

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.

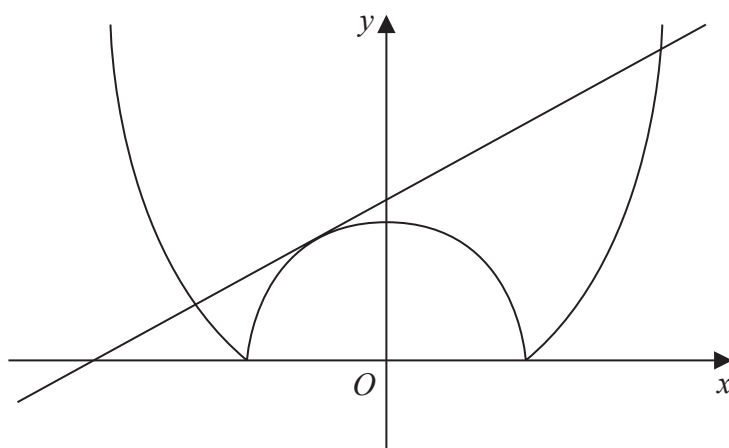


Figure 1

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

$$m^2 - 4c + 32 = 0 \quad (2)$$

Given that  $c = 3m$

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

(c) Hence solve

$$|x^2 - 8| \geq mx + c \quad (3)$$

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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)



















