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# IYGB GCE

## Core Mathematics C2

## Advanced Subsidiary

## Practice Paper U

Difficulty Rating: 4.0067/2.0067

## Time: 2 hours

**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 8 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.

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**Question 1**

Max is revising for an exam by practicing papers.

He takes 3 hours and 20 minutes to complete the first paper and 3 hours and 15 minutes to complete the second paper.

It is assumed that the times Max takes to complete each successive paper are consecutive terms of a geometric progression.

**a)** Assuming this model, show that Max will take approximately …

**i.** … 176 minutes to complete the sixth paper. **(3)**

**ii.** … 35 hours to complete the first 12 papers. **(3)**

Max aims to be able to complete a paper in under two hours.

**b)** Determine, by using logarithms, the minimum number of papers he needs to practice in order to achieve his target according to this model. **(4)**

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**Question 2**

**a)** Find the binomial expansion of $(2x-4)^5$, simplifying fully each coefficient. **(4)**

**b)** Hence find the coefficient of …

**i.** … $y^2$ in the binomial expansion of $\left(\frac{y+16}{4}\right)^5$. **(2)**

**ii.** … $z^8$ in the binomial expansion of $\left(\sqrt{2}z-2\right)^5\left(\sqrt{2}z+2\right)^5$. **(3)**

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**Question 3**

Solve the following simultaneous logarithmic equations

$$\log_2\left(xy^2\right)=0$$

$$\log_2\left(x^2y\right)=3\,.$$ **(5)**

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**Question 4**

$$f(x) \equiv x^3 + (a+2)x^2 - 2x + b,$$

where $a$ and $b$ are non zero constants.

It is given that $(x-2)$ and $(x+a)$ are factors of $f(x)$, $a > 0$.

**a)** By forming two equations show that $a = 3$ and find the value of $b$. **(6)**

**b)** Solve the equation $f(x) = 0$. **(2)**

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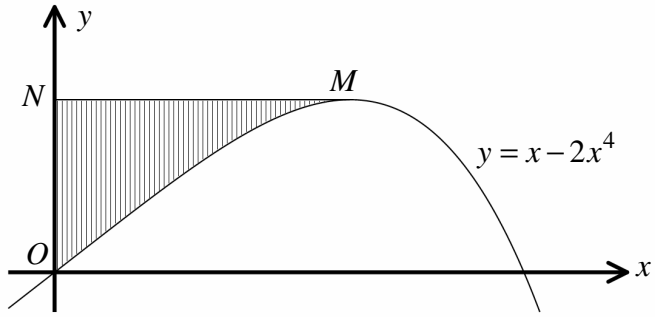
**Question 5**




The diagram below shows the quartic curve with equation

$$y = x - 2x^4, \quad x \in \mathbb{R}.$$

The point $M$ is the maximum point on the curve and the point $N$ lies on the $y$ axis so that the straight line segment $MN$ is parallel to the $x$ axis.

Find the exact area of the shaded region, bounded by the curve, the $y$ axis and the straight line segment from $M$ to $N$. **(9)**

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**Question 6**

The population, $P$ in thousands, of a colony of wild bees, $t$ weeks after a certain instant, is given by the formula

$$P = 16\sqrt{t} + \frac{27}{t} \ , \ 0 < t < 16 \, .$$

**a)** Calculate the number of bees in the colony after $2\frac{1}{4}$ weeks. **(1)**

**b)** Determine the range of values of $t$ during which the bees' population increasing. **(5)**

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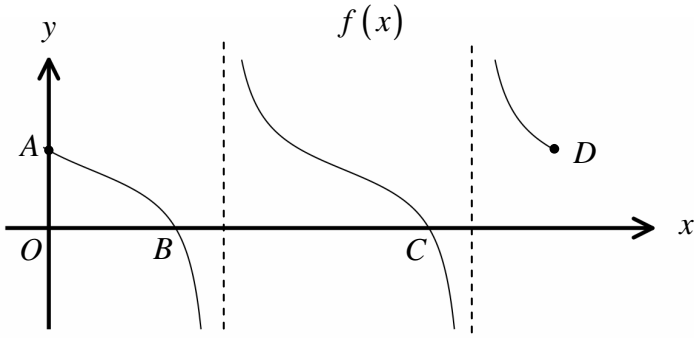
**Question 7**




The figure above shows the graph of the curve with equation

$$f(x)=\sqrt{3}-\tan(2x°-\alpha°),\quad 0\le x\le 180,\ 0<\alpha<90.$$

**a)** Given that the point $(52.5,-2)$ lies on the curve show that $\alpha=30$. **(4)**

The curve crosses the $x$ axis at the points $B$ and $C$.

**b)** Determine the coordinates of $B$ and $C$. **(4)**

The points $A$ and $D$ are the endpoints of the curve.

**c)** Find the exact coordinates of $A$ and $D$. **(2)**

The dotted lines represent the vertical asymptotes of the curve.

**d)** Write down the period of $f(x)$. **(1)**

**e)** Determine the equations of the two vertical asymptotes of the curve. **(2)**

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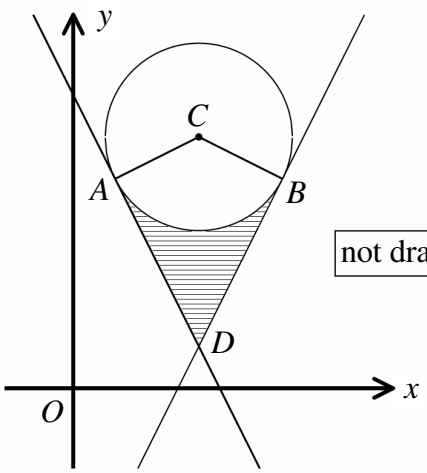
**Question 8**




The figure above shows a circle with centre at $C(3,6)$. The points $A(1,5)$ and $B(p,q)$ lie on the circle. The straight lines $AD$ and $BD$ are tangents to the circle.

The kite $CADB$ is symmetrical about the straight line with equation $x=3$.

**a)** Calculate the radius of the circle. **(2)**

**b)** State the value of $p$ and the value of $q$. **(2)**

**c)** Find an equation of the tangent to the circle at $A$. **(3)**

**d)** Show that the angle $ACB$ is approximately $2.214$ radians. **(3)**

**e)** Hence determine, to three significant figures, the area of the shaded region bounded by the circle and its tangents at $A$ and $B$. **(5)**