Question 3 **(25 marks)**

(a) Factorise fully: $3xy - 9x + 4y - 12$.

(b) $g(x) = 3x\ln x - 9x + 4\ln x - 12$.
Using your answer to **part (a)** or otherwise, solve $g(x) = 0$.

(c) Evaluate $g'(e)$ correct to 2 decimal places.

Q3	Model Solution – 25 Marks	Marking Notes
(a)	$(3x+4)(y-3)$	**Scale 5B (0, 2, 5)** *Mid Partial Credit:* - Any relevant factorisation
(b)	$3xlnx-9x+4lnx-12=$ $3x(lnx-3)+4(lnx-3)=$ $(3x+4)(lnx-3)$ $3x+4=0 \Rightarrow x=-\frac{4}{3}$ $lnx-3=0$ $lnx=3$ $x=e^3$	**Scale 10D (0, 4, 5, 8, 10)** *Low Partial Credit:* - Any relevant factorisation of $g(x)$ - Trial and improvement with at least two values tested - Substitutes $20 \leq x \leq 20{\cdot}1$ - $y=lnx$ *Mid Partial Credit* - Expression fully factorised *High Partial Credit:* - $lnx=3$ *Full Credit :* - Both solutions presented <u>*Note*</u>: Accept $x=20{\cdot}1$ for $x=e^3$ in the last line of the solution <u>*Note*</u>: If no reference is made to $3x+4$ in the solution, then award high partial credit **at most**

(c)	$g'(x) = 3x\left(\frac{1}{x}\right) + (3)lnx - 9 + 4\left(\frac{1}{x}\right)$ $g'(e) = 3(e)\left(\frac{1}{e}\right) + (3)\,ln(e) - 9 + 4\left(\frac{1}{e}\right)$ $g'(e) = 3 + 3 - 9 + \frac{4}{e} = -1{\cdot}53$	**Scale 10D (0, 4, 5, 8, 10)** *Low Partial Credit:* - Any relevant differentiation - $g(e)$ evaluated correctly to at least 2 decimal places *Mid Partial Credit* - Expression fully differentiated - Product rule not applied but finishes correctly *High Partial Credit:* - Derivative fully substituted