

Differentiation – 2023 June A2 Math 9709

1. June/2023/Paper\_9709/21/No.2

A curve has equation  $y = \frac{2 + 3 \ln x}{1 + 2x}$ .

Find the equation of the tangent to the curve at the point  $(1, \frac{2}{3})$ . Give your answer in the form  $ax + by + c = 0$ , where  $a, b$  and  $c$  are integers. [5]

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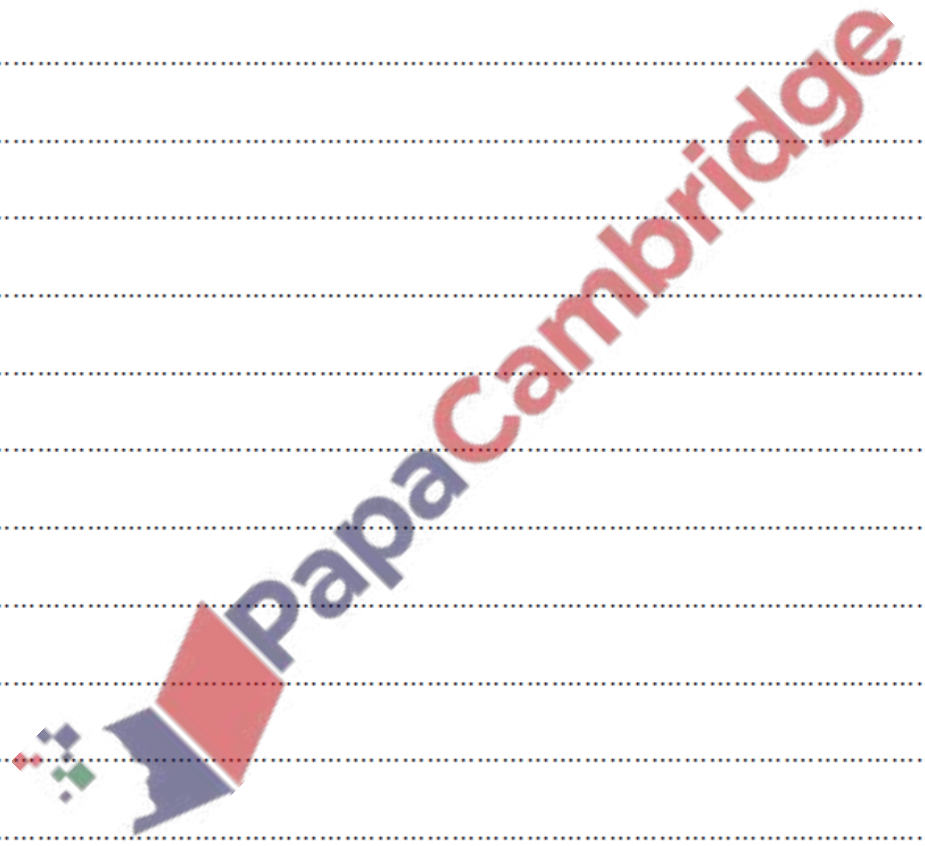
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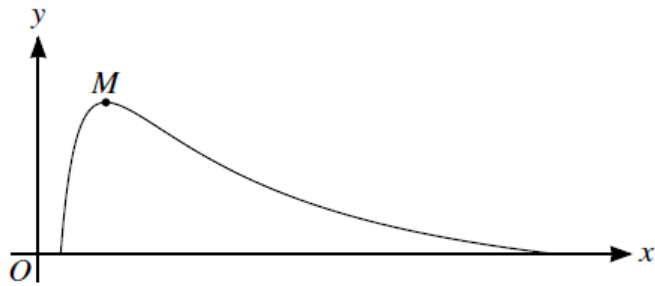
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The diagram shows the curve with parametric equations

$$x = 4e^{2t}, \quad y = 5e^{-t} \cos 2t,$$

for  $-\frac{1}{4}\pi \leq t \leq \frac{1}{4}\pi$ . The curve has a maximum point  $M$ .

- (a) Find an expression for  $\frac{dy}{dx}$  in terms of  $t$ .

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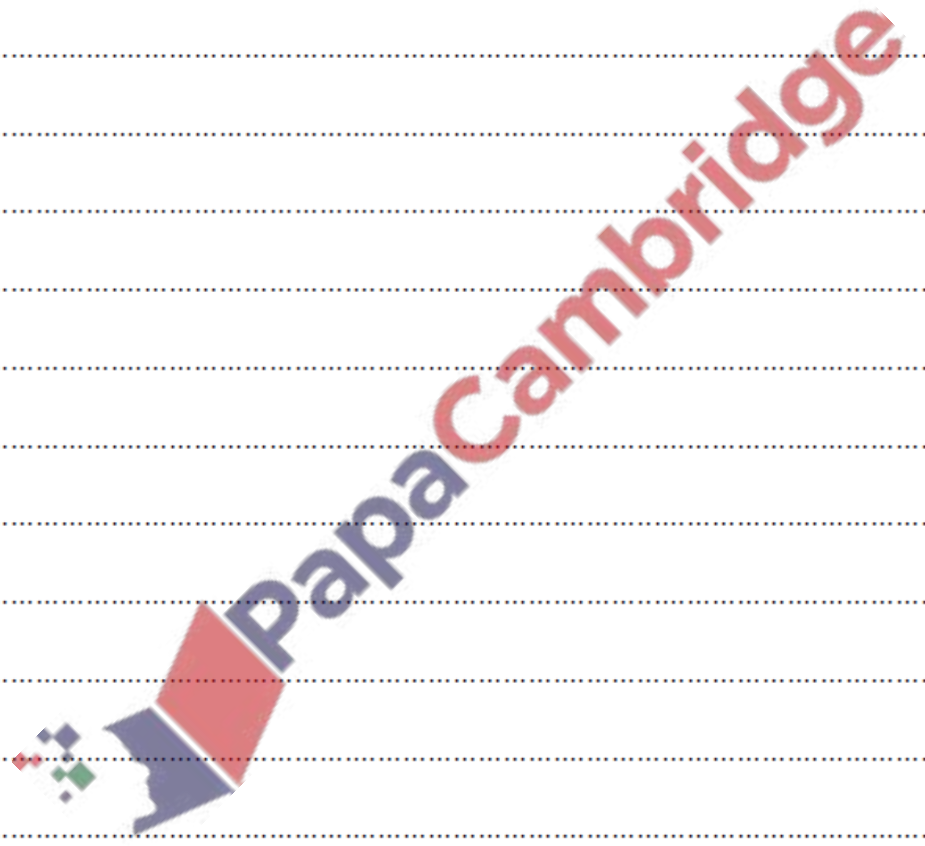
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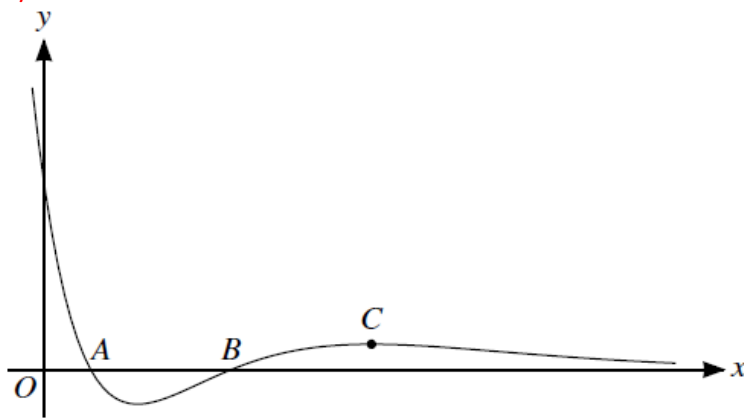
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(b) Find the coordinates of  $M$ , giving each coordinate correct to 3 significant figures. [5]

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3. June/2023/Paper\_9709/22/No.5



The diagram shows the curve with equation  $y = e^{-\frac{1}{2}x}(x^2 - 5x + 4)$ . The curve crosses the  $x$ -axis at the points  $A$  and  $B$ , and has a maximum at the point  $C$ .

(a) Find the exact gradient of the curve at  $B$ .

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(b) Find the exact coordinates of  $C$ .

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