

Please check the examination details below before entering your candidate information

Candidate surname

Other names

MME Edexcel
Level 3 GCE

Centre Number

Candidate Number

MME Edexcel Practice Papers

Morning (Time: 2 hours)

Paper Reference **2MME**

Mathematics
Advanced
Paper 2: Pure Mathematics 2

You must have:
Mathematical Formulae and Statistical Tables, Calculator

Total Marks

Candidates may use any approved calculator.
Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided - there may be more space than you need.
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- The total mark for this paper is 100.
- The marks for each question are shown in brackets
- use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

MME
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MME

1. Figure 1 shows a sketch of the curve C with equation $y = h(x)$,

$$h(x) = 1 + \sqrt{x + 3}, \quad x \geq -3$$

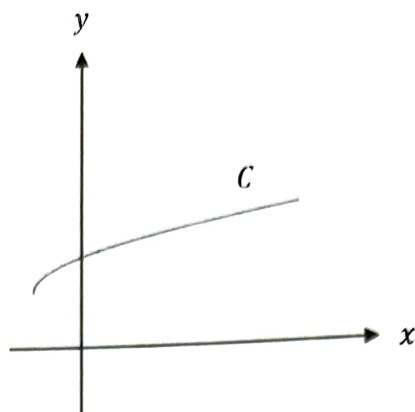


Figure 1

- (a) State the range of $h(x)$. (1)
- (b) Find $h^{-1}(x)$ and state its domain. (3)
- (c) Find the exact value of x that satisfies the equation,
$$h(x) = x$$
 (4)
- (d) State the value of m such that,
$$h(m) = h^{-1}(m)$$
 (1)

2. Relative to a fixed origin, O , the position vectors A , B and C are,

$$A: (ai + \sqrt{2}j + 5k) \quad B: (2i - 3j - 4k) \quad C: (bi + 3j - 2k)$$

Where a and b are constants and $a > 0$ and $b < 0$

Given that, $|\vec{OA}| = 6$

- (a) Find the value of a .

(3)

- (b) D is the position vector such that $\vec{AB} = \vec{BD}$

Find the position vector D .

(2)

- (c) Given $|\vec{BC}| = 7$, find the value of b .

(2)

(Total for Question 2 is 7 marks)

3. The equation $3x^2 - 4x - 3e^{-x} = 0$ has exactly one real root.

(a) Show that the Newton-Raphson formula can be written in the form,

$$x_{n+1} = \frac{3x_n^2 + 3(x_n + 1)e^{-x_n}}{6x_n - 4 + 3e^{-x_n}} \tag{4}$$

(b) Using $x_1 = 2$ and the formula given in part (a), find the values of x_2 , x_3 and x_4 (3)

(c) State an approximation for the root to 3 decimal places. (1)

(d) Explain why not all values for x_1 will give a suitable approximation. (2)

4. Find algebraically the exact solutions to the equations

(a) $\ln(2 - x) + \ln(10 - 5x) = 2 \ln(x + 2) \quad -2 < x < 2$ (5)

(b) $2^x e^{2x+1} = 5$

Give your answer in the form $\frac{a + \ln b}{c + \ln d}$ where a, b, c and d are integers.

(5)

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5. (a) Express $5\sin \theta + 12\cos \theta$ in the form $R\sin(\theta + \alpha)$ where, $R > 0$ and $0 < \alpha < \frac{\pi}{2}$
Give your answer to 3 decimal places.

(4)

- (b) Hence, or otherwise, find the solution to the equation,

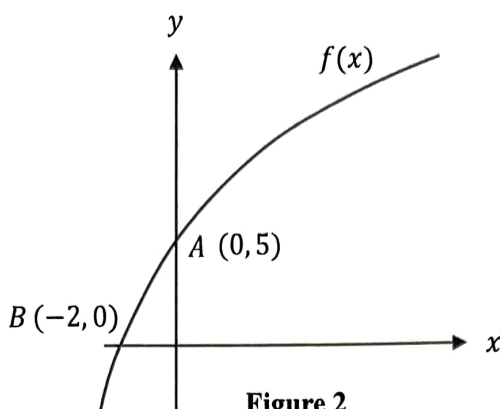
$$5\sin \theta + 12\cos \theta = 6 \quad -\frac{\pi}{2} < \theta < \frac{\pi}{2}$$

Give your answer to 3 decimal places.

(4)

6. **Figure 2** shows part of the curve with equation $y = f(x)$, $x \in \mathbb{R}$

The curve passes through the points $A(0,5)$ and $B(-2,0)$ as shown.



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accurately

Figure 2

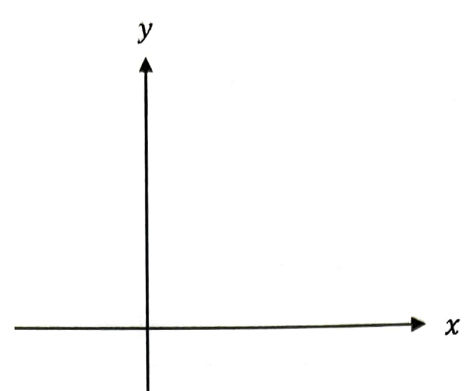
On separate diagrams, sketch the curves with following equations making sure to clearly label any intersections with the axes.

(a) $y = 2f(0.5x)$ (2)

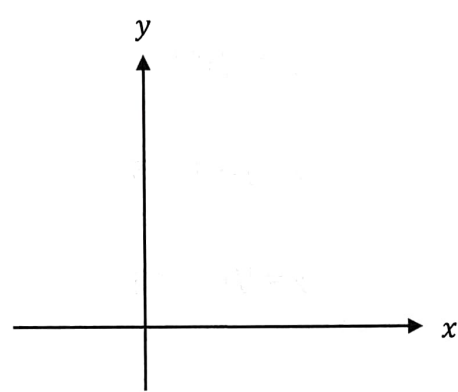
(b) $y = f(|x|) - 5$ (2)

(c) $y = |f(x - 4)|$ (2)

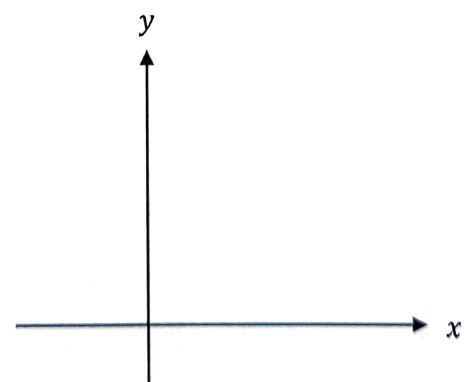
(a)



(b)



(c)



(Total for Question 6 is 6 marks)

7.

$$y = \frac{2(1 + \sin x)^2}{3 \cos^2 x}$$

x	$\frac{\pi}{6}$		$\frac{\pi}{4}$	$\frac{7\pi}{24}$	$\frac{\pi}{3}$
y	2		3.8856	5.7856	9.2855

- (a) Calculate the missing values in the table.

(2)

- (b) Use all values from the completed table in part (a) and the trapezium rule to find an estimate for

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{2(1 + \sin x)^2}{3 \cos^2 x} dx$$

Give your answer to 4 decimal places.

(3)

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8. Show that when $y = \tan^{-1} x$,

$$\frac{dy}{dx} = \frac{1}{1+x^2}$$

(6)

9. Given that,

(a)
$$\frac{2x^2 + 11x - 3}{(x + 4)(x - 1)} = A + \frac{B}{x + 4} + \frac{C}{x - 1}$$

find the values of the constants, A, B and C .

(5)

(b) Given,

$$f(x) = \frac{2x^2 + 11x - 3}{(x + 4)(x - 1)}, \quad x > 1$$

Show that $f(x)$ is strictly decreasing

(5)

10. For any arithmetic sequence, prove the sum of the first n positive integers, S_n is given by,

$$S_n = \sum_{i=1}^n a_i = \frac{1}{2}n(a + l)$$

where a and l are the first and last terms in the sequence respectively.

(7)

(Total for Question 10 is 7 marks)

11. Evaluate the following integrals,

(a)

$$I = \int \sin^3 x \cos x \, dx$$

(5)

(b)

$$I = \int \cos^4 x \, dx$$

(7)

12. A triangle has vertices $(1,1)$, $(2,3)$, $(0,5)$.

Find the equation of its circumcircle.

(10)

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