Question	Scheme	Marks	AOs
6(a)(i)	$\left(f'(x)=\right)8xe^{4x^2-1}$ or e.g. $\dfrac{8xe^{4x^2}}{e}$ oe	B1	1.1b
(ii)	$\left(g'(x)=\right)\dfrac{8}{x}$ or e.g. $8x^{-1}$ oe	B1	1.2
		(2)	
(b)	$8xe^{4x^2-1}=\dfrac{8}{x}\Rightarrow e^{4x^2-1}=\dfrac{1}{x^2}\Rightarrow 4x^2-1=\ln\dfrac{1}{x^2}$	M1	1.1b
	$4x^2-1=\ln\dfrac{1}{x^2}\Rightarrow 4x^2-1=-2\ln x$ $\Rightarrow 4x^2+2\ln x-1=0*$	A1*	2.1
		(2)	
(c)(i)	$x_1=0.6\Rightarrow x_2=\sqrt{\dfrac{1-2\ln 0.6}{4}}$	M1	1.1b
	$\left(x_2=\right)0.7109$	A1	1.1b
(ii)	$\left(\alpha=\right)0.6706$	B1 (A1 In ePEN)	1.1b
		(3)	
			(7 marks)

(a)(i)

B1: Correct derivative in any form. "$f'(x)=$" is not required. Apply isw if necessary.

(ii)

B1: Correct derivative in any form. "$g'(x)=$" is not required. Apply isw if necessary.

(b)

M1: Eliminates e by setting their $f'(x)=$ their $g'(x)$ where $f'(x)=Axe^{4x^2-1}$ oe and $g'(x)=\dfrac{B}{x}$ oe with $A\times B>0$ and proceeds via $e^{4x^2-1}=\dfrac{...}{x^2}$ or equivalent work (see below) to obtain $4x^2-1=\ln\dfrac{...}{x^2}$ oe e.g. $\ln x+4x^2-1=\ln\dfrac{1}{x}$

Allow if they use α for x.

Note that there are various alternatives for this mark but the derivatives must be of the form defined above and the processing must be correct with coefficient/sign slips only.

Examples of equivalent work:

$$8xe^{4x^2-1}=\frac{8}{x}\Rightarrow x^2e^{4x^2-1}=1\Rightarrow \ln x^2+\ln e^{4x^2-1}=0\Rightarrow \ln e^{4x^2-1}=-\ln x^2\Rightarrow 4x^2-1=-2\ln x$$

$$\frac{8xe^{4x^2}}{e}=\frac{8}{x}\Rightarrow\frac{1}{e}e^{4x^2}=\frac{1}{x^2}\Rightarrow e^{4x^2}=\frac{e}{x^2}\Rightarrow \ln e^{4x^2}=\ln\frac{e}{x^2}\Rightarrow 4x^2=\ln\frac{e}{x^2}=1-2\ln x$$

A1*: Obtains the printed answer with sufficient working and no errors.
Sufficient work would require the "e" eliminated before the given answer.
Must follow correct derivatives in part (a).
Condone $4x^2+2\ln|x|-1=0$ and condone $4\alpha^2+2\ln\alpha-1=0$ or $4\alpha^2+2\ln|\alpha|-1=0$

Note that if both derivatives in (a) **are correct** we will allow fully correct work using the equation in (b) to work backwards to verify that $pf'(x) = qg'(x)$ for M1 then obtains $f'(x) = g'(x)$ with a minimal conclusion for A1

If either derivative in (a) is incorrect or missing, candidates who work backwards score no marks in (b).

(c)(i)/(ii)

M1: Attempts to use the iterative formula with $x_1 = 0.6$

Award this mark for e.g. $(x_2 =)\sqrt{\frac{1-2\ln 0.6}{4}}$ or may be implied by awrt 0.71 provided no incorrect working is seen.

Candidates sometimes find x_3 (or possibly subsequent terms) rather than x_2 in which case the M1 can be implied. (See table below for first few iterations)

A1: (x_2 =) awrt 0.7109

Sight of (x_2 =) awrt 0.7109 scores M1A1

B1(A1 on ePEN): (α =) 0.6706 (4dp)

Must be this value and **not** awrt 0.6706

For reference:

x_1	0.6
x_2	0.7109239143
x_3	0.6485329086
x_4	0.6830236199
x_5	0.6637868021
x_6	0.6744606223
. . .	. . .
α	0.6706416243