

11	(a)	<p>differentiate to obtain $2x - 4$</p> <p>$+ 1 \times \ln x + x \times \frac{1}{x}$ oe</p> <p>derivative = 0 oe seen and terms combined</p> <p>$2x - 3 + \ln x = 0$ www isw AG</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>[4]</p>	<p>3.1a</p> <p>2.1</p> <p>1.1</p> <p>2.4</p>	<p>use of Product Rule</p> <p>all correct</p>	<p>allow one error</p>
----	-----	---	---	--	---	------------------------

Question		Answer	Marks	AOs		Guidance
11	(b)	any rearrangement to obtain $x = g(x)$ from given derivative = 0	M1*	2.1	allow sign error	eg $x = e^{2x-3}$
		$x = \frac{3 - \ln x}{2}$	A1	1.1	any correct rearrangement	need not see subscripts in iterative formula
		use of their $g(x_n) = \frac{3 - \ln x_n}{2}$ to obtain at least two iterates eg 2, 1.1534, 1.4286...	M1dep*	1.1	must see iterates	
		1.3500 cao	A1	2.2a		0 for 1.3500 unsupported
	 <i>Alternatively,</i>				trial and improvement does not score
		$x_{n+1} = x_n - \frac{2x_n - 3 + \ln x_n}{2 + \frac{1}{x_n}}$ their $\left(2 + \frac{1}{x_n}\right)$	M1*	2.1	Newton-Raphson iterative formula seen (not for solving $f(x) = 0$)	need not see subscripts in iterative formula
		use of their N-R formula to obtain x_1, x_2, \dots eg 1.5, 1.34795, 1.34996,1.349962	A1	1.1	formula all correct	
		1.3500 cao	M1dep*	1.1	must see iterates	
	A1	2.2a				
	[4]					