

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel  
Level 3 GCE**

Centre Number

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Candidate Number

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**Wednesday 7 October 2020**

Afternoon (Time: 2 hours)

Paper Reference **9MA0/01**

**Mathematics**

**Advanced**

**Paper 1: Pure Mathematics 1**

**You must have:**

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

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**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.
- There are 16 questions in this question paper. 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 ►

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1. (a) Find the first four terms, in ascending powers of  $x$ , of the binomial expansion of

$$(1 + 8x)^{\frac{1}{2}}$$

giving each term in simplest form.

(3)

- (b) Explain how you could use  $x = \frac{1}{32}$  in the expansion to find an approximation for  $\sqrt{5}$

There is no need to carry out the calculation.

(2)



**Question 1 continued**

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**(Total for Question 1 is 5 marks)**



P 6 6 7 8 5 A 0 3 5 2

2. By taking logarithms of both sides, solve the equation

$$4^{3p-1} = 5^{210}$$

giving the value of  $p$  to one decimal place.

(3)

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**Question 2 continued**

Lined area for writing the answer to Question 2.

**(Total for Question 2 is 3 marks)**



3. Relative to a fixed origin  $O$

- point  $A$  has position vector  $2\mathbf{i} + 5\mathbf{j} - 6\mathbf{k}$
- point  $B$  has position vector  $3\mathbf{i} - 3\mathbf{j} - 4\mathbf{k}$
- point  $C$  has position vector  $2\mathbf{i} - 16\mathbf{j} + 4\mathbf{k}$

(a) Find  $\vec{AB}$

(2)

(b) Show that quadrilateral  $OABC$  is a trapezium, giving reasons for your answer.

(2)





4. The function  $f$  is defined by

$$f(x) = \frac{3x - 7}{x - 2} \quad x \in \mathbb{R}, x \neq 2$$

(a) Find  $f^{-1}(7)$

(2)

(b) Show that  $ff(x) = \frac{ax + b}{x - 3}$  where  $a$  and  $b$  are integers to be found.

(3)

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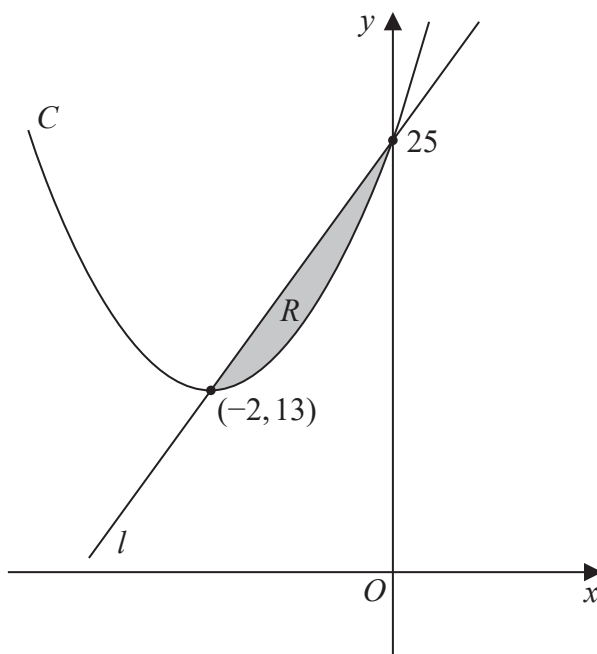
**Figure 1**

Figure 1 shows a sketch of a curve  $C$  with equation  $y = f(x)$  and a straight line  $l$ .

The curve  $C$  meets  $l$  at the points  $(-2, 13)$  and  $(0, 25)$  as shown.

The shaded region  $R$  is bounded by  $C$  and  $l$  as shown in Figure 1.

Given that

- $f(x)$  is a quadratic function in  $x$
- $(-2, 13)$  is the minimum turning point of  $y = f(x)$

use inequalities to define  $R$ .

(5)















9.

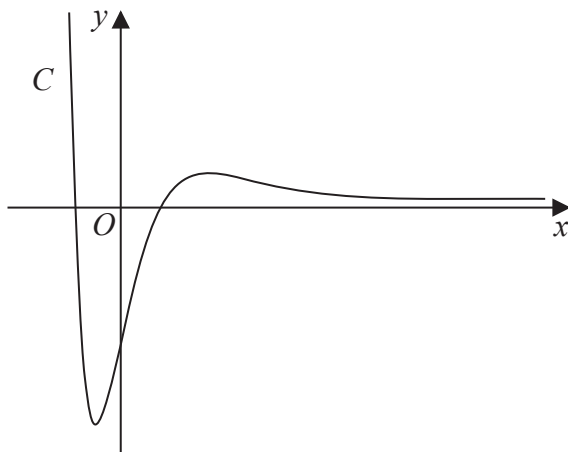


Figure 2

Figure 2 shows a sketch of the curve  $C$  with equation  $y = f(x)$  where

$$f(x) = 4(x^2 - 2)e^{-2x} \quad x \in \mathbb{R}$$

- (a) Show that  $f'(x) = 8(2 + x - x^2)e^{-2x}$  (3)
- (b) Hence find, in simplest form, the exact coordinates of the stationary points of  $C$ . (3)

The function  $g$  and the function  $h$  are defined by

$$g(x) = 2f(x) \quad x \in \mathbb{R}$$

$$h(x) = 2f(x) - 3 \quad x \geq 0$$

- (c) Find (i) the range of  $g$   
 (ii) the range of  $h$  (3)





























12.

**In this question you must show all stages of your working.****Solutions relying entirely on calculator technology are not acceptable.**

(a) Show that

$$\operatorname{cosec} \theta - \sin \theta \equiv \cos \theta \cot \theta \quad \theta \neq (180n)^\circ \quad n \in \mathbb{Z} \quad (3)$$

(b) Hence, or otherwise, solve for  $0 < x < 180^\circ$ 

$$\operatorname{cosec} x - \sin x = \cos x \cot(3x - 50^\circ) \quad (5)$$





































16. Prove by contradiction that there are no positive integers  $p$  and  $q$  such that

$$4p^2 - q^2 = 25$$

(4)

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