Pearson Edexcel International Advanced Level

Tuesday 9 June 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA14/01A**

Mathematics

International Advanced Level
Pure Mathematics P4
Question paper

You must have:
Answer book (sent separately)
Do not return this question paper with the answer book

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Pearson

1. Find the first 4 terms of the binomial expansion, in ascending powers of x, of

$$(8 + 32x)^{\frac{1}{3}} \qquad |x| < \frac{1}{4}$$

giving each term in simplest form.

(4)

(Total for Question 1 is 4 marks)

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2. Given that

$$\frac{2x^2 - x + 11}{(x+2)(2x-3)} \equiv A + \frac{B}{x+2} + \frac{C}{2x-3}$$

(a) find the value of each of the constants A, B and C.

(4)

(b) Hence find

$$\int \frac{2x^2 - x + 11}{(x+2)(2x-3)}\,\mathrm{d}x$$

(3)

(Total for Question 2 is 7 marks)

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3. A solid metal cube is being heated and is expanding.

The volume of the cube is increasing at a constant rate of $0.085\,\text{cm}^3\,\text{s}^{-1}$

At time t seconds,

- the side length of the cube is x cm
- the volume of the cube is $V\ \text{cm}^3$

At the instant the volume of the cube is $100\,\text{cm}^3$, the side length is increasing at a rate of $k\ \text{cm}\,\text{s}^{-1}$

Find the value of k, giving your answer to 3 significant figures.

(4)

(Total for Question 3 is 4 marks)

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4. The curve C has parametric equations

$$x = \frac{3}{5t-2} \qquad y = \frac{t}{4-t} \qquad t \in \mathbb{R} \qquad t \neq \frac{2}{5} \qquad t \neq 4$$

(a) Show that the Cartesian equation of C is

$$y = \frac{ax+b}{cx+d} \qquad x \neq -\frac{d}{c}$$

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

(3)

The line l has equation $y = -x + 1$

(b) Use algebra to prove by contradiction that l and C do not intersect.

(4)

(Total for Question 4 is 7 marks)

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5. Use the substitution $u = \sqrt{2x-1}$ to show that

$$\int \frac{x}{\sqrt{2x-1}}\,\mathrm{d}x = A(2x-1)^{\frac{1}{2}}(x+B) + k$$

where A and B are constants to be found, and k is an arbitrary constant.

(5)

(Total for Question 5 is 5 marks)

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

The curve C has equation

$$x^2 - xy + y^2 + 4x = 12$$

(a) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x and y.

(4)

Given that the point $P(-4, -6)$ lies on C,

(b) find the equation of the normal to C at P, giving the answer in the form $y = mx + c$ where m and c are constants.

(3)

The normal to C at P intersects C again at the point Q.

(c) Find the exact coordinates of Q.

(3)

(Total for Question 6 is 10 marks)

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7. Relative to a fixed origin O

- the point A has position vector $5\mathbf{i} - 3\mathbf{j} + \mathbf{k}$
- the point B has position vector $3\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$
- the point C has position vector $\alpha\mathbf{i} + \beta\mathbf{j} - 5\mathbf{k}$

where α and β are constants.

The straight line l passes through A and B.

(a) Find a vector equation for l.

(2)

Given that C lies on l

(b) find the value of α and the value of β.

(2)

(c) Find, in degrees to one decimal place, the acute angle between OC and AB.

(3)

The point D lies on l such that OD is perpendicular to l.

(d) Find the exact coordinates of D.

(3)

(Total for Question 7 is 10 marks)

8. (a) Use integration to show that

$$\int x\cos 2x\,\mathrm{d}x = Ax\sin 2x + B\cos 2x + c$$

where A and B are constants to be found, and c is an arbitrary constant.

(3)

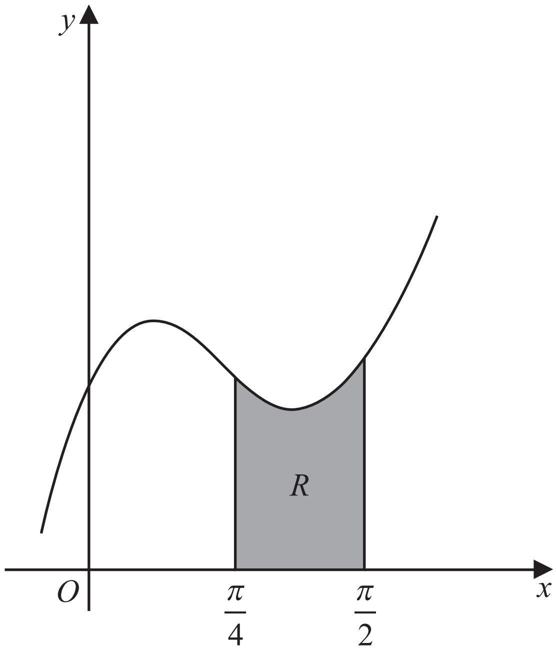

Figure 1

Figure 1 shows a sketch of part of the curve with equation

$$y = 4x + 3\cos 2x$$

The finite region R, shown shaded in Figure 1, is bounded by the curve, the line with equation $x = \frac{\pi}{2}$, the x-axis and the line with equation $x = \frac{\pi}{4}$

The region R is rotated through 2π radians about the x-axis to form a solid of revolution S.

(b) Use algebraic integration to find the exact volume of S, giving the answer in the form

$$\pi\left(p\pi^3 + q\pi + r\right)$$

where p, q and r are constants.

(6)

(Total for Question 8 is 9 marks)

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

A drink is put in a freezer to cool.

The temperature, θ°C, of the drink, t minutes after it is put in the freezer, is modelled by the differential equation

$$\frac{d\theta}{dt} = -k(\theta + 15)$$

where k is a positive constant.

Given that the temperature of the drink when it was put in the freezer was 21°C,

(a) solve the differential equation to show that, according to the model,

$$\theta = Ae^{-kt} + B$$

where A and B are integers to be found.

(5)

Given that 20 minutes after the drink is put in the freezer, its temperature is 12.9°C,

(b) find the value of k, giving the answer to 3 significant figures.

(2)

(c) Hence find, according to the model, the temperature of the drink, one hour after it was put in the freezer. Give the answer to one decimal place.

(2)

(Total for Question 9 is 9 marks)

10.

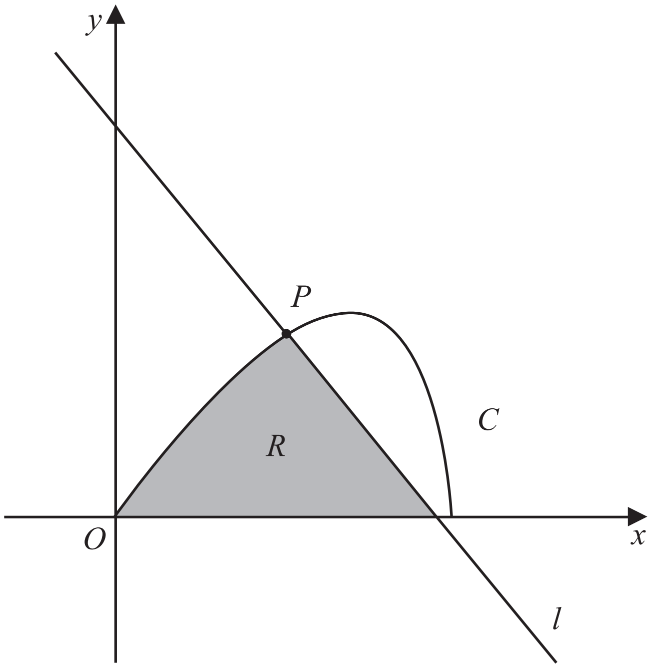

Figure 2

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

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

$$x = 8\cos\theta \qquad y = 5\sin 2\theta \qquad 0 \leqslant \theta \leqslant \frac{\pi}{2}$$

The point P with parameter $\theta = \dfrac{\pi}{3}$ lies on C.

The line l is the normal to C at P, as shown in Figure 2.

(a) Use calculus to show that l has equation

$$y = p\sqrt{3}\,x + q\sqrt{3}$$

where p and q are rational constants to be found.

(4)

The finite region R, shown shaded in Figure 2, is bounded by C, l and the x-axis.

(b) Using algebraic integration, find the exact area of R, giving the answer in the form $A + B\sqrt{3}$ where A and B are rational constants.

(6)

(Total for Question 10 is 10 marks)

TOTAL FOR PAPER IS 75 MARKS

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