

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel Level 3 GCE

Time 1 hour 30 minutes

Paper
reference

9FM0/3A

Further Mathematics

Advanced

PAPER 3A: Further Pure Mathematics 1

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebraic 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

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- 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 ►

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Q:1/1/1/1/




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7.

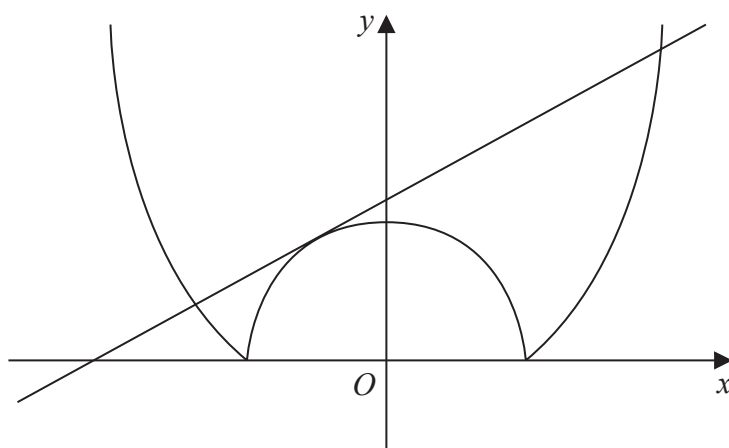


Figure 1

Figure 1 shows a sketch of the curve with equation $y = |x^2 - 8|$ and a sketch of the straight line with equation $y = mx + c$, where m and c are positive constants.

The equation

$$|x^2 - 8| = mx + c$$

has exactly 3 roots, as shown in Figure 1.

(a) Show that

$$m^2 - 4c + 32 = 0 \tag{2}$$

Given that $c = 3m$

(b) determine the value of m and the value of c (3)

(c) Hence solve

$$|x^2 - 8| \geq mx + c \tag{3}$$



8.

$$\left[\begin{array}{l} \text{The Taylor series expansion of } f(x) \text{ about } x = a \text{ is given by} \\ f(x) = f(a) + (x - a)f'(a) + \frac{(x - a)^2}{2!}f''(a) + \dots + \frac{(x - a)^r}{r!}f^{(r)}(a) + \dots \end{array} \right]$$

- (i) (a) Use differentiation to determine the Taylor series expansion of $\ln x$, in ascending powers of $(x - 1)$, up to and including the term in $(x - 1)^2$ (4)
- (b) Hence prove that

$$\lim_{x \rightarrow 1} \left(\frac{\ln x}{x - 1} \right) = 1 \quad (2)$$

- (ii) Use L'Hospital's rule to determine

$$\lim_{x \rightarrow 0} \left(\frac{1}{(x + 3) \tan(6x) \operatorname{cosec}(2x)} \right)$$

(Solutions relying entirely on calculator technology are not acceptable.) (4)



