

1. June/2023/Paper_9709/21/No.3(b)

It is given that $\int_0^a (3e^{2x} - 1) dx = 12$, where a is a positive constant.

(a) Show that $a = \frac{1}{2} \ln(9 + \frac{2}{3}a)$.

(b) Use an iterative formula, based on the equation in (a), to find the value of a correct to 4 significant figures. Use an initial value of 1 and give the result of each iteration to 6 significant figures. [3]

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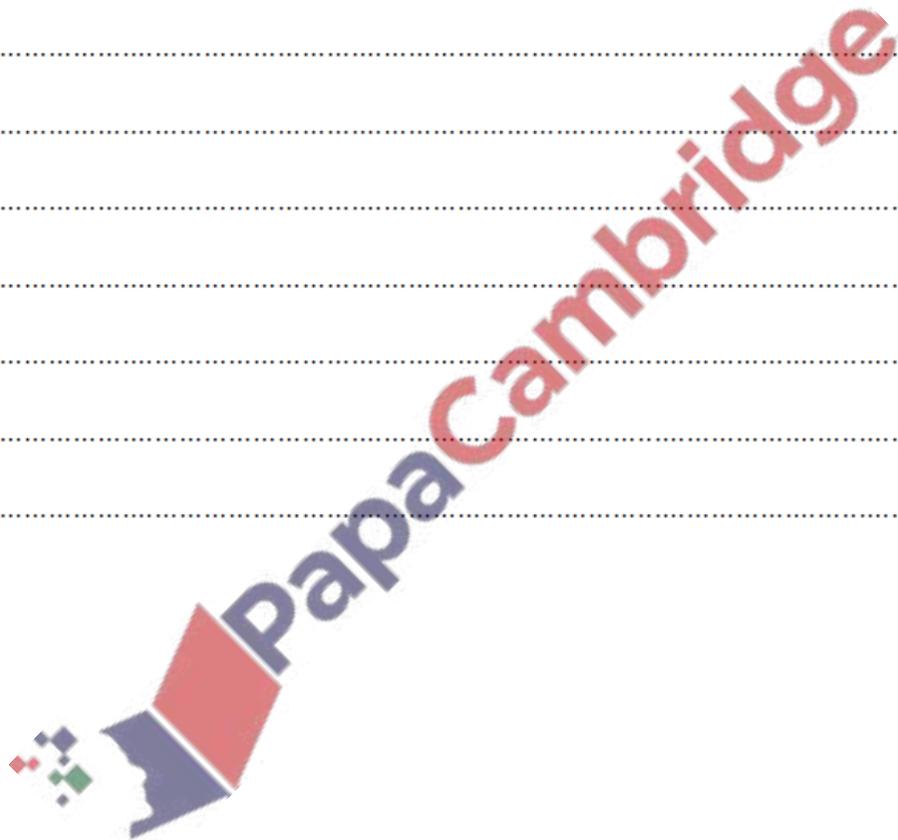
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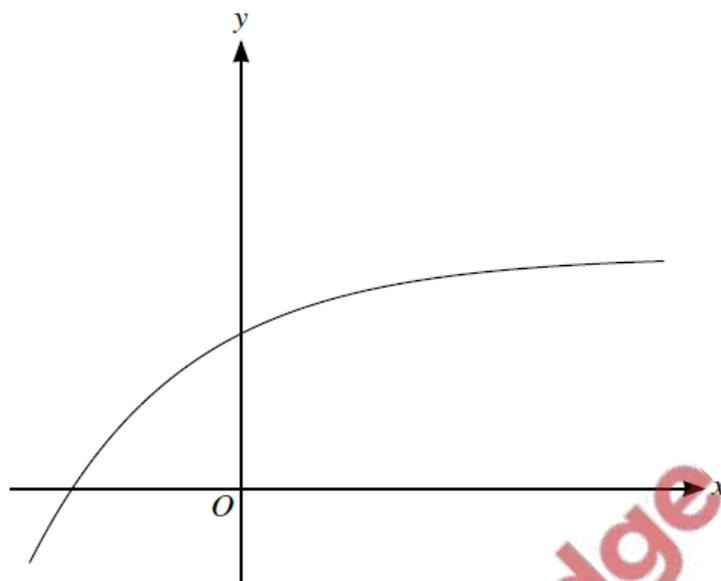
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(a)



The diagram shows the graph of $y = 3 - e^{-\frac{1}{2}x}$.

On the diagram, sketch the graph of $y = |5x - 4|$, and show that the equation $3 - e^{-\frac{1}{2}x} = |5x - 4|$ has exactly two real roots. [2]

It is given that the two roots of $3 - e^{-\frac{1}{2}x} = |5x - 4|$ are denoted by α and β , where $\alpha < \beta$.

(b) Show by calculation that α lies between 0.36 and 0.37. [2]

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(c) Use the iterative formula $x_{n+1} = \frac{1}{5}(7 - e^{-\frac{1}{2}x_n})$ to find β correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

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