# Pure 3 May June 2024 Guess Paper

CIE A Level Maths 9709

SMTYL

GCEALevelMaths9709

## Questions

1. Solve the equation $2\left(3^{2x-1}\right) = 4^{x+1}$, giving your answer correct to 2 decimal places.[4]

2. (a) On an Argand diagram, shade the region whose points represents the complex numbers $z$ satisfying the inequalities $-\frac{1}{3}\pi \le \arg(z-1-2i) \le \frac{1}{3}\pi$ and $\Re z \le 3$. [3]

   (b) Calculate the least value of $\arg z$ for points in the region from (a). Give your answer in radians correct to 3 decimal places. [2]

3. Find, in terms of $a$, the set of values of $x$ satisfying the inequality

$$2|3x+a| < |2x+3a|,$$

   where $a$ is a positive constant. [4]

4. (a) Express $5\sin\theta + 12\cos\theta$ in the form $R\cos(\theta-\alpha)$, where $R>0$ and $0<\alpha<\frac{1}{2}\pi$. [3]

   (b) Hence solve the equation $5\sin 2x + 12\cos 2x = 6$, for $0 \le x \le \pi$. [4]

5. The equation of a curve is $x^3 + 3x^2y - y^3 = 3$.

   (a) Show that $\frac{dy}{dx} = \frac{x^2+2xy}{y^2-x^2}$. [4]

   (b) Find the coordinates of the points on the curve where the tangent is parallel to the $x$-axis. [5]

6. The constant $a$ is such that $\int_0^a xe^{-2x}\ dx = \frac{1}{8}$. (9709/31/M/J/23 number 9)

   (a) Show that $a = \frac{1}{2}\ln(4a+2)$. [5]

   (b) Verify by calculation that $a$ lies between $0.5$ and $1$. [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]

7. Using integration by parts, find the exact value of $\int_0^2 \tan^{-1}\left(\frac{1}{2}x\right)\ dx$. [5]

8. The variables $x$ and $y$ satisfy the differential equation

$$\frac{dy}{dx} = \frac{y^2+4}{x(y+4)}$$

   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]

9. Solve the equation

$$\frac{5z}{1+2i} - zz^* + 30 + 10i = 0$$

   giving your answers in the form $x+iy$, where $x$ and $y$ are real. [5]

10. Relative to the origin $O$, the points $A$, $B$ and $C$ have position vectors given by

$$\overrightarrow{OA} = \begin{pmatrix}1\\3\\1\end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix}3\\1\\2\end{pmatrix} \quad \text{and} \quad \overrightarrow{OC} = \begin{pmatrix}5\\3\\-2\end{pmatrix}$$

    (a) Using a scalar product, find the cosine of the angle $BAC$. [4]

    (b) Hence find the area of triangle $ABC$. Give your answer in a simplified form. [4]

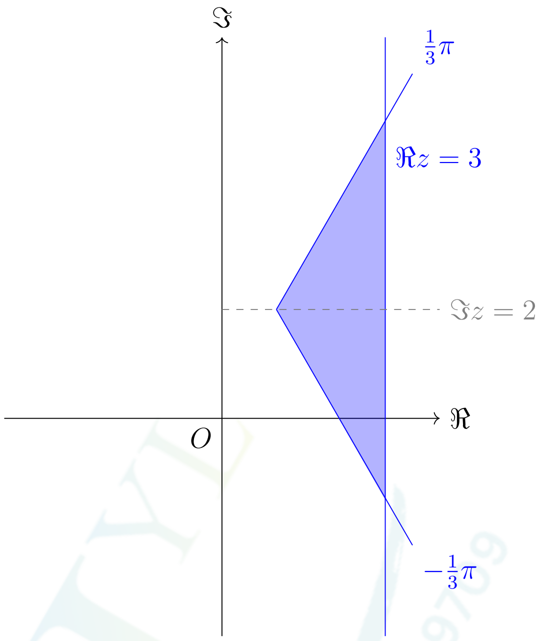
11. Let $f(x) = \frac{21-8x-2x^2}{(1+2x)(3-x)^2}$.

    (a) Express $f(x)$ in partial fractions. [5]

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

## Answers

1. $x = 2.21$
2. (a)




   (b) $-0.454$

3. $-\frac{5}{8}a < x < \frac{1}{4}a$
4. (a) $13\cos(\theta - 0.395)$

   (b) $x = 0.743$ or $0.742, \quad x = 2.79$
5. (a) $\frac{dy}{dx} = \frac{x^2+2xy}{y^2-x^2}$

   (b) $(-2, 1), \quad \left(0, -\sqrt[3]{3}\right)$
6. (a) $a = \frac{1}{2}\ln(4a+2)$

   (b) Justify the given statement

   (c) $0.84$
7. $\frac{1}{2}\pi - \ln 2$
8. $\frac{1}{2}\ln\left(y^2+4\right) + 2\tan^{-1}\frac{y}{2} = \ln x + \frac{2\pi}{3}$
9. $3 - 4i \quad 6 + 2i$
10. (a) $\frac{1}{3}$

    (b) $5\sqrt{2}$
11. (a) $\frac{2}{1+2x} + \frac{2}{3-x} - \frac{3}{(3-x)^2}$

    (b) $\frac{7}{3} - 4x + \frac{215}{27}x^2$