Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Tuesday 9 June 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA14/01**

Mathematics

International Advanced Level
Pure Mathematics P4

You must have:
Mathematical Formulae and Statistical Tables (Yellow), 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 8 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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Pearson

1. $$f(x) = \frac{2+11x}{(1+x)(2+5x)}$$

(a) Write $f(x)$ in partial fraction form.

(3)

(b) Using

- the answer to part (a)
- appropriate binomial series expansions

find the first 3 terms, in ascending powers of x, of the series expansion of $f(x)$.
Write the answer in simplest form.

(5)

(c) State the range of values of x for which the expansion in part (b) is valid.

(1)

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Question 1 continued

Question 1 continued

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Question 1 continued

(Total for Question 1 is 9 marks)

2. With respect to a fixed origin O, the lines l_1 and l_2 are given by the equations

$$l_1: \quad \mathbf{r} = \begin{pmatrix} -2 \\ 5 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ 5 \end{pmatrix} \qquad l_2: \quad \mathbf{r} = \begin{pmatrix} 6 \\ 12 \\ -5 \end{pmatrix} + \mu \begin{pmatrix} 4 \\ -3 \\ 10 \end{pmatrix}$$

where λ and μ are scalar parameters.

(a) With reference to the equations, explain why l_1 and l_2 are not parallel.

(1)

(b) Prove by contradiction that l_1 and l_2 do not intersect.

(5)

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Question 2 continued

(Total for Question 2 is 6 marks)

3. The curve C is defined by the parametric equations

$$x = \frac{4}{t+2} \qquad y = \frac{6t}{t+4} \qquad t > -1$$

The point P with parameter $t = 2$ lies on C.

(a) Use parametric differentiation to find the equation of the tangent to C at P. Give the answer in the form $y = mx + c$, where m and c are constants.

(5)

(b) Show that the equation of C can be written in the form $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{ax+b}{x+d} \qquad 0 < x < k$$

and where a, b, d and k are integers to be found.

(4)

(c) Hence, or otherwise, find the range of f.

(2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 11 marks)

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

Water flows at a constant rate into a container.

When the depth of water in the container is h cm, the volume of water in the container, V cm^3, is modelled by the equation

$$V = \frac{1}{3}h^2\sqrt{(h+4)} \qquad 0 \leqslant h \leqslant 21$$

Given that

- the container is initially empty
- water flows into the container at a rate of $30\ \text{cm}^3\text{s}^{-1}$
- the container is full when the depth of the water is 21 cm

find, according to the model,

(a) the time taken to fill the container,

(2)

(b) the exact rate of change of the depth of the water, in cm s^{-1}, when $h = 5$

(5)

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Question 4 continued

(Total for Question 4 is 7 marks)

5.

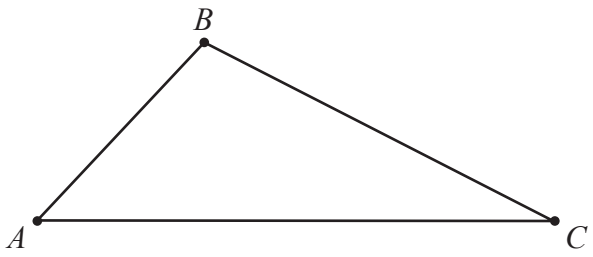


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a sketch of triangle ABC.

Given that

- $\overrightarrow{AB} = 2\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$
- $\overrightarrow{AC} = 6\mathbf{i} - 2\mathbf{j} - 8\mathbf{k}$

(a) find the size of angle BAC, giving the answer, in degrees, to one decimal place.

(3)

(b) Hence find the area of triangle ABC, giving the answer to one decimal place.

(2)

The line AB is extended to a point D such that angle ADC is a right angle.

(c) Find $\overrightarrow{AD}$

(4)

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Question 5 continued

Question 5 continued

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Question 5 continued

(Total for Question 5 is 9 marks)

6.

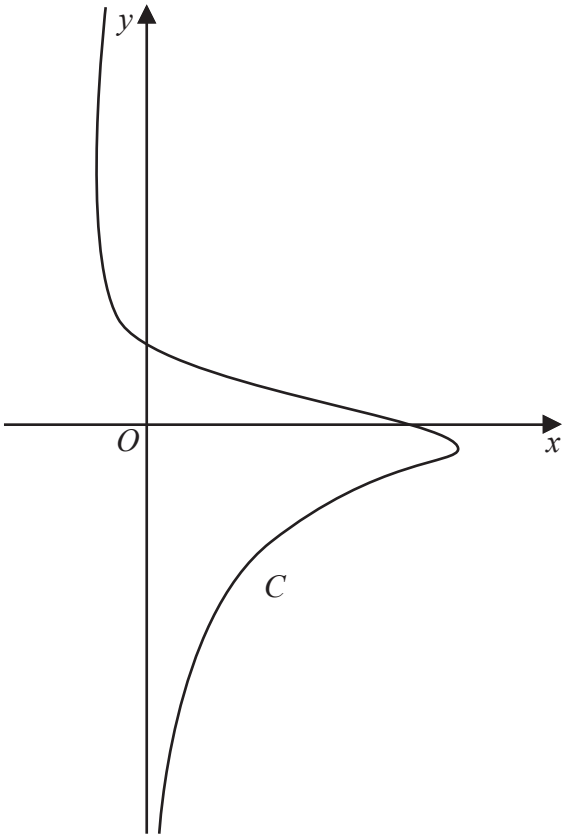


Figure 2

Figure 2 shows a sketch of the curve C with equation

$$4xy^2 + 12y + 6x = 53 \qquad y \in \mathbb{R}$$

(a) Use implicit differentiation to find $\frac{dy}{dx}$ in simplest form in terms of x and y.

(5)

The point $P(a, b)$ lies on C.

Given that a is the maximum possible value of x

(b) find the value of a and the value of b.

(*Solutions relying on calculator technology are not acceptable.*)

(5)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 10 marks)

7. (i) Use integration by parts to find

$$\int e^{2x} \cos 4x \, dx$$

(6)

(ii) Using the substitution $2x = \sin u$ and algebraic integration, find the exact value of

$$\int_{\frac{1}{4}}^{\frac{\sqrt{3}}{4}} \frac{2x^3}{\sqrt{1-4x^2}} \, dx$$

giving the answer in simplest form.

(*Solutions relying on calculator technology are not acceptable.*)

(7)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 13 marks)

8. The growth of algae on the surface of a pond is being monitored.

The surface area of the pond covered by algae, $S\ \text{m}^2$, is modelled by the equation

$$S = 140 - \frac{k}{0.3t + 8}$$

where t days is the time after monitoring began and k is a constant.

Given that $18\ \text{m}^2$ of the surface area of the pond was covered by algae when monitoring began,

(a) find, according to this model,

(i) the value of k,

(ii) the value of $\frac{\text{d}S}{\text{d}t}$ when $t = 10$

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

(3)

In an improved model, S increases with respect to t according to the differential equation

$$\frac{\text{d}S}{\text{d}t} = \frac{128 - S}{50}$$

(b) Solve the differential equation, with $S = 18$ when $t = 0$, to find an equation for S in terms of t.

(6)

Given that the algae grows until it covers the entire surface of the pond,

(c) find, according to the **improved** model, the maximum possible area of the pond.

(1)

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Question 8 continued

Question 8 continued

(Total for Question 8 is 10 marks)

TOTAL FOR PAPER IS 75 MARKS

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