

Write your name here	
Surname	Other names
Edexcel	Centre Number
International GCSE	Candidate Number
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 2</h2>	
Tuesday 22 January 2013 – Afternoon Time: 2 hours	Paper Reference 4PM0/02
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.

Turn over ►

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PEARSON

(Total for Question 1 is 6 marks)



2 Using the identities $\sin (A+B)=\sin A \cos B+\cos A \sin B$

$$\cos (A+B)=\cos A \cos B-\sin A \sin B$$

$$\tan A=\frac{\sin A}{\cos A}$$

(a) show that $\tan (A+B)=\frac{\tan A+\tan B}{1-\tan A \tan B}$ (3)

(b) Hence show that

(i) $\tan 105^{\circ}=\frac{1+\sqrt{3}}{1-\sqrt{3}}$ (ii) $\tan 15^{\circ}=\frac{\sqrt{3}-1}{1+\sqrt{3}}$ (4)



(Total for Question 2 is 7 marks)



- (3)

- (1)

(3)

(2)



(Total for Question 3 is 9 marks)

4 Differentiate with respect to x

(a) $3x \sin 5x$

(3)

(b) $\frac{e^{2x}}{4 - 3x^2}$

(3)

(Total for Question 4 is 6 marks)



P 4 2 0 3 9 A 0 9 3 2

5

$$\cos (A+B)=\cos A \cos B-\sin A \sin B$$

- (a) Use the above identity to show that $2 \sin^2 A = 1 - \cos 2A$ (3)

- (b) Hence find the value of k such that $\sin^2 2A = k(1 - \cos 4A)$ (1)

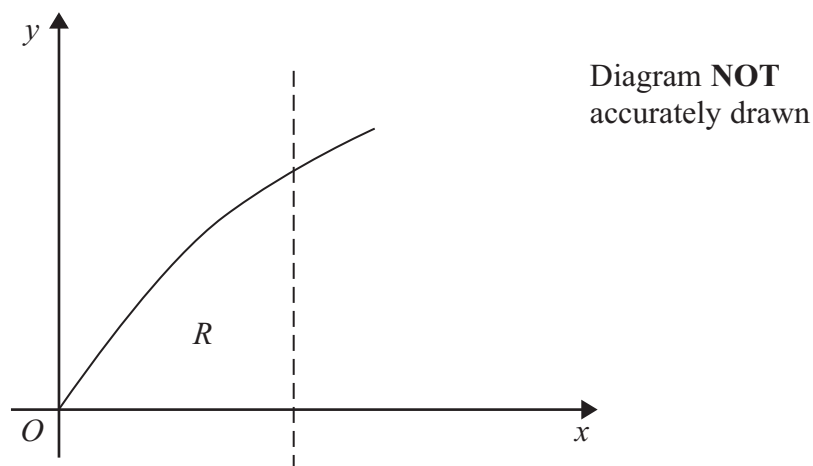


Figure 2

Figure 2 shows part of the curve with equation $y = 3 \sin 2x$. The region R , bounded by the curve, the positive x -axis and the line $x = \frac{\pi}{6}$, is rotated through 360° about the x -axis.

- (c) Use calculus to find, to 3 significant figures, the volume of the solid generated. (6)



Question 5 continued



(Total for Question 3 is 10 marks)





Question 6 continued



(Total for Question 6 is 11 marks)



- (3)

(3)

(2)

- (3)

Question 7 continued



(Total for Question 7 is 11 marks)



8

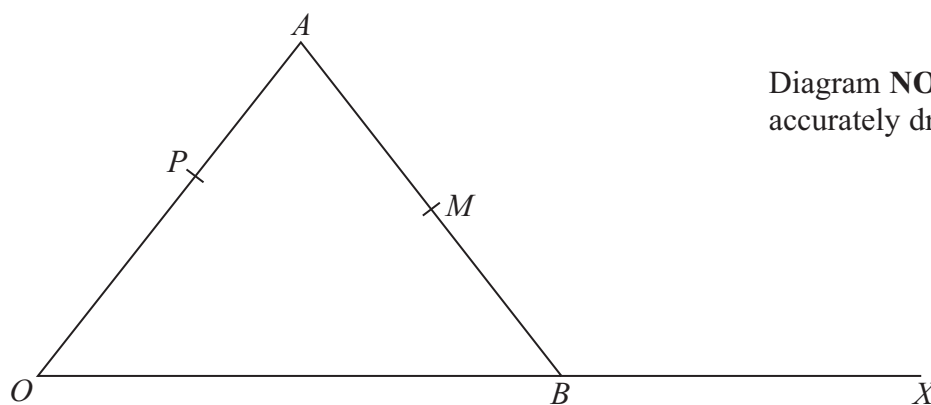


Figure 3

In Figure 3, $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$ and M is the mid-point of AB .

The point P is on OA such that $OP:PA = 3:2$

The point X lies on OB produced.

(a) Find, as simplified expressions in terms of \mathbf{a} and \mathbf{b} ,

- (i) \vec{AB} (ii) \vec{OM} (iii) \vec{PM}

(6)

Given that P , M and X are collinear

(b) find, in terms of \mathbf{b} , \vec{OX}

(4)

(c) Find the ratio (area $\triangle OAM$):(area $\triangle OAX$).

(3)





Question 8 continued

(Total for Question 8 is 13 marks)



Question 9 continued



Question 9 continued

(Total for Question 9 is 16 marks)



Question 10 continued



TOTAL FOR PAPER IS 100 MARKS