IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper V

Difficulty Rating: 3.9000/1.8987

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.

Question 1

The polynomial function f is given below

$$f(x) \equiv (2x-1)(x+4) - 4(x-3)^2, \ x \in \mathbb{R}.$$

a) Simplify $f(x)$ fully. **(3)**

The polynomial function g is defined, in terms of the constant k, by

$$g(x) \equiv (3x-2)(x+4)(x+k), \ x \in \mathbb{R}.$$

b) Determine the value of k, given that the coefficient of x^2 in the simplified expansion of $f(x)$ is equal to the coefficient of x^2 in the simplified expansion of $g(x)$. **(3)**

Question 2

Grandad gave Kevin £10 on his first birthday and he increased the amount by 20% on each subsequent birthday.

a) Calculate the amount of money that Kevin received from his grandad on his 10^{th} birthday **(3)**

Kevin received the last birthday amount of money from his grandad on his n^{th} birthday and on that birthday the amount he received exceeded £1000 for the first time.

b) Show clearly that

$$n > \frac{2}{\log_{10}(1.2)} + 1.$$ **(4)**

c) State the value of n. **(1)**

Question 3

In the binomial expansion of

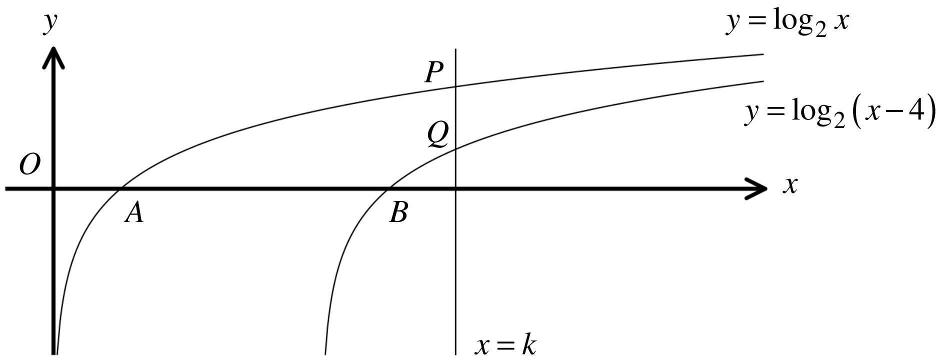
$$(2x+k)^4,$$

where k is a non zero constant,

the coefficient of x^2 is 12 times as large as the coefficient of x^3.

Find the value of k. **(4)**

Question 4



The figure above shows the graphs of the curves with equations

$$y=\log_2 x, \quad \text{and} \quad y=\log_2(x-4).$$

The points A and B are the respective x intercepts of the two graphs.

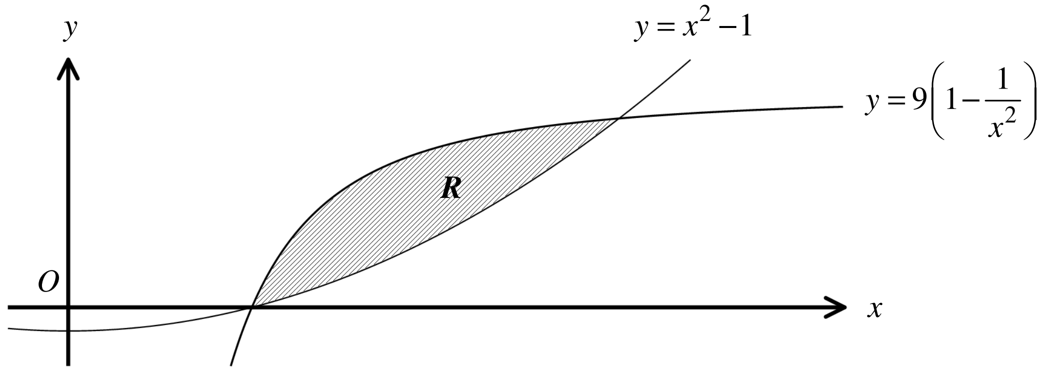
a) Describe the geometric transformation which maps the graph of $y=\log_2 x$ onto the graph of $y=\log_2(x-4)$. **(2)**

b) State the distance AB. **(1)**

The straight line with equation $x=k$, where k is a positive constant, meets the graph of $y=\log_2 x$ at the point P and the graph of $y=\log_2(x-4)$ at the point Q.

c) Given that the distance PQ is 2 units determine the value of k. **(4)**

Question 5



The figure above shows the graphs of the curves with equations

$$y = x^2 - 1 \quad \text{and} \quad y = 9\left(1 - \frac{1}{x^2}\right).$$

The finite region R is bounded by the two curves in the 1st quadrant, and is shown shaded in the figure above.

Determine the exact area of R. **(10)**

Question 6

The depth of water in a harbour on a particular day can be modelled by the equation

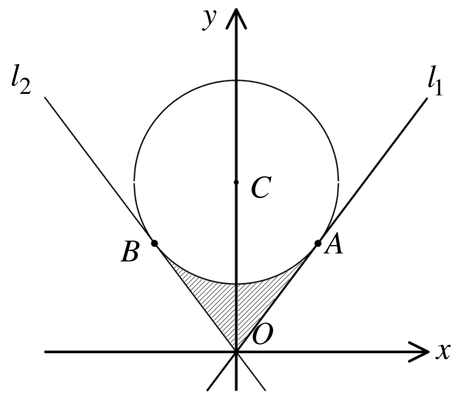
$$D = 12 + 3\sin\left(\frac{\pi t}{6}\right),$$

where D is the depth of the water in metres, t hours after midnight.

Determine the times after noon, when the depth of water in the harbour is 10 metres. **(8)**

I.Y.G.B www.madasmaths.com

Question 7



The figure above shows the circle with equation

$$9x^2 + (3y - 25)^2 = 225$$

whose centre is at C and its radius is r.

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

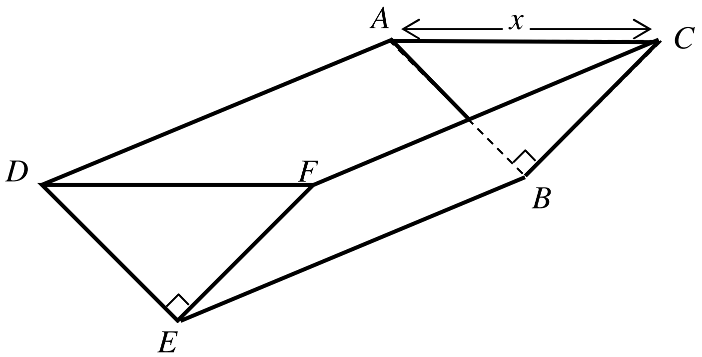
The points $A\left(4, \frac{16}{3}\right)$ and $B\left(-4, \frac{16}{3}\right)$ lie on the circle. The straight lines l_1 and l_2 are tangents to the circle at A and B, respectively.

b) Show that l_1 passes through the origin O. **(5)**

c) Show further that the angle BCA is approximately 1.8546 radians. **(2)**

d) Calculate the area of the shaded region, bounded by the circle, l_1 and l_2. **(4)**

Question 8



The figure above shows the design of a horse feeder which in the shape of a hollow, open topped triangular prism.

The triangular faces at the two ends of the feeder are isosceles and right angled, so that $AB = BC = DE = EF$ and $\widehat{ABC} = \widehat{DEF} = 90°$.

The triangular faces are vertical, and the edges AD, BE and CF are horizontal.

The capacity of the feeder is 4 m^3.

a) Show that the surface area, $A \text{ m}^2$, of the feeder is given by

$$A = \frac{1}{2}x^2 + \frac{16\sqrt{2}}{x}, \qquad (6)$$

where x is the length of AC.

b) Determine by differentiation the value of x for which A is stationary, giving the answer in the form $k\sqrt{2}$, where k is an integer. **(5)**

c) Show that the value of x found in part **(b)** gives the minimum value for A. **(2)**

d) Show that the minimum surface area of the feeder is 12 m^2. **(2)**

e) Show further that the length ED is equal to the length EB. **(2)**