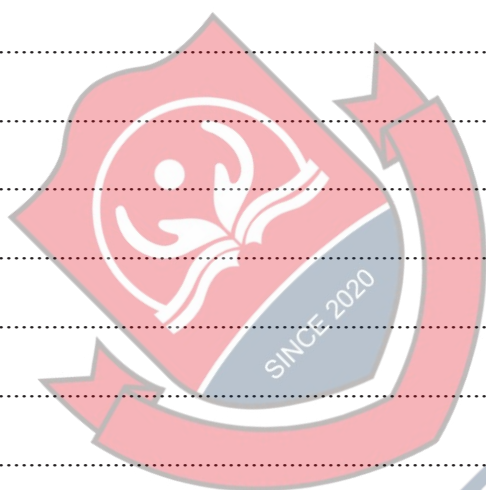


- 1 A curve has equation $y = 2 \tan x - 5 \sin x$ for $0 \leq x < \frac{1}{2}\pi$.

Find the x -coordinate of the stationary point of the curve. Give your answer correct to 3 significant figures. [3]



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- 2 A curve has equation $x^2 \ln y + y^2 + 4x = 9$.

Find the gradient of the curve at the point (2, 1).

[5]



- 3 (a) Sketch on the same diagram the graphs of $y = |3x - 8|$ and $y = 5 - x$. [2]



- (b) Solve the inequality $|3x - 8| < 5 - x$. [4]

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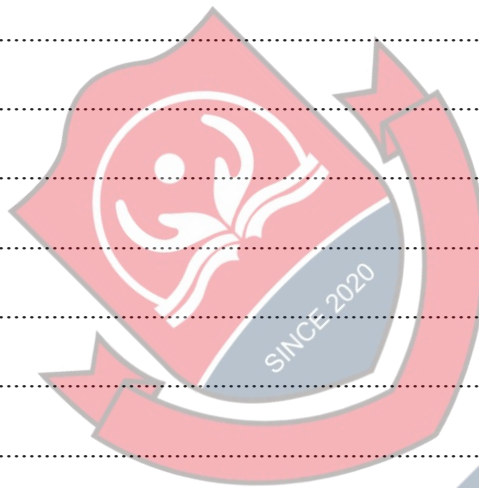
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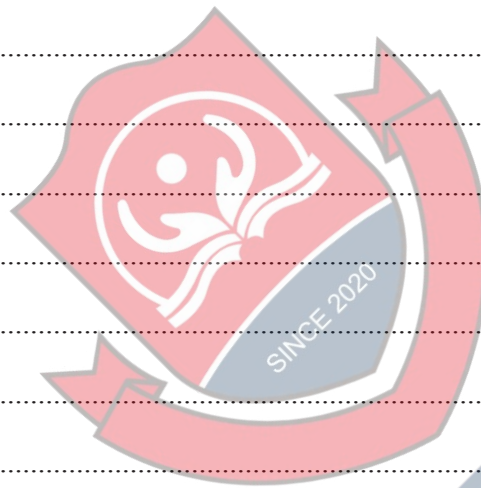
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- (c) Hence determine the largest integer N satisfying the inequality $|3e^{0.1N} - 8| < 5 - e^{0.1N}$. [2]



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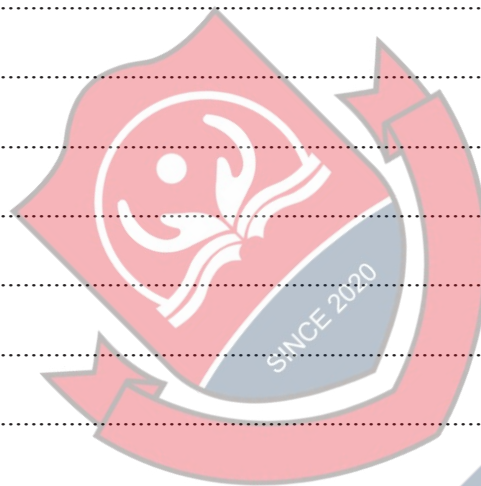
- 4 (a) Show that $3 \tan 2\theta + \tan(\theta + 45^\circ) \equiv \frac{\tan^2 \theta + 8 \tan \theta + 1}{1 - \tan^2 \theta}$. [4]



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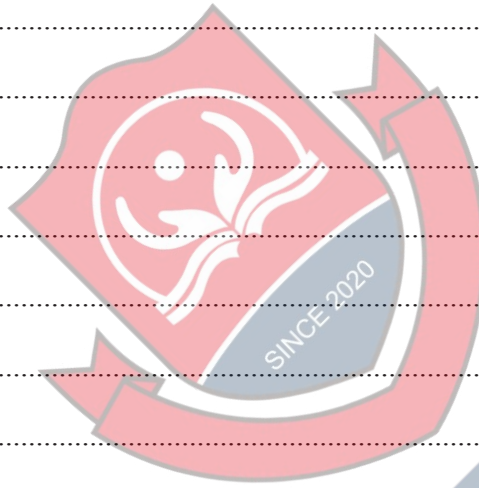
(b) Hence solve the equation $3 \tan 2\theta + \tan(\theta + 45^\circ) = 4$ for $0^\circ < \theta < 180^\circ$.

[3]

The image features the University of Alberta logo in the top left corner, which includes a red shield with a white stylized plant and the text 'SINCE 2020'. A large, light blue, diagonal watermark reading '4U Admission' is overlaid across the entire page. The background is white with horizontal dotted lines.

- 5 A curve has equation $y = \frac{1 + e^{2x}}{1 + 3x}$. The curve has exactly one stationary point P .

(a) Find $\frac{dy}{dx}$ and hence show that the x -coordinate of P satisfies the equation $x = \frac{1}{6} + \frac{1}{2}e^{-2x}$. [4]

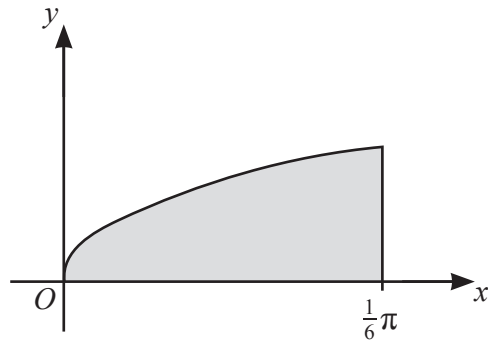


- (b)** Show by calculation that the x -coordinate of P lies between 0.35 and 0.45 . [2]

- (c) Use an iterative formula based on the equation in part (a) to find the x -coordinate of P correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

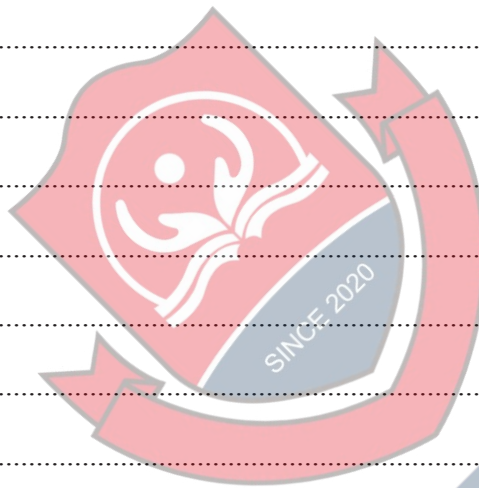
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6



The diagram shows the curve with equation $y = \sqrt{\sin 2x + \sin^2 2x}$ for $0 \leq x \leq \frac{1}{6}\pi$. The shaded region is bounded by the curve and the straight lines $x = \frac{1}{6}\pi$ and $y = 0$.

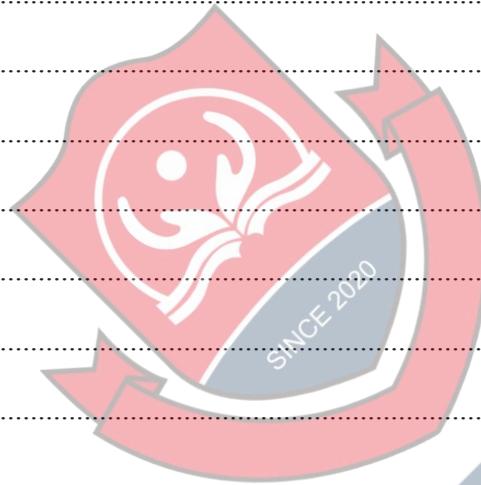
- (a) Use the trapezium rule with two intervals to find an approximation to the area of the shaded region. Give your answer correct to 2 significant figures. [3]



- (b) The shaded region is rotated completely about the x -axis.

Find the exact volume of the solid produced.

[6]



7 The polynomial $p(x)$ is defined by

$$p(x) = 9x^3 + 6x^2 + 12x + k,$$

where k is a constant.

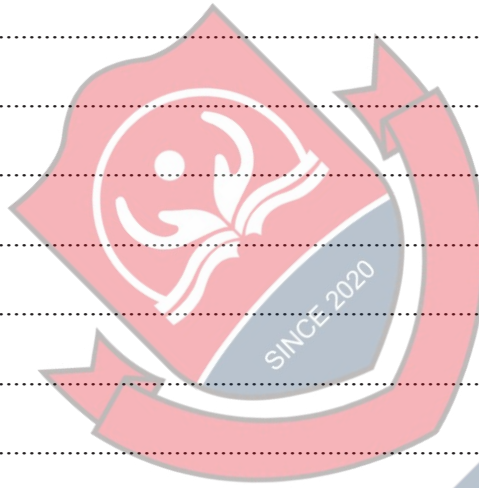
- (a) Find the quotient when $p(x)$ is divided by $(3x+2)$ and show that the remainder is $(k-8)$. [3]



- (b) It is given that $\int_1^6 \frac{p(x)}{3x+2} dx = a + \ln 64$, where a is an integer.

Find the values of a and k .

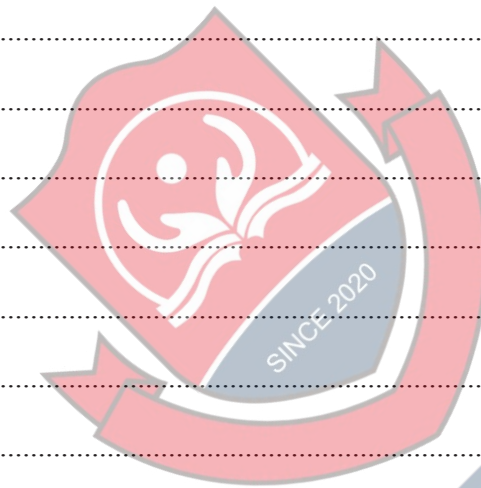
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Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.



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