Exercise 2

Paper 2 style · Graphic display calculator

2 7 marks SL 5.4 ●○○ Routine

Let $g(x) = x\ln(x+2)$, for $x > -2$.

(a) Find $g(1.5)$. **[1]**

(b) Find the gradient of the graph of g at the point where $x = 1.5$. **[2]**

(c) Hence find the equation of the tangent to the graph of g at this point. Give your answer in the form $y = mx + c$. **[2]**

(d) Find the equation of the normal to the graph of g at this point. Give your answer in the form $y = mx + c$. **[2]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$g(1.5) = 1.88 \quad (1.87914\ldots)$ **A1**

Total 1 mark

MARKSCHEME (b)

use of GDC, or $g'(x) = \ln(x+2) + \dfrac{x}{x+2}$ **(M1)**

$g'(1.5) = 1.68 \quad (1.68133\ldots)$ **A1**

Total 2 marks

MARKSCHEME (c)

$y - 1.87914 = 1.68133(x - 1.5)$ **(M1)**

$y = 1.68x - 0.643$ **A1**

Total 2 marks

Note FT from their answers to (a) and (b). Working with the rounded values 1.88 and 1.68 gives $c = -0.64$: accept.

MARKSCHEME (d)

gradient of the normal $= -\dfrac{1}{1.68133} = -0.594766\ldots$ **(M1)**

$y = -0.595x + 2.77$ **A1**

Total 2 marks

Note FT from their gradient in (b).

ON THE CALCULATOR

NumWorks (a) Calculation: type $1.5\ln(3.5) \rightarrow 1.879144$. (b) Toolbox → Calculus → Derivative, type $x\ln(x+2)$, then the value $1.5 \rightarrow 1.681334$. Store each value (sto) before using it: the rounded values give a less accurate c.