# IYGB GCE

## Core Mathematics C2

## Advanced Subsidiary

## Practice Paper K

Difficulty Rating: 3.2067/1.4320

## Time: 1 hour 30 minutes

**Candidates may use any calculator allowed by the Regulations of the Joint Council for Qualifications.**

**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.
Non exact answers should be given to an appropriate degree of accuracy.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

**Question 1**

The straight line segment joining the points $A(-7,4)$ and $B(1,-2)$ is a diameter of a circle with centre at the point $C$ and radius $r$.

**a)** Find the coordinates of $C$ and the value of $r$. **(4)**

The point $(0,a)$ lies on the circumference of this circle.

**b)** Determine the possible values of $a$. **(4)**

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**Question 2**

$$f(x) \equiv x + 10 + \frac{25}{x},\ x \neq 0.$$

Find the coordinates of the two stationary points of $f(x)$ and use $f''(x)$ to determine their nature. **(9)**

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**Question 3**

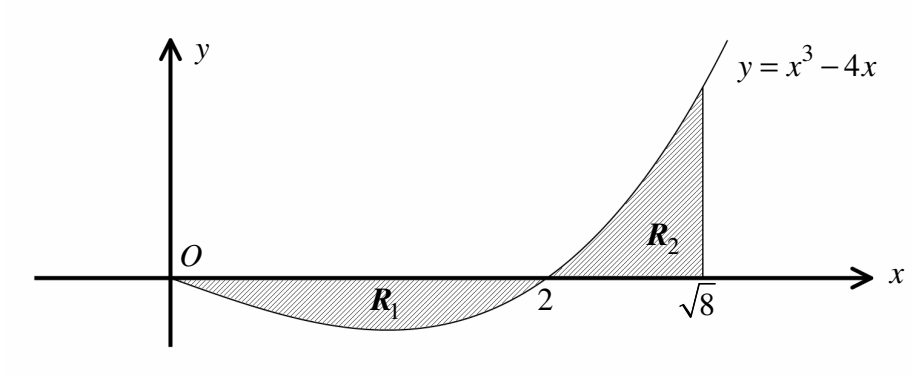
The third and the sixth term of a geometric series is $4$ and $6.912$, respectively.

**a)** Find the exact value of the first term and the common ratio of the series. **(4)**

**b)** Calculate, correct to significant figures, the sum of the first ten terms of the series. **(2)**

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**Question 4**




The figure above shows the cubic curve with equation

$$y = x^3 - 4x,\ x \geq 0 .$$

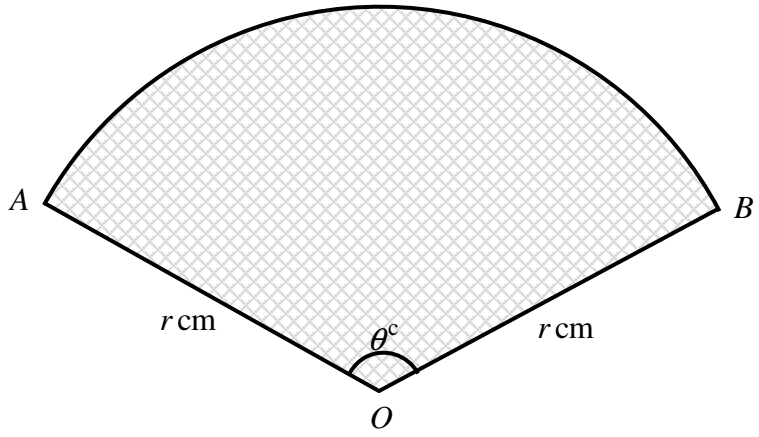
The curve meets the $x$ axis at the origin $O$ and at the point where $x = 2$.

The finite region $R_1$ is bounded by the curve and the $x$ axis, for $0 \leq x \leq 2$.

The region $R_2$ is bounded by the curve and the $x$ axis, for $2 \leq x \leq \sqrt{8}$.

Show that the area of $R_1$ is equal to the area of $R_2$. **(7)**

**Question 5**




The figure above shows a circular sector $OAB$, centred at $O$.

The radius of the sector is $r$ cm and subtends an angle of $\theta$ radians at $O$.

The area of the sector is $67.5\ \text{cm}^2$ and its perimeter is $33$ cm.

By forming two suitable equations, or otherwise, determine the two possible pairs of values for $r$ and $\theta$. **(9)**

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**Question 6**

**a) Use the trapezium rule** with $4$ equally spaced strips to find an estimate for

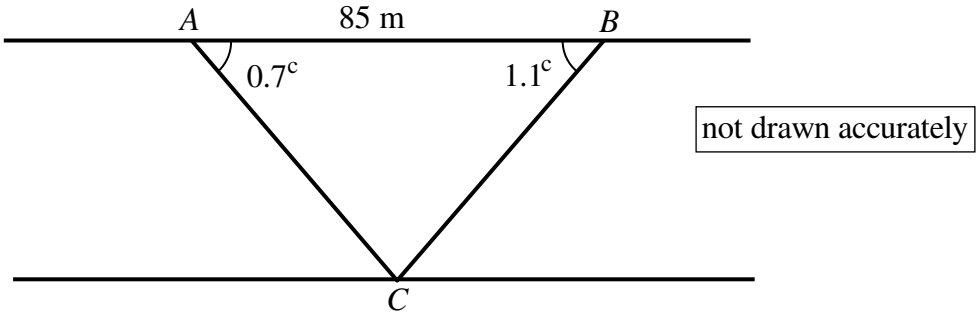
$$\int_0^{\frac{\pi}{3}} \cos^2 x \ dx . \qquad \textbf{(5)}$$

**b) Use the answer of part (a)** to find an estimate for

$$\int_0^{\frac{\pi}{3}} \sin^2 x \ dx . \qquad \textbf{(4)}$$

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**Question 7**




The figure above shows a river of constant width $w$ metres with the points $A$ and $B$ located on one river bank and the point $C$ located on the other river bank.

The distance $AB$ is 85 metres.

The angles $CAB$ and $CBA$ are 0.7 radians and 1.1 radians, respectively.

Show that $w$ is approximately 50 metres. **(5)**

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**Question 8**

$$f(x) = x^3 - x^2 - 3x + 3 .$$

**a)** Show that $(x-1)$ is a factor of $f(x)$. **(2)**

**b)** Express $f(x)$ as the product of **three linear factors**. **(3)**

**c)** Hence solve the trigonometric equation

$$\tan^3\theta - \tan^2\theta - 3\tan\theta + 3 = 0,$$

for $0° \le \theta < 360°$. **(6)**

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**Question 9**

Solve the following simultaneous logarithmic equations

$$\log_y x = 5$$

$$\log_2 x = 2 + \log_2 y\,.$$

Give the answer as exact simplified surds. **(8)**

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**Question 10**

$$f(x) \equiv (1+x)^n,\ x \in \mathbb{R},\ n \in \mathbb{N}\,.$$

Determine showing a clear complete method the coefficient … **(1)**

**a)** … of the **highest** power of $x$ in the binomial expansion of $f(x)$, when $n = 13$. **(1)**

**b)** … of the **second highest** power of $x$ in the binomial expansion of $f(x)$, when $n = 14$. **(1)**

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