

Write your name here

Surname

Other names

Pearson Edexcel
International GCSE

Centre Number

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Candidate Number

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Further Pure Mathematics

Paper 1

Monday 8 June 2015 – Morning
Time: 2 hours

Paper Reference

4PM0/01

Calculators may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- 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.
- Check your answers if you have time at the end.

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Turn over ►

PEARSON

Answer all TEN questions

Write your answers in the spaces provided

You must write down all the stages in your working

- 1 The region enclosed by the curve with equation $y = 4x^2 - 9$, the positive x -axis and the negative y -axis is rotated through 360° about the x -axis.

Use algebraic integration to find, to 3 significant figures, the volume of the solid generated.

(5)

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Question 1 continued

Ruled writing area with horizontal dotted lines for student response.

(Total for Question 1 is 5 marks)



2 Given that $y = 4x^2e^{2x}$

(a) find $\frac{dy}{dx}$ (3)

(b) hence show that $x\frac{dy}{dx} = 2y(1+x)$ (2)

Handwriting practice area consisting of multiple horizontal dotted lines for writing.



Question 3 continued

Ruled area for writing the answer to Question 3.

(Total for Question 3 is 5 marks)



Question 4 continued

Dotted lines for writing.

(Total for Question 4 is 7 marks)



P 4 4 4 0 6 A 0 9 3 2

5 (a) Show that $(\alpha + \beta)(\alpha^2 - \alpha\beta + \beta^2) = \alpha^3 + \beta^3$ (1)

The roots of the equation $2x^2 + 6x - 7 = 0$ are α and β where $\alpha > \beta$

Without solving the equation,

(b) find the value of $\alpha^3 + \beta^3$ (4)

(c) show that $\alpha - \beta = \sqrt{23}$ (2)

(d) Hence find the exact value of $\alpha^3 - \beta^3$ (2)

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Question 5 continued

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 5 continued

A series of horizontal dotted lines for writing.



Question 5 continued

Dotted lines for writing.

(Total for Question 5 is 9 marks)



P 4 4 4 0 6 A 0 1 3 3 2

6

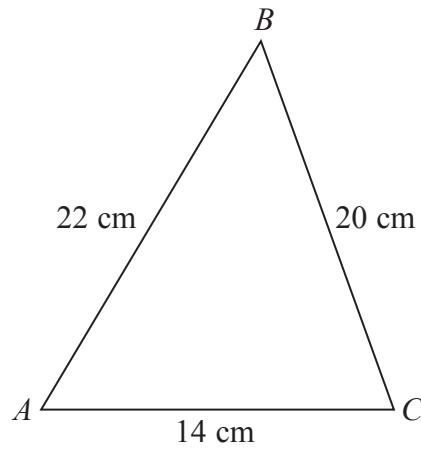


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows $\triangle ABC$ with $AB = 22$ cm, $AC = 14$ cm and $BC = 20$ cm.

(a) Find, to 3 decimal places, the size of each of the three angles of $\triangle ABC$. (5)

The bisector of angle BAC meets BC at P .

(b) Find, in cm to 3 significant figures, the length of AP . (3)

(c) Find, to the nearest cm^2 , the area of $\triangle ABC$. (2)

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Question 6 continued

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 6 continued

A series of horizontal dotted lines for writing.



Question 6 continued

Dotted lines for writing.

(Total for Question 6 is 10 marks)



7 (a) Expand $\left(1 + \frac{x}{3}\right)^{\frac{1}{4}}$ in ascending powers of x up to and including the term in x^3 , giving each coefficient as an exact fraction. (3)

(b) Expand $\left(1 - \frac{x}{3}\right)^{-\frac{1}{4}}$ in ascending powers of x up to and including the term in x^3 , giving each coefficient as an exact fraction. (3)

(c) Write down the range of values of x for which both of your expansions are valid. (1)

(d) Expand $\left(\frac{3+x}{3-x}\right)^{\frac{1}{4}}$ in ascending powers of x up to and including the term in x^2 , giving each coefficient as an exact fraction. (3)

(e) Hence obtain an estimate, to 3 significant figures, of $\int_0^{0.6} \left(\frac{3+x}{3-x}\right)^{\frac{1}{4}} dx$ (4)

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Question 7 continued

Handwriting practice area with 25 horizontal dotted lines.



Question 7 continued

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 8 continued

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 8 continued

A series of horizontal dotted lines for writing.



Question 8 continued

Dotted lines for writing.

(Total for Question 8 is 17 marks)



9 A curve C has equation $y = \frac{3x + 1}{2x + 3}$ $x \neq -\frac{3}{2}$

(a) Write down an equation of the asymptote of C which is parallel to

- (i) the x -axis,
- (ii) the y -axis.

(2)

(b) Find the coordinates of the points where C crosses

- (i) the x -axis,
- (ii) the y -axis.

(2)

(c) Using the axes opposite, sketch the curve C , showing clearly the asymptotes and the coordinates of the points where C crosses the axes.

(3)

The curve C intersects the x -axis at the point A .

The line l is the normal to C at A .

(d) Find an equation for l .

(5)

The line l meets C again at the point B .

(e) Find the x -coordinate of B .

(5)

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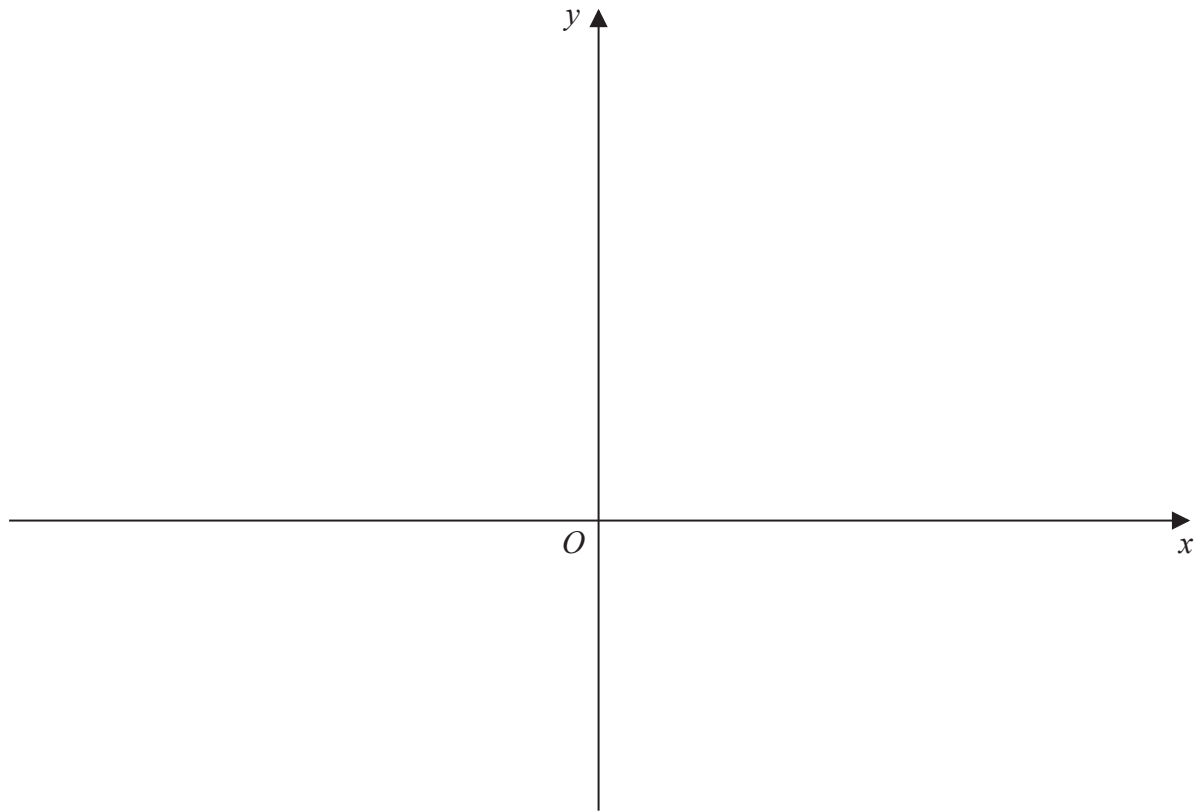
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Question 9 continued



A series of horizontal dotted lines for writing, consisting of 15 lines spaced evenly down the page.



Question 9 continued

A large rectangular area with rounded corners, containing 25 horizontal dotted lines for writing.



Question 9 continued

A series of 25 horizontal dotted lines for writing answers.

(Total for Question 9 is 17 marks)



10 A solid right circular cylinder has base radius r cm and height h cm. The volume of the cylinder is 50 cm^3 and the total surface area is $A \text{ cm}^2$.

(a) Show that $A = 2\pi r^2 + \frac{100}{r}$ (3)

(b) Use calculus to find, to 4 significant figures, the value of r for which A is a minimum. (3)

(c) Use calculus to verify that the value of r found in part (b) does give a minimum value of A . (3)

(d) Find, to the nearest whole number, the minimum value of A . (2)

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Question 10 continued

A series of horizontal dotted lines for writing.



Question 10 continued

(This area contains horizontal dotted lines for writing the answer to Question 10.)

(Total for Question 10 is 11 marks)

TOTAL FOR PAPER IS 100 MARKS

