

Cambridge International AS & A Level

CANDIDATE
NAME

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MATHEMATICS

9709/21

Paper 2 Pure Mathematics 2

May/June 2021

1 hour 15 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

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1 Solve the inequality $|3x - 7| < |4x + 5|$.

[4]

[illegible]

- 2** By first expanding $\sin(\theta + 30^\circ)$, solve the equation $\sin(\theta + 30^\circ) \operatorname{cosec} \theta = 2$ for $0^\circ < \theta < 360^\circ$. [6]

[illegible]

- 3 (a) Show that $(\sec x + \cos x)^2$ can be expressed as $\sec^2 x + a + b \cos 2x$, where a and b are constants to be determined. [2]

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- (b) Hence find the exact value of $\int_0^{\frac{1}{4}\pi} (\sec x + \cos x)^2 dx$. [4]

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4 A curve has parametric equations

$$x = \ln(2t + 6) - \ln t, \quad y = t \ln t.$$

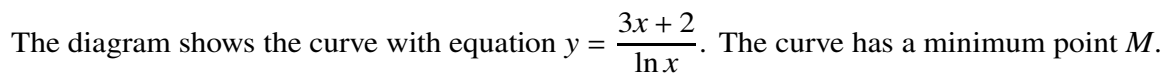
(a) Find the value of t at the point P on the curve for which $x = \ln 4$. [3]

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(b) Find the exact gradient of the curve at P .

[5]

[illegible]



- [illegible]

- (b) Use the equation in part (a) to show by calculation that the x -coordinate of M lies between 3 and 4. [2]

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- (c) Use an iterative formula, based on the equation in part (a), to find the x -coordinate of M correct to 5 significant figures. Give the result of each iteration to 7 significant figures. [3]

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- 6 (a) Use the trapezium rule with three intervals to find an approximation to $\int_1^4 \frac{6}{1+\sqrt{x}} dx$. Give your answer correct to 5 significant figures. [3]

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- (b) Find the exact value of $\int_1^4 2e^{\frac{1}{2}x-2} dx$. [3]

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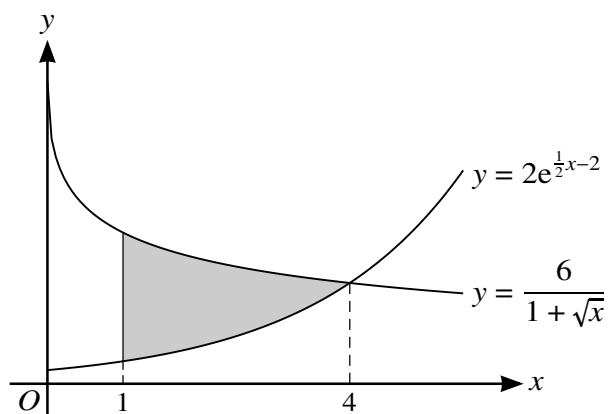
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(c)



The diagram shows the curves $y = \frac{6}{1 + \sqrt{x}}$ and $y = 2e^{\frac{1}{2}x - 2}$ which meet at a point with x -coordinate 4. The shaded region is bounded by the two curves and the line $x = 1$.

Use your answers to parts (a) and (b) to find an approximation to the area of the shaded region. Give your answer correct to 3 significant figures. [2]

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(d) State, with a reason, whether your answer to part (c) is an over-estimate or under-estimate of the exact area of the shaded region. [1]

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

$$p(x) = ax^3 - 11x^2 - 19x - a,$$

where a is a constant. It is given that $(x - 3)$ is a factor of $p(x)$.

- (a) Find the value of a . [2]

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- (b) When a has this value, factorise $p(x)$ completely. [3]

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