2 q)^2 = 24\log_2 q$	$\left(5\log_q 16 + 4\frac{\log_q q}{\log_q 2} = 24\right)$ $20(\log_q 2)^2 + 4 = 24\log_q 2$	M1 A1
	$(\log_2 q - 5)(\log_2 q - 1)(=0)$	$(5\log_q 2 - 1)(\log_q 2 - 1)(=0)$	dM1
	$(\log_2 q = 5) \to q = 32$ $(\log_2 q = 1) \to q = 2$	$\left(\log_q 2 = \frac{1}{5}\right) \to q = 32$ $(\log_q 2 = 1) \to q = 2$	M1 A1 [6]
			Total 11 marks

Part	Mark	Additional Guidance
(a)	B1	The curve must not bend back on itself and should cross both axes once on negative x and once on positive y. It needs to demonstrate an asymptotic nature. Accept an asymptote drawn correctly as well as their curve.
	B1	It is enough for –1 to be indicated on the x-axis with the curve passing through this point and for $\log_{10}2$ to be marked on the y- axis (decimal 0.3…… allowed) There must be a curve drawn (even incorrectly) to achieve this mark. **Do not** accept intersections unless they are marked on the graph in the correct place.
(b)	M1	For the use of the power rule with logs to obtain $2\log_a 4$ from $\log_a 16$ OR $4\log_a 2$ from $\log_a 16$
	dM1	A **correct** rearrangement of their equation to obtain for example $a^{\frac{1}{6}} = 4$ or $a^{\frac{1}{12}} = 2$ or even of the type $a^1 = 64^2$ There are many ways of completing this. Look for a correct value for the corresponding correct power of a. **This mark is dependent on the first M mark**. Look for correct log work for their values.
	A1	For $a = 4096$
ALT	M1	For use of the correct log rule to obtain $\log_a 64$
	dM1	A correct rearrangement of their equation to obtain $a^{\frac{1}{2}} = 64$ **This mark is dependent on the first M mark**. Look for correct log work for their values.
	A1	For $a = 4096$
(c)	M1	For a fully correct change of base of log to either base 2 or base q
	M1	For an attempt to rearrange and form a 3TQ quadratic. Allow one arithmetical slip only.
	A1	For the correct 3TQ.
	dM1	**Dependent on the second M mark** – an acceptable attempt to solve the quadratic equation – see general guidance.
	M1	For a correct application using either of their solutions moving from log form to exponential form. **Note this is an independent mark.**
	A1	**Both** correct solutions.