

1. Nov/2021/Paper_9709/31/No.7

(a) Given that $y = \ln(\ln x)$, show that

$$\frac{dy}{dx} = \frac{1}{x \ln x}. \quad [1]$$

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The variables x and t satisfy the differential equation

$$x \ln x + t \frac{dx}{dt} = 0.$$

It is given that $x = e$ when $t = 2$.

(b) Solve the differential equation obtaining an expression for x in terms of t , simplifying your answer. [7]

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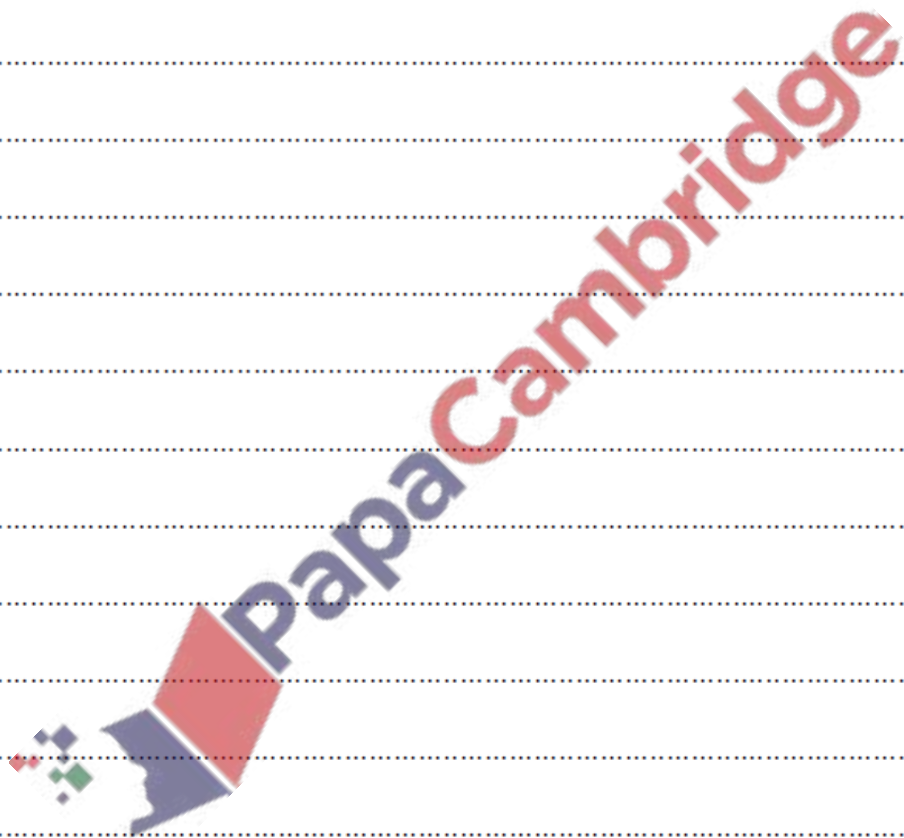
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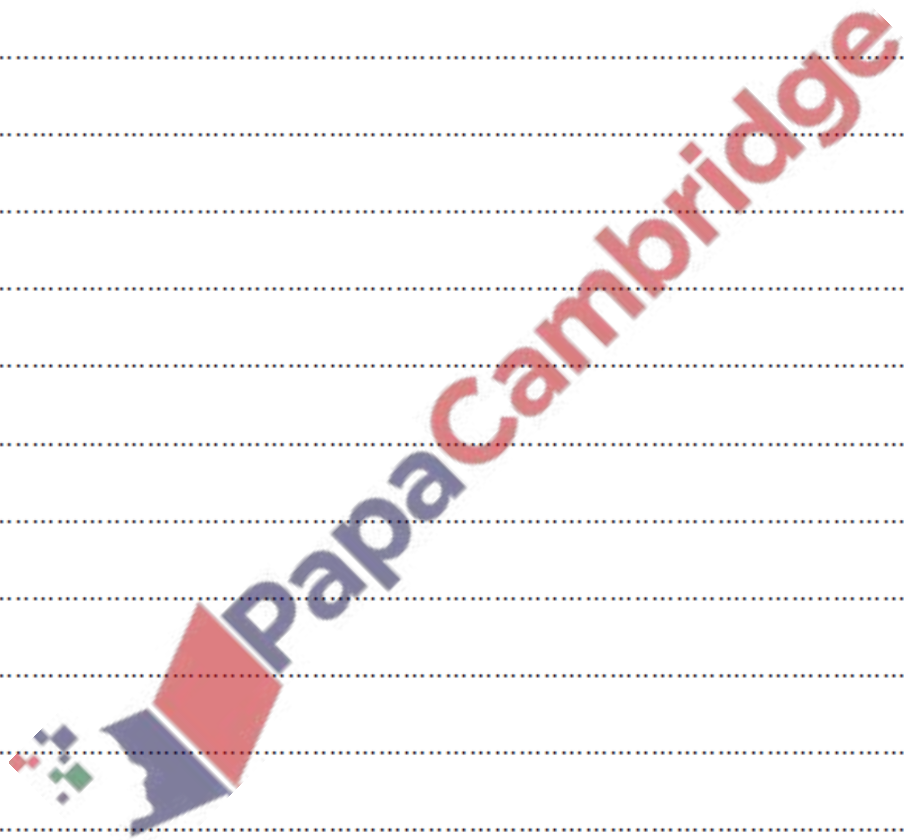
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(c) Hence state what happens to the value of x as t tends to infinity. [1]



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(c) Use an iterative formula based on the equation in part (b), with an initial value of 2, to determine x correct to 2 decimal places. Give the result of each iteration to 4 decimal places. [3]

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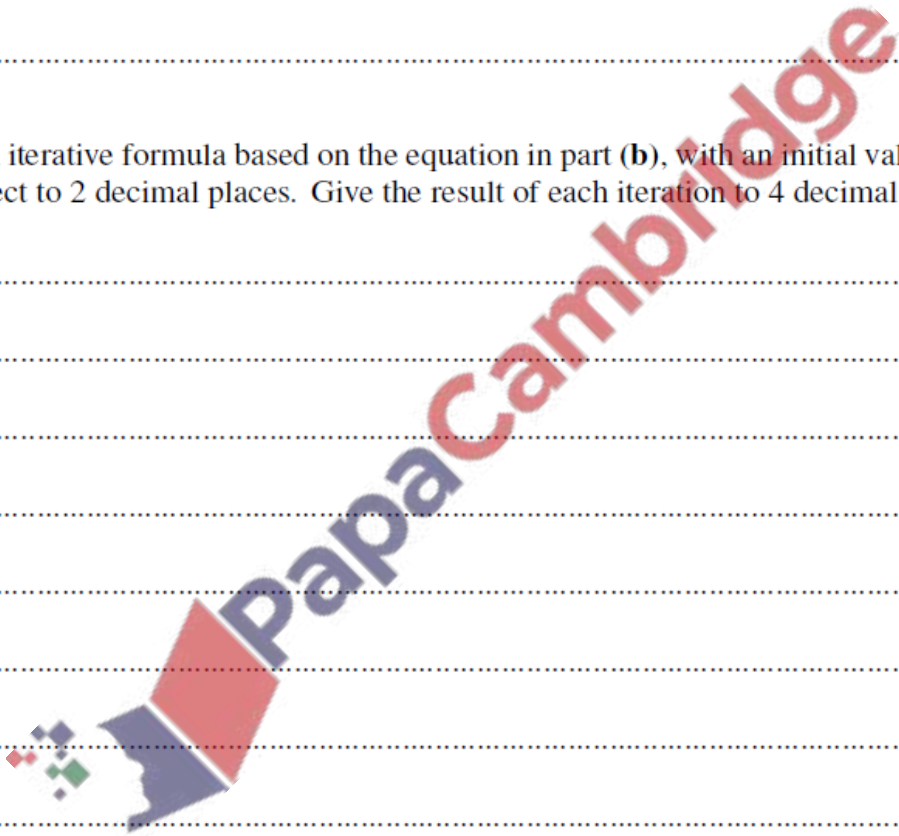
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(d) Calculate the value of t at which the entire plantation becomes infected. [1]

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