Marked example 3

Paper 1 style · No calculator

3 6 marks SL 5.6 ●●○ Typical

Let $f(x) = \dfrac{\ln(2x)}{x}$, for $x > 0$.

(a) Show that $f'(x) = \dfrac{1 - \ln(2x)}{x^2}$. **[3]**

(b) Hence find the exact coordinates of the point on the graph of f at which the tangent is horizontal. **[3]**

MARKSCHEME (a)

attempt to use the quotient rule (or the product rule with x^{-1}) **M1**

$\dfrac{\mathrm{d}}{\mathrm{d}x}\ln(2x) = \dfrac{1}{x}$ **A1**

$f'(x) = \dfrac{x \cdot \frac{1}{x} - \ln(2x) \cdot 1}{x^2}$ **A1**

$f'(x) = \dfrac{1 - \ln(2x)}{x^2}$ **AG**

Total 3 marks

Note Candidates who write $\dfrac{\mathrm{d}}{\mathrm{d}x}\ln(2x) = \dfrac{1}{2x}$ cannot reach the given answer correctly: award at most M1A0A0.

MARKSCHEME (b)

$1 - \ln(2x) = 0$ **M1**

$x = \dfrac{\mathrm{e}}{2}$ **A1**

$y = \dfrac{\ln \mathrm{e}}{\mathrm{e}/2} = \dfrac{2}{\mathrm{e}}$ point $\left(\dfrac{\mathrm{e}}{2}, \dfrac{2}{\mathrm{e}}\right)$ **A1**

Total 3 marks

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