Question	Scheme	Marks
4(a)	(i) $f'(x) = \underline{Ax^{-5}} + \underline{Bx^{-\frac{9}{2}}}$ oe for at least one power	**M1**
	$f'(x) = -\frac{-4x^{-5}}{8} + \frac{2\times-\frac{7}{2}x^{-\frac{9}{2}}}{7} = \frac{1}{2x^5} - \frac{1}{x^{\frac{9}{2}}}$ oe	**A1**
	(ii) Since $f'(0.25) = 512 - 512 = 0$ the process cannot be carried out as it would require division by zero.	**B1**
	(iii) $\alpha = 0.15 - \frac{f(0.15)}{f'(0.15)} = 0.15 - \frac{-27.332...}{1484.137...} = ...$	**M1**
	$= 0.168$ to 3 d.p.	**A1cso**
		(5)
(b)	e.g. $\frac{f(0.25)-f(0.15)}{0.25-0.15} = \frac{f(0.15)-0}{0.15-\alpha}$ or $\frac{\alpha-0.25}{0-f(0.25)} = \frac{\alpha-0.15}{0-f(0.15)}$ etc	**M1**
	$\Rightarrow \alpha = 0.15 - \frac{0.1\times f(0.15)}{f(0.25)-f(0.15)} = ...$ or $\alpha = \frac{0.25f(0.15)-0.15f(0.25)}{\left(f(0.15)-f(0.25)\right)} = ...$ etc	**M1**
	$= 0.15 - \frac{0.1\times-27.332...}{5.571...-(-27.332)} = 0.23306... = \text{awrt}\,0.233$ (3 d.p.)	**A1**
		(3)
		(8 marks)

Notes:

(a)(i)

M1: Attempts to differentiate f(x), obtaining the correct power for at least one term.

A1: Correct differentiation, need not be simplified.

(ii)

B1: Correct reason given, accept e.g. "as f'(0.25) = 0" as a minimum and isw after a correct reason is given. Just stating f'(0.25) = 0 is not sufficient, there must be an indication this is the reason why the process cannot be used but accept any indication (such as "not valid") following this.

(iii)

M1: Correct Newton-Raphson process attempted using their derivative or implied by the correct answer from use of a calculator.

A1cso: Correct answer from correct work (derivative must have been correct). Must be 3dp.

(b)

M1: Correct interpolation strategy. Accept any correct statement such as the one shown. They may use e.g. x for $\alpha - 0.15$, in which case the the method will be gained once the correct overall strategy is clear.

M1: Proceeds from a recognisable attempt at interpolation to find a value for α. Not dependent, but they must have attempted to set up a suitable equation in α. If no working is shown accept any value for the root following the suitable statement.

A1: Accept awrt 0.233 following correct working.