

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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**Tuesday 13 October 2020**

Morning (Time: 1 hour 30 minutes)

Paper Reference **WMA14/01**

**Mathematics**

**International Advanced Subsidiary/Advanced Level**  
**Pure Mathematics P4**

**You must have:**

Mathematical Formulae and Statistical Tables (Lilac), calculator

Total Marks

**Candidates may use any calculator permitted 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 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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1. Given that  $n$  is an integer, use algebra, to prove by contradiction, that if  $n^3$  is even then  $n$  is even.

(4)

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Question 1 continued

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(Total 4 marks)

Q1





Question 2 continued

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Question 2 continued

Lined area for writing the answer to Question 2.

(Total 8 marks)

Q2





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Question 3 continued

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(Total 6 marks)

Q3



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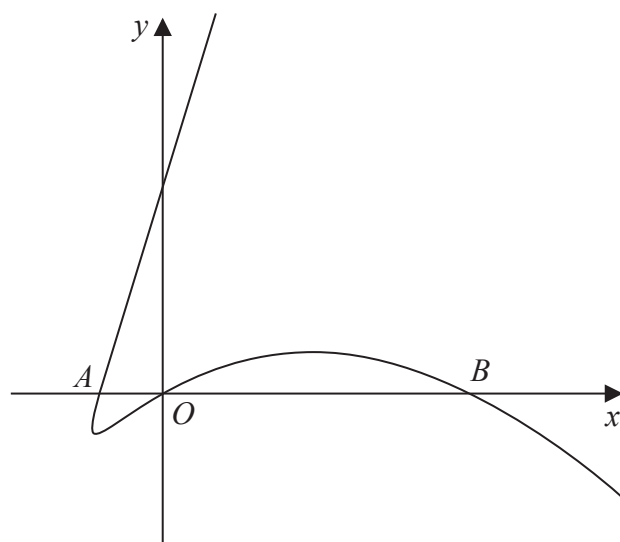


**Figure 2**

Figure 2 shows a sketch of part of the curve with parametric equations

$$x = 2t^2 - 6t, \quad y = t^3 - 4t, \quad t \in \mathbb{R}$$

The curve cuts the  $x$ -axis at the origin and at the points  $A$  and  $B$ , as shown in Figure 2.

- (a) Find the coordinates of  $A$  and show that  $B$  has coordinates  $(20, 0)$ . (3)

- (b) Show that the equation of the tangent to the curve at  $B$  is

$$7y + 4x - 80 = 0 \quad (5)$$

The tangent to the curve at  $B$  cuts the curve again at the point  $P$ .

- (c) Find, using algebra, the  $x$  coordinate of  $P$ . (4)

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**Question 4 continued**

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### Question 4 continued

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Question 4 continued

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Q4



A Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. The origin is labeled  $O$ . A curve representing the function  $y = \frac{1}{x}$  for  $x > 0$  is shown. The curve starts high on the y-axis and decreases as it moves to the right. A region  $R$  is shaded in gray, bounded by the x-axis, the vertical line  $x = 2$ , the vertical line  $x = 4$ , and the curve  $y = \frac{1}{x}$ . The label  $R$  is placed inside the shaded region.

(a) Find  $\int \frac{\ln x}{x^2} dx$  (3)

$$y = \frac{3 + 2x + \ln x}{x^2} \quad x > 0.5$$

(b) Use the answer to part (a) to find the exact area of  $R$ , writing your answer in simplest form. (4)

Question 5 continued

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Question 5 continued

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(Total 7 marks)

Q5



$$y = x^{\sin x} \quad x > 0 \quad y > 0$$

- (a) Find, by firstly taking natural logarithms, an expression for  $\frac{dy}{dx}$  in terms of  $x$  and  $y$ . (5)
- (b) Hence show that the  $x$  coordinates of the stationary points of  $C$  are solutions of the equation

$$\tan x + x \ln x = 0 \tag{2}$$

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Question 6 continued

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Question 6 continued

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Q6





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Question 7 continued

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Question 7 continued

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Question 7 continued

Lined area for writing the answer to Question 7.

(Total 12 marks)

Q7



8. Relative to a fixed origin  $O$ , the lines  $l_1$  and  $l_2$  are given by the equations

$$l_1: \quad \mathbf{r} = \begin{pmatrix} 4 \\ -3 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} \quad \text{where } \lambda \text{ is a scalar parameter}$$

$$l_2: \quad \mathbf{r} = \begin{pmatrix} 2 \\ 0 \\ -9 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix} \quad \text{where } \mu \text{ is a scalar parameter}$$

Given that  $l_1$  and  $l_2$  meet at the point  $X$ ,

- (a) find the position vector of  $X$ .

(5)

The point  $P(10, -7, 0)$  lies on  $l_1$

The point  $Q$  lies on  $l_2$

Given that  $\overrightarrow{PQ}$  is perpendicular to  $l$ ,

- (b) calculate the coordinates of  $Q$ .

(5)



Question 8 continued

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### Question 8 continued

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Question 8 continued

Lined area for writing the answer to Question 8.

Q8

Mark box for Question 8.

(Total 10 marks)



- $$\frac{dA}{dt} = \frac{A^{\frac{3}{2}}}{5t^2} \quad t > 0$$

$$A = \left( \frac{pt}{qt + r} \right)^2$$

(2)

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**TOTAL FOR PAPER IS 75 MARKS**

**END**