IYGB GCE

Core Mathematics C1

Advanced Subsidiary

Practice Paper T

Time: 2 hours 30 minutes

Calculators may NOT be used in this examination.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
The standard booklet "Mathematical Formulae and Statistical Tables" may be used.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 10 questions in this question paper.
The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1

The curve C has equation

$$y = \frac{1}{2x^2} + \frac{4}{3x^3}, \ x > 0 .$$

Show clearly that

$$x^2 \frac{d^2y}{dx^2} + 6x\frac{dy}{dx} + 6y = 0 . \qquad (\mathbf{5})$$

Question 2

The straight line l_1 passes through the points $A(2,1)$ and $B(k,8)$, where k is a constant.

a) Given the gradient of l_1 is $\frac{7}{2}$ show that $k = 4$. $(\mathbf{1})$

b) Find an equation for l_1. $(\mathbf{1})$

The straight line l_2 is parallel to the y axis and passing through A.

The point C lies on l_2 so that the length of BC is exactly $2\sqrt{2}$.

c) Find the possible coordinates of C. $(\mathbf{3})$

d) Determine the largest possible area of the triangle ABC. $(\mathbf{2})$

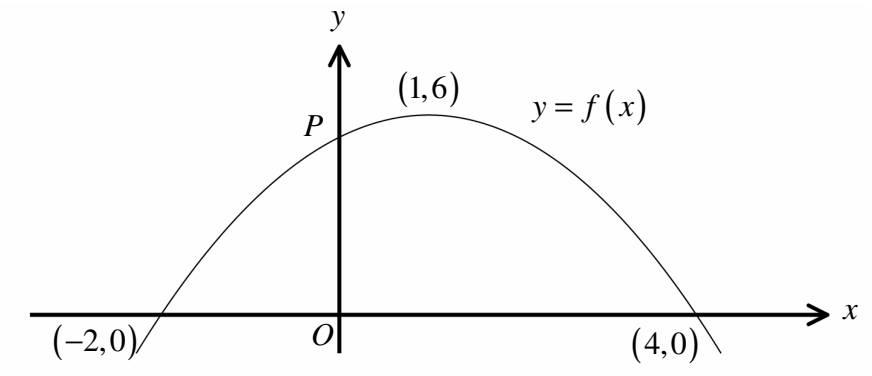
Question 3

A relationship between two variables is given below

$$25y^3 = 128\left(4x^2 + 1\right)^2 .$$

Find the possible values of x when $y = 8$. **(3)**

Question 4



The figure above shows the graph of the **quadratic** curve with equation $y = f(x)$ that meets the x axis at the points $(-2,0)$ and $(-4,0)$, and the y axis at the point P. The curve has a maximum at $(1,6)$.

a) Sketch the graph of

$$y = -3f(x+2),$$

showing clearly the coordinates of any points where the graph meets the x axis, and the new coordinates of the maximum point of the curve. **(3)**

The point P has coordinates $\left(0, \frac{16}{3}\right)$.

b) Find an equation for $y = f(x)$. **(3)**

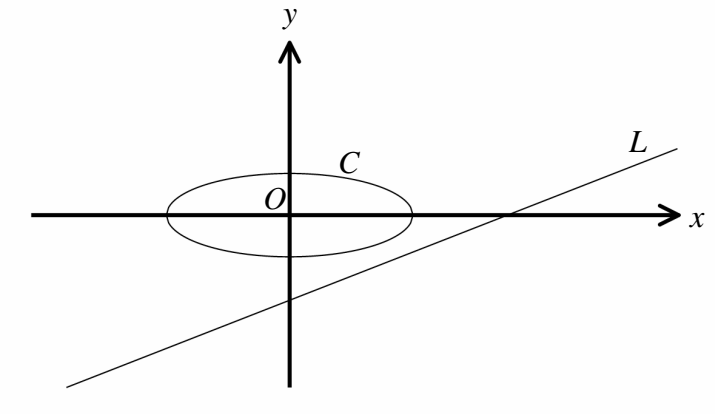
c) Hence, or otherwise, determine the y intercept of $y = -3f(x+2)$. **(3)**

Question 5

Show clearly that

$$\frac{4}{\sqrt{3}+\sqrt{2}+1}=2+\sqrt{2}-\sqrt{6}\,. \qquad (\mathbf{5})$$

Question 6



The figure above shows the graph of the curve C and the straight line L with respective equations

$$\frac{x^2}{5}+\frac{y^2}{4}=1 \quad \text{and} \quad y=x-5\,.$$

When C is translated in the positive x direction, L becomes a tangent to C, at some point P.

Determine the possible coordinates of P. $(\mathbf{11})$

Question 7

$$A=\frac{3}{2}xy+2yz+2xz\,.$$

Given that $x=\left(\frac{4}{3}\right)^{\frac{1}{3}}$, $y=\left(\frac{4}{3}\right)^{\frac{1}{3}}$ and $z=\left(\frac{3}{4}\right)^{\frac{2}{3}}$, show that $A=3\sqrt[3]{6}$ **(7)**

Question 8

An arithmetic progression has common difference 5.

The sum of its **first** 20 terms is 610, and the sum of its **last** 20 terms is 7410.

Determine the number of terms in the progression. **(9)**

Question 9

Heron's formula for the area of a triangle asserts that

$$\text{Area}=\sqrt{s(s-a)(s-b)(s-c)}\,,$$

where a, b and c are the lengths of the 3 sides of the triangle and $s=\frac{1}{2}(a+b+c)$.

A given triangle has a perimeter of 36 cm and one of its sides is 14 cm.

Show with full justification that the largest area of this triangle is $42\sqrt{2}$ cm^2. **(10)**

Question 10

The n^{th} term of a sequence is given by

$$u_n = 1 + \left(\frac{1}{3}\right)^n, \quad \text{where } n \geq 1.$$

a) By expressing u_{n+1} in terms of u_n, or otherwise, define the terms of the sequence as a recurrence relation. **(4)**

A recurrence relation is defined for $n \geq 1$ by

$$U_{n+1} = 2U_n - 5, \; U_1 = 6.$$

b) By finding the n^{th} term of the sequence, or otherwise, show that

$$u_{31} = 1,073,741,829. \quad \textbf{(6)}$$