<u>Differential Equations – 2022 A2 June Math</u>

1. March/2022/Paper_9709/32/No.9

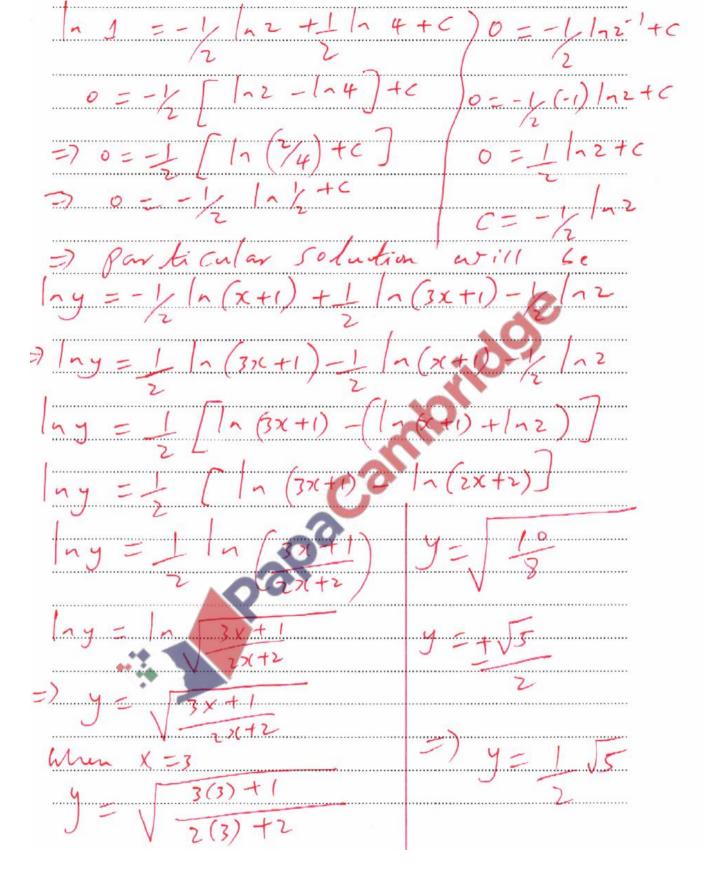
The variables x and y satisfy the differential equation

$$(x+1)(3x+1)\frac{\mathrm{d}y}{\mathrm{d}x} = y,$$

and it is given that y = 1 when x = 1.

Solve the differential equation and find the exact value of y when x = 3, giving your answer in a simplified form. [9]

3x +1) 3x+1



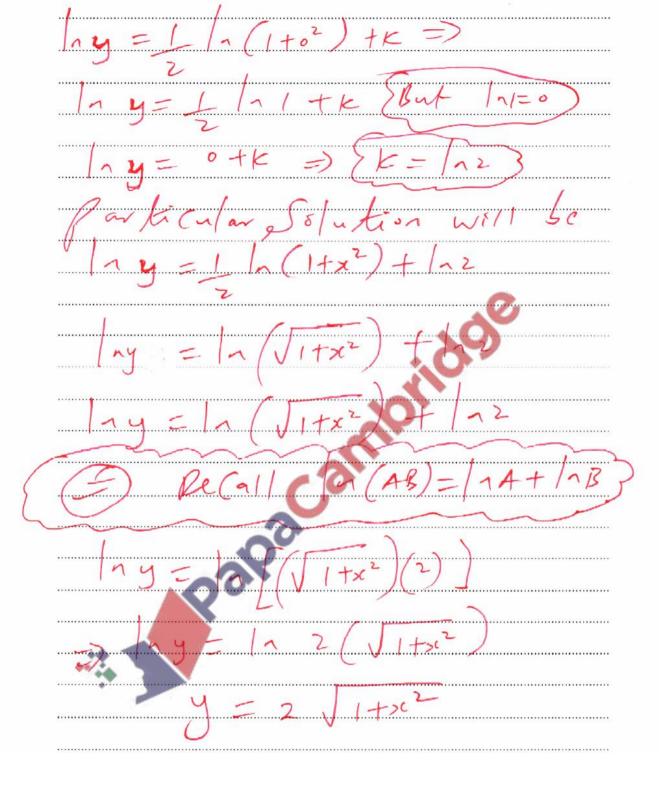
2. June/2022/Paper_9709/31/No.4

The variables x and y satisfy the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{xy}{1+x^2},$$

and y = 2 when x = 0.

Solve the differential equation, obtaining a simplified expression for y in terms of x. [7]

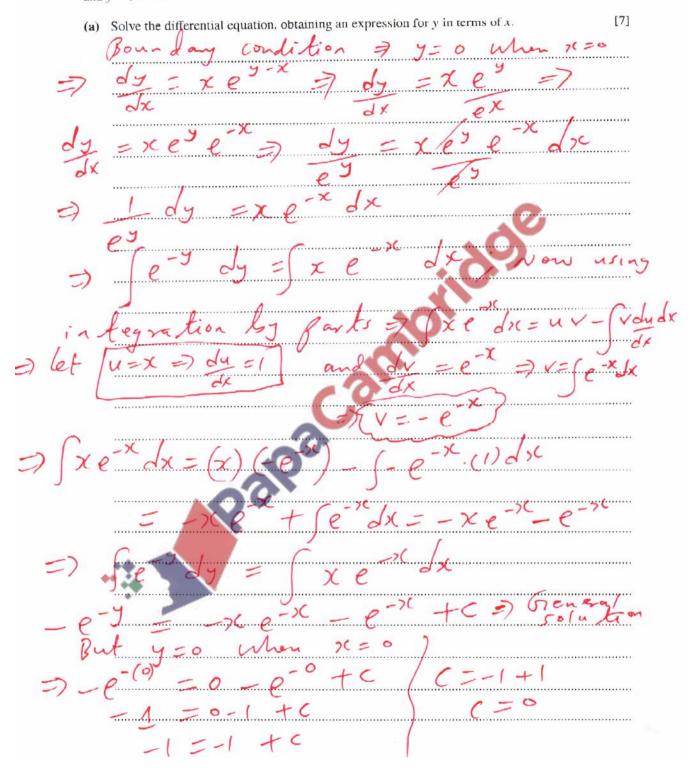


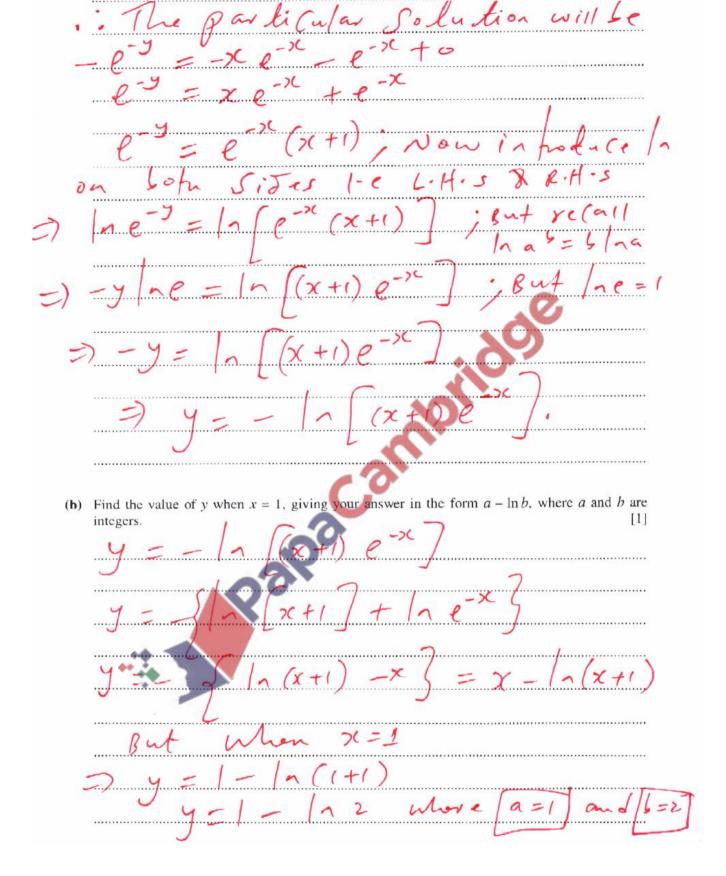
3. June/2022/Paper_9709/32/No.6

The variables x and y satisfy the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} = x\mathrm{e}^{y-x},$$

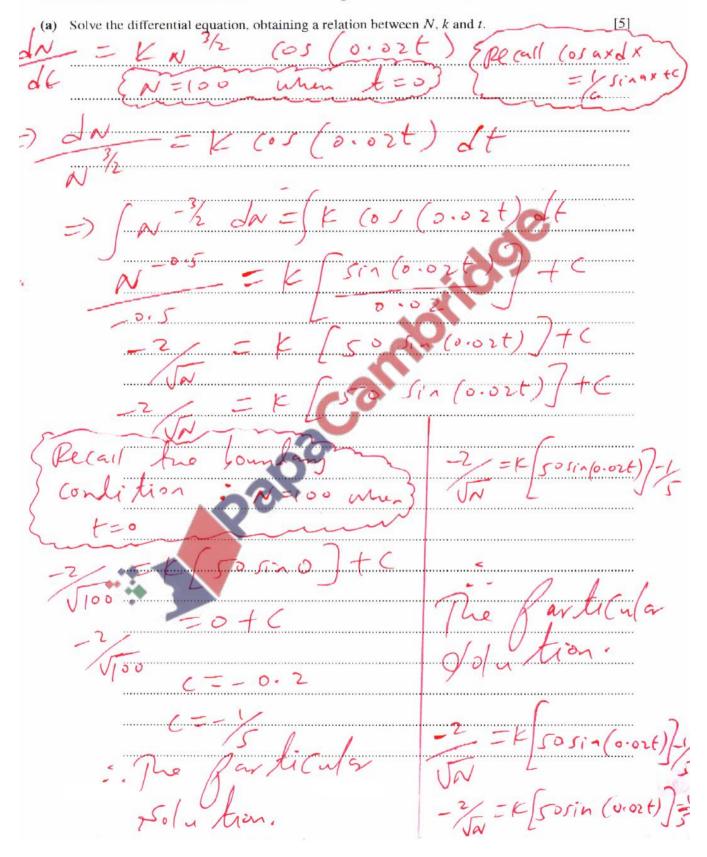
and y = 0 when x = 0.





4. June/2022/Paper_9709/33/No.8

At time t days after the start of observations, the number of insects in a population is N. The variation in the number of insects is modelled by a differential equation of the form $\frac{dN}{dt} = kN^{\frac{3}{2}}\cos 0.02t$, where k is a constant and N is a continuous variable. It is given that when t = 0, N = 100.



(b) Given also that $N = 625$ when $t = 50$, find the value of k . [2]	
When teso then N = 625	
7 - 2/ = 50 K Sin 1 - 1/5	
3/ = 50 K Sin 1	
=) k = 3	
50×25×51-1	
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(c) Obtain an expression for N in terms of t , and find the greatest value of N predicted by this model.	
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