



## SMIYL GCEALevelMaths9709

CANDIDATE  
NAME

--

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--

### MATHEMATICS

Paper 3 Guess Paper

9709 Pure 3

October/November 2024

1 hour and 50 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 75
- The number of marks for each question or part question is shown in brackets

This document has 16 pages.

1. Solve the equation  $4^{x-2} = 4^{x+1} - 4$ , giving your answer correct to 3 significant figures. [4]

2. (a) On a sketch of an Argand diagram, shade the region whose points represent complex numbers  $z$  satisfying the inequalities  $|z - 4 - 5i| \leq 3$  and  $\operatorname{Re} z \leq 2$ . [4]

- (b) Find the greatest value of  $\arg z$  for points in this region. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3. The equation of a curve is  $y = \sin^3 x \sqrt{\cos x}$ . It is given that the curve has one stationary point in the interval  $0 < x < \frac{1}{2}\pi$ .

Find the  $x$ -coordinate of this stationary point, giving your answer correct to 3 significant figures. [6]

4. Solve the equation  $\tan(x + 30^\circ) = 3 \cot x$  for  $0^\circ < x < 180^\circ$ .

[5]

Show that  $\frac{dy}{dx} = (3 - \cos \theta)^2$ . [5]

$$x = \frac{\sin \theta}{3 - \cos \theta}, \quad y = 3 \sin \theta - \theta$$

Show that  $\frac{dy}{dx} = (3 - \cos \theta)^2$ . [5]

SM TYL

GCEALevelMaths9709

6. Using the substitution  $u = \sqrt{x}$ , find the exact value of

$$\int_4^{\infty} \frac{2}{(x+4)\sqrt{x}} dx.$$

[6]

SM TYL

GCEALevelMaths9709

Solve the equations for  $v$  and  $w$ , giving your answers in the form  $x + iy$ , where  $x$  and  $y$  are real. [6]

$$2iv + 3w - 11i = 2 \quad v - (4 - i)w + 10 + 8i = 0$$

Solve the equations for  $v$  and  $w$ , giving your answers in the form  $x + iy$ , where  $x$  and  $y$  are real. [6]



8. The constant  $a$  is such that  $\int_1^a \frac{\ln(x^2)}{\sqrt{x}} dx = 4$ .

(a) Show that  $a = \sqrt{\exp\left(4 - \frac{2}{\sqrt{a}}\right)}$ .

[5]

[ $\exp(x)$  is an alternative notation for  $e^x$ .]

(b) Verify by calculation that  $a$  lies between 4 and 5.

[2]

(c) Use an iterative formula based on the equation in part (a) to determine  $a$  correct to 2 decimal places. Give the result of each iteration to 4 decimal places. [3]

9. The variables  $x$  and  $\theta$  satisfy the differential equation

$$4x \sin^2 \theta \frac{dx}{d\theta} = 3 \sec^2 \theta - 3 - 2 \cot \theta,$$

for  $0 < \theta < \frac{1}{2}\pi$  and  $x > 0$ . It is given that  $x = 1$  when  $\theta = \frac{1}{4}\pi$ .

- (a) Show that  $\frac{d}{d\theta} (\csc^2 \theta) = -\frac{2 \cot \theta}{\sin^2 \theta}$ . [1]

(You may assume without proof that the derivative of  $\csc \theta$  with respect to  $\theta$  is  $-\csc \theta \cot \theta$ .)

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Solve the differential equation and find the value of  $x$  when  $\theta = \frac{1}{6}\pi$ . [7]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



GCEALevelMaths9709

(a) Show that  $l$  does not intersect the line passing through  $A$  and  $B$ . [5]

(b) Find the position vector of the foot of the perpendicular from  $A$  to  $l$ .

[4]

11. Let  $f(x) = \frac{2x^2+9x+4}{(2+x)(1+x)^2}$ .

(a) Express  $f(x)$  in partial fractions.

[5]

SM TYL

CEALevelMaths9709

- (b) Hence obtain the expansion of  $f(x)$  in ascending powers of  $x$ , up to and including the term in  $x^2$ . [5]



SM TYL

GCEALevelMaths9709

© [www.gcealevelmaths9709.com](http://www.gcealevelmaths9709.com)