<u>Differential Equations – 2023 June A2 Math 9709</u>

1. June/2023/Paper_9709/31/No.7

The variables x and y satisfy the differential equation

$$\cos 2x \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{4\tan 2x}{\sin^2 3y},$$

where $0 \le x < \frac{1}{4}\pi$. It is given that y = 0 when $x = \frac{1}{6}\pi$.

Solve the differential equation to obtain the value of x when $y = \frac{1}{6}\pi$. 3 decimal places.	Give your answer correct to [8]
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2.	June/2023,	/Paper_	9709,	/32/No.8	
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(a) The variables x and y satisfy the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{4 + 9y^2}{\mathrm{e}^{2x+1}}.$$

It is given that y = 0 when x = 1.

Solve the differential equation, obtaining an expression for y in terms of x .	[7]
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State what happens to the value of y as x tends to infinity. Give your answer in an exact form. [1]

(b)

3.	June/2023/Paper_9709/33/No.8 The variables x and y satisfy the differential equation
	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{y^2 + 4}{x(y+4)}$
	for $x > 0$. It is given that $x = 4$ when $y = 2\sqrt{3}$.
	Solve the differential equation to obtain the value of x when $y = 2$. [8]
	(3)
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