Question			Answer	Marks	AO	Guidance	
10	(a)		$u'v = \frac{3}{x}(4x-1)$ $v'u = 4(3\ln x + 1)$	B1	1.1a	$\frac{3}{x}(4x-1)$ or $4(3\ln x+1)$ seen	At least one product correct (possibly expanded)
			$\frac{dy}{dx} = \frac{\frac{3}{x}(4x-1) - 4(3\ln x + 1)}{(4x-1)^2}$	M1	1.1	Attempt use of quotient rule; correct structure ie correct order (and subtraction) in numerator and v^2 in the denominator	Allow **BOD** for missing bracket(s), as long as intention is clear
				A1	1.1	Obtain correct derivative, possibly unsimplified	**ISW** an incorrect attempt to simplify Must be fully correct, including brackets, for **A1** (no back credit from part **(b)**) If implicit differentiation is attempted then consult your TL
			Alternative method **Using the product rule**				
			$u = (4x-1)^{-1}$ gives $u' = -4(4x-1)^{-2}$	B1		Correct differentiation of $(4x-1)^{-1}$	Either seen explicitly or as part of product rule (if latter, then must be convincing)
			$\frac{dy}{dx} = -4(4x-1)^{-2}(3\ln x + 1) + \frac{3}{x}(4x-1)^{-1}$	M1		Attempt use of the product rule; correct structure	Allow **BOD** for missing bracket(s), as long as intention is clear
				A1		Obtain correct derivative, possibly unsimplified Could be negative indices or fractions	**ISW** an incorrect attempt to simplify Must be fully correct, including brackets, for **A1** (no back credit from part **(b)**)
				[3]			

Question			Answer	Marks	AO	Guidance	
10	(b)		$\frac{\frac{3}{x}(4x-1)-4(3\ln x+1)}{(4x-1)^2}=0$	M1*	1.1	Equate attempt at their derivative to 0 May no longer be the derivative credited in **(a)**, eg if **ISW** had been applied	Could be implied by simply equating their numerator to 0 oe, if quotient rule was used Could see $\frac{8-\frac{3}{x}-12\ln x}{(4x-1)^2}$ or $\frac{8x-3-12x\ln x}{x(4x-1)^2}$ if already simplified in part **(a)**
			$12x-3-12x\ln x-4x=0$	M1dep*	1.1	Attempt to rearrange ie clear any fractions from their derivative	Evidence for clearing fractions could have been seen in part **(a)**
			$8x-3=12x\ln x$ $x=\frac{8x-3}{12\ln x}$ **AG**	A1 [3]	2.1	Rearrange to given answer www	**A0** if derivative was no longer correct when equated to 0

Question			Answer	Marks	AO	Guidance	
10	(c)		$x - \frac{8x-3}{12\ln x}$ $1.6 - \frac{8\times1.6-3}{12\ln1.6}$ $1.7 - \frac{8\times1.7-3}{12\ln1.7}$	**M1**	**1.1**	Gather terms on one side first, and attempt to use **both** $x = 1.6$ and $x = 1.7$	soi Subtraction could be either way around Condone using $x = 1.6$ and 1.7 in **correct** $\frac{dy}{dx}$ (full expression or just numerator oe) instead of the given equation, possibly rearranged, with full credit available
			$x = 1.6$ gives $-0.1375\ldots$ $x = 1.7$ gives $0.0353\ldots$	**A1**	**2.1**	Obtain at least one correct value – minimum of 1sf	Could be 0.138 and -0.035 if order of subtraction was reversed Condone rounding or truncating
			$-0.1375\ldots < 0$ $0.0353\ldots > 0$ Change of sign (hence $1.6 <$ root < 1.7)	**A1**	**2.2a**	Obtain both correct values and conclude correctly Just need to mention change of sign	Conclusion needed Condone rounding or truncating
			Alternative method (using $x = F(x)$)				
			$F(1.6) = 1.7375\ldots$ and compare to 1.6 $F(1.7) = 1.6646\ldots$ and compare to 1.7	**M1**		Attempt **both** $F(1.6)$ **and** $F(1.7)$, **and** compare to x values	**M0** if simply evaluating $F(x)$ and not considering x as well
			$1.6 < 1.7375\ldots$ $1.7 > 1.6646\ldots$	**A1**		Obtain at least one correct value of $F(1.6)$ or $F(1.7)$ in comparison of x and $F(x)$ – minimum of 2dp	Condone any inequality signs, but must be attempting to use both sides of the equation Condone rounding or truncating
			Change of (inequality) sign (hence $1.6 <$ root < 1.7)	**A1**		Obtain both correct comparisons and conclude correctly Just need to mention change of sign	Conclusion needed Condone rounding or truncating
				[3]			

Question			Answer	Marks	AO	Guidance	
10	(d)	(i)	$x_2 = 1.697\ldots$	B1	1.1	Correct first iterate	At least 3sf Allow rounded (hence 1.70) or truncated (hence 1.69)
			1.666…, 1.686…, 1.673…, 1.681…, 1.676…, 1.679…	M1	1.1	Correct iterative process; at least **3 further values** stated (at least 3sf)	**M** mark so condone incorrect values as long as correct process is being attempted
			$x = 1.68$	A1 [3]	1.1	Obtain 1.68	**A0** for eg $x_8 = 1.68$ (implies 8th iterate and not root) Process self corrects so **B0M1A1** possible; or **B1M1A1** if the error is in a term other than x_2 Condone answers given to more than 3sf as long as it agrees with the root ie 1.678152166… (and no need to see further explicit iterations to justify this)
10	(d)	(ii)	P is (1.68, 0.447)	B1 [1]	2.2a	Correct coordinates of P Condone if no iteration seen	Condone $x = 1.68$, $y = 0.447$ Must be exactly 3sf
10	(e)		Cobweb	B1	1.2	Correct term used	Must state 'cobweb' as per specification,
			As iterates are both above and below the root	B1 [2]	2.4	Correct explanation Not spiralling / circling etc, as this is describing the cobweb diagram and not the behaviour of the iterates	Not dependent on previous **B** mark, even if 'staircase' was stated Idea that the iterates go up and down (no need to explicitly mention the root) Could use informal language eg alternating / oscillating / back and forth Could also consider gradient at root ie $F'(1.68) = -0.64 < 0$ www