

Question			Answer	Marks	AO	Guidance
5	(a)		DR $1^4 - 2^1 \quad (= -1 < 0)$ and $2^4 - 2^2 \quad (= 12 > 0)$ Values are -1 and 12 so there is a change of sign (and hence a root between 1 and 2)	M1 A1 [2]	1.1 2.4	See appendix • Allow $1^4 - 2^1$ or $1 - 2$ and $2^4 - 2^2$ or $16 - 4$ • Ignore ‘= 0’ • Condone -1 and 12 only provided clearly linked to $x = 1$ and $x = 2$ e.g. as coordinates or in a table of values • Allow for using two values between 1 and 2 that are either side of 1.24 e.g. 1.2 and 1.3 • Correct values of function and comment on change of sign, allow e.g. $-1 < 0$ and $12 > 0$ • Condone no mention of function being sufficiently well-behaved (or continuous) • e.g. 1.2 and 1.3 leading to -0.22 and 0.39 (2 s.f. is sufficient)
5	(b)		$x^4 = 2^x$ $x = (2^x)^{\frac{1}{4}}$ $= 2^{0.25x}$	B1 [1]	2.1	• AG • Convincing rearrangement to given result • Must show one step of working and no incorrect work seen • Must not work backwards • e.g. $4\log_2(x) - x = 0$ is B0 as not convincingly from a correct process unless $4\log_2(x) = x$ is seen first
5	(c)		$x_1 = 1.07\dots$ 1.24	M1 A1 [2]	1.1 2.2a	• $x_1 = \text{awrt } 1.07 \quad (= 1.07177\dots).$ • soi by any of these values: $1.204\dots, 1.232\dots, 1.237\dots$ • cao • Must have shown at least one iteration e.g. $x_1 = 1.07$

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5	(d)			B1 B1 [2]	1.1 1.1	- Vertical line $x = 0.4$ drawn to meet the curve, could start line from $y = x$ - Correct completion of staircase diagram to head towards root with at least two vertical and two horizontal lines seen (lines need not extend beyond region between line and curve) - Condone good freehand lines, mark intent SC B1B0 for using a different starting value e.g. $x = 0$ with at least two vertical and two horizontal lines seen. Correct staircase diagram converging to root from <i>their</i> starting value.
5	(e)		$x^4 = 2^x$ $x = \log_2(x^4)$ $= 4\log_2 x$	B1 [1]	2.1	- AG Convincing rearrangement to given result - Must show at least one step of working and no incorrect work seen - e.g. $\log_2(x^4) - \log_2(2^x) = 0$ is B0 as not convincingly from a correct process unless $\log_2(x^4) = \log_2(2^x)$ is seen first - Must not work backwards
5	(f)		DR $x_1 = 0$ Not possible to find log of zero	M1 A1 [2]	1.1 2.4	- Or $4\log_2 1 = 0$ - Condone e.g. math error or x_2 is invalid or x_2 has no solution provided log 0 is mentioned

Question 5a

REMEMBER: It is not possible to have an award of M0A1

After M1 has been awarded the following comments would earn A1

There is a sign change therefore the curve crosses the x -axis therefore a root is between 1 and 2

Change of sign and root must be between 1 and 2

$-1 < 0$ and $12 > 0$

-1 is negative and 12 is positive

Change of sign then there is a root between 1.2 and 1.3, which also lies between 1 and 2

After M1 has been awarded the following comments would earn A0

$x = 1, y = -1$ and $x = 2, y = 8$, sign change suggests a root between these values

A0 as $y = 8$ is incorrect

There is a root between 1 and 2

A0 as no mention of sign change