

Please check the examination details below before entering your candidate information

Candidate surname				Other names			
Pearson Edexcel		Centre Number		Candidate Number			
Level 3 GCE		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			
				Paper reference		8FM0/21	
Further Mathematics Advanced Subsidiary Further Mathematics options 21: Further Pure Mathematics 1 (Part of options A, B, C and D)							
You must have: Mathematical Formulae and Statistical Tables (Green), calculator						Total Marks	

Candidates may use any calculator allowed by Pearson regulations. 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

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- The total mark for this part of the examination is 40. There are 5 questions.
- 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.
- Good luck with your examination.

Turn over ►

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1. Use algebra to determine the values of x for which

$$x(x - 1) > \frac{x - 1}{x}$$

giving your answer in set notation.

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2. The variables x and y satisfy the differential equation

$$\frac{d^2y}{dx^2} + 15\frac{dy}{dx} - 3y^2 = 2x$$

where $y = 1$ at $x = 0$ and where $y = 2$ at $x = 0.1$

Use the approximations

$$\left(\frac{d^2y}{dx^2}\right)_n \approx \frac{(y_{n+1} - 2y_n + y_{n-1}))}{h^2} \text{ and } \left(\frac{dy}{dx}\right)_n \approx \frac{(y_{n+1} - y_{n-1}))}{2h}$$

with $h = 0.1$ to find an estimate for the value of y when $x = 0.3$

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5. The point $P(ap^2, 2ap)$, where a is a positive constant, lies on the parabola with equation

$$y^2 = 4ax$$

The normal to the parabola at P meets the parabola again at the point $Q(aq^2, 2aq)$

- (a) Show that

$$q = \frac{-p^2 - 2}{p} \quad (5)$$

- (b) Hence show that

$$PQ^2 = \frac{ka^2}{p^4}(p^2 + 1)^n$$

where k and n are integers to be determined.

(5)

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