Question Number	Scheme	Marks
1. (a)	$g(3) = -265, \quad g(4) = 3104$ States change of sign, continuous and hence root in $[3, 4]$	M1 A1 **(2)**
(b)	$x_2 = \sqrt[6]{1000 - 2 \times 3} \quad = 3.1591$ $(\alpha =) 3.1589$	M1 A1 A1 **(3)**
		(5 marks)

Notes

(a)

M1 Attempts the value of g at 3 and 4 with one correct (accept any value for the other as an attempt). Note narrower ranges are possible but must contain the root and lies in [3,4].

A1 Both values correct with reason (Sign change (stated or indicated) and continuous function) and minimal conclusion (root)

(b)

M1 Attempts to substitute $x_1 = 3$ into the formula. Implied by sight of expression, awrt 3.159

A1 awrt 3.1591

A1 $(\alpha =) 3.1589$ cao - must be to 4 d.p. Do not be concerned about the labelling of the root (x or α etc), mark the final answer of (b)(ii). (Note sight of this value implies the M1 even if x_2 is not seen).

Question Number	Scheme	Marks
2 (a) (i)	$\log_6 T = 4 - 2\log_6 x$	B1
(ii)	E.g. $\log_6 T = 4 - 2\log_6 216 \Rightarrow \log_6 T = 4 - 2\times 3 = -2 \Rightarrow T = ...$	M1
	$\Rightarrow T = 6^{-2} = \frac{1}{36}$	A1
		(3)
(b)	$\log_6 T = 4 - 2\log_6 x \Rightarrow T = 6^{4-2\log_6 x}$	M1
	$\Rightarrow T = 6^4 \times 6^{\log_6 x^{-2}}$	dM1
	$\Rightarrow T = \frac{1296}{x^2}$	A1
		(3)
		(6 marks)

Notes

Mark the question as a whole. Do not be concerned about part labelling.

(a)(i)

B1 Correct linear equation $\log_6 T = 4 - 2\log_6 x$ (oe) The 4 may be written as $\log_6 1296$

(ii)

M1 Substitutes $x = 216$ into an equation linking *T* and *x* arising from a linear equation in the logarithms and proceeds to make *T* the subject. They may have answered (b) first. Do not be concerned about the process for this mark. May be implied by awrt 0.028 following a correct equation.

A1 Correct value $T = \frac{1}{36}$. Do not accept 6^{-2}.

(b)

M1 Makes a first step towards achieving an answer. Use of a correct log rule or law **applied** at some stage in their attempt to eliminate logs from the equation.
As a rule of thumb this can be awarded for e.g.

- application of a power rule $-"2"\log_6 x = -\log_6 x^{"2"}$ or $"4" = \log_6 6^{"4"}$ or $4 \to 6^4$ (note that e.g. $\log_6 T = -2\log_6 x + 4 \to x^{-2} + 6^4$ implies this mark)
- an attempt to make *T* the subject. E.g. $\log_6 T = "4" - "2"\log_6 x \Rightarrow T = 6^{"4"-"2"\log_6 x}$

dM1 Full and complete method in proceeding from an equation of form $\log_6 T = a + b\log_6 x \ \left(a, b \neq 0\right)$ to an equation of form $T = k \times x^{\pm n}$ or equivalent. All log work must be correct but allow slips on coefficients.

A1 Achieves $T = \frac{1296}{x^2}$ or equivalent such as $Tx^2 = 1296$ and isw after a correct answer. Allow 6^4 for 1296.

Note: Allow the M marks if a different letter than *T* is used, e.g. *y*. But must be correct in terms of *T* and *x* for the A mark.