Write your name here

Surname	Other names

Edexcel IGCSE

Centre Number	Candidate Number

Further Pure Mathematics

Paper 1

Monday 13 June 2011 – Afternoon
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.

Turn over ▶

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Answer all TEN questions

Write your answers in the spaces provided

You must write down all stages in your working

1 Solve the equations

$$y = x^2 - 3x + 2$$
$$y - x = 7$$

(5)

(Total for Question 1 is 5 marks)

2 (a) Given that $\log_a x = \dfrac{\log_b x}{\log_b a}$ show that $\log_a b = \dfrac{1}{\log_b a}$

(2)

(b) Hence solve the equation

$$\log_x 8 - 6\log_8 x = 1 \qquad x \in \mathbb{Z}^+$$

(5)

Question 2 continued

(Total for Question 2 is 7 marks)

3 Given that $y = e^{2x} \sin 3x$

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

(3)

(b) show that $\frac{d^2y}{dx^2} = 2\frac{dy}{dx} - 9y + 6e^{2x} \cos 3x$

(4)

Question 3 continued

(Total for Question 3 is 7 marks)

4

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

(a) Write down an expression for $\sin 2A$ in terms of $\sin A$ and $\cos A$

(1)

(b) Find an expression for $\cos 2A$ in terms of $\sin A$

(2)

(c) Show that $\sin 3A + \sin A = 4\sin A - 4\sin^3 A$

(4)

Question 4 continued

(Total for Question 4 is 7 marks)

5

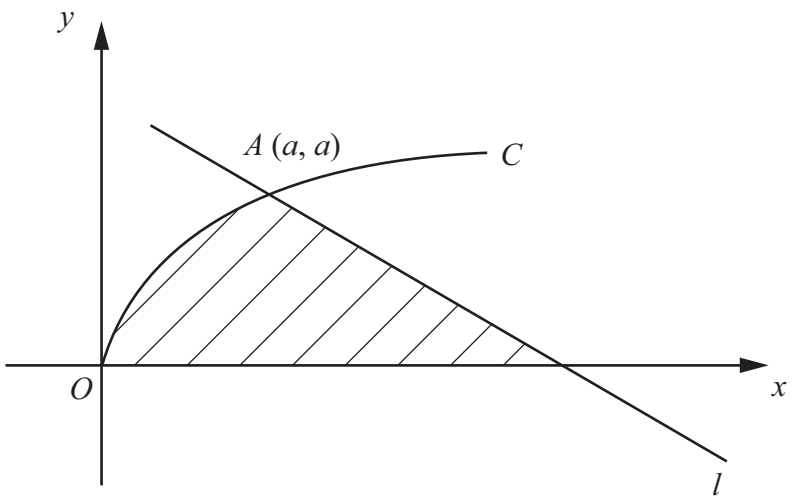

Figure 1

The curve C, with equation $y^2 = 5x$ and the line l intersect at the point A with coordinates (a, a), $a \neq 0$, as shown in **Figure 1**.

(a) Find the value of a.

(2)

The line l has gradient $-\frac{5}{7}$ and intersects the x-axis at the point B.

(b) Find the x-coordinate of B.

(3)

The shaded region is rotated through 360° about the x-axis.

(c) Find, in terms of π, the volume of the solid generated.

(5)

Question 5 continued

(Total for Question 5 is 10 marks)

6 The third term of an arithmetic series is 70 and the sum of the first 10 terms of the series is 450

(a) Calculate the common difference of the series.

(4)

The sum of the first n terms of the series is S_n

Given that $S_n \geqslant 350$

(b) find the set of possible values of n.

(6)

Question 6 continued

(Total for Question 6 is 10 marks)

7 (a) Solve

$$5p^2 - 11p + 2 = 0$$

(2)

(b) Hence solve $5\left(3^{2x}\right) - 11\left(3^{x}\right) + 2 = 0$ giving your answers to 3 significant figures.

(4)

The curve with equation $y = 5\left(3^{2x}\right) - 6\left(3^{x}\right)$ intersects the curve with equation $y = 5\left(3^{x}\right) - 2$ at two points.

(c) Find the coordinates of each of these two points, giving your answers to 3 significant figures where appropriate.

(4)

Question 7 continued

(Total for Question 7 is 10 marks)

8 The points A and B have coordinates $(1,5)$ and $(9,7)$ respectively.

(a) Find an equation of AB, giving your answer in the form $y = ax + b$, where a and b are rational numbers.

(3)

The line l is the perpendicular bisector of AB.

(b) Find an equation of l.

(4)

The point C has coordinates $(3, q)$. Given that C lies on l

(c) find the value of q.

(2)

The line l meets the x-axis at the point D.

(d) Find the exact area of the kite $ACBD$.

(4)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 13 marks)

9 A curve has equation

$$y = \frac{2x^2 - 6}{3x - 6} \qquad x \neq 2$$

(a) Write down an equation of the asymptote to the curve which is parallel to the y-axis.

(1)

(b) Find the coordinates of the stationary points on the curve.

(7)

The curve crosses the y-axis at the point A.

(c) Find an equation of the normal to the curve at A.

(3)

The normal at A meets the curve again at B.

(d) Find the x-coordinate of B.

(4)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 15 marks)

10

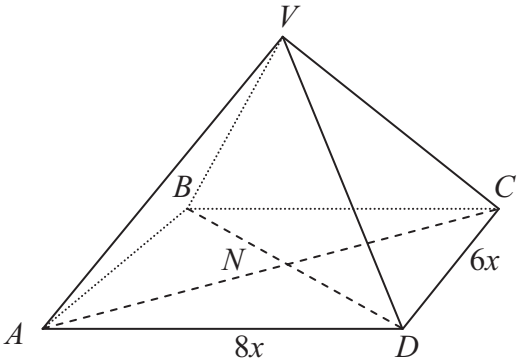

Figure 2

Figure 2 shows the pyramid $VABCD$. The base $ABCD$ is a rectangle with $CD = 6x$ cm and $AD = 8x$ cm. The diagonals of the base intersect at the point N. The edges VA, VB, VC and VD are all of equal length. The angle between VA and the base $ABCD$ is $60°$.

Find, in terms of x,

(a) the height, VN, of the pyramid,

(4)

(b) the length of VA.

(3)

Find, in degrees to the nearest $0.1°$,

(c) the size of the angle between the planes AVB and $ABCD$,

(3)

(d) the size of the angle between the planes BVD and AVC.

(3)

The volume of the pyramid is 1110 cm^3.

(e) Find, to the nearest whole number, the value of x.

(3)

Question 10 continued

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS