Question	Scheme	Marks
6.(i)	$f(x) = x - 4 - \cos\left(5\sqrt{x}\right) \qquad x > 0$	
(a)	$f(2.5) = -1.44..., \ f(3.5) = 0.497...$	**M1**
	Sign change (negative, positive) and f(x) is **continuous** therefore (a **root)** α is between $x = 2.5$ and $x = 3.5$	**A1**
		(2)
(b)	E.g. $\dfrac{\alpha - 2.5}{\left\|f(2.5)\right\|} = \dfrac{3.5 - \alpha}{f(3.5)} \Rightarrow \alpha = ...$ or $\dfrac{\alpha - 2.5}{0 - f(2.5)} = \dfrac{3.5 - 2.5}{f(3.5) - f(2.5)} \Rightarrow \alpha = ...$	**M1**
	$\alpha =$ awrt 3.24	**A1**
		(2)
(ii)	$g(x) = \dfrac{1}{10}x^2 - \dfrac{1}{2x^2} + x - 11 \qquad x > 0$	
(a)	$g'(x) = \dfrac{1}{5}x + \dfrac{1}{x^3} + 1$	**M1**
		A1
		(2)
(b)	$x_1 = 6 - \dfrac{g(6)}{g'(6)} = 6 - \dfrac{-1.41388...}{2.20462...}$	**M1**
	= 6.641	**A1cao**
		(2)
		(Total 8 marks)

Notes

(i)(a)

M1: Attempts both f (2.5) and f (3.5) with at least one correct in either radians or degrees. Note that in degrees f(2.5) = −2.49… and f(3.5) = −1.4867…

A1: Both f (2.5) = awrt −1 and f(3.5) = awrt 0.5, sign change (accept f(2.5)f(3.5) <0), continuous and conclusion all given but be forgiving with exact language. Use of degrees will be A0 as there is no change in sign.

(b)

M1: Uses a correct interpolation method to find a value for α. There are other alternative versions but look for a correct full process. E.g. may attempt the equation of the line through the two end points, then substitute $y = 0$ to find x. Allow if using degrees so long as a correct interpolation statement is clear.

A1: Correct value, accept awrt 3.24.

(ii)(a)

M1: $x^n \rightarrow x^{n-1}$ in at least two of the first 3 terms.

A1: All correct simplified or unsimplified.

(b)

M1: Correct application of Newton-Raphson. If no expression is seen, the method may be implied by a correct answer. (Look for the process rather than labelling if they write f but use g.)

A1cao: Correct value. Must be to 3d.p.. ISW if they try a second application of N-R.

Note: If correct answers for (b) appear after an incorrect derivative then please send to review.