IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper D

Difficulty Rating: 3.0733/1.3667

Time: 1 hour 30 minutes

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

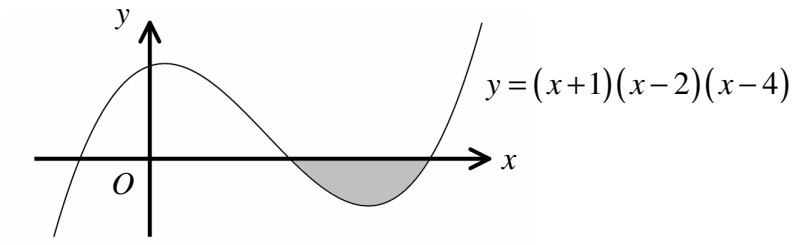
Information for Candidates

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 figure above shows the curve with equation

$$y=(x+1)(x-2)(x-4),\ x\in\mathbb{R}.$$

a) Write the equation of the curve in the form $y=x^3+ax^2+bx+c$, where a, b and c are constants. **(2)**

b) Find the exact area the shaded region. **(4)**

Question 2

$$f(x)\equiv ax^3-x^2-5x+b,$$

where a and b are constants.

When $f(x)$ is divided by $(x-2)$ the remainder is 36.

When $f(x)$ is divided by $(x+2)$ the remainder is 40.

Find the value of a and the value of b. **(5)**

Question 3

A circle has equation

$$x^2 + y^2 - 20x + 8y + 16 = 0 .$$

The centre of the circle is at C and its radius is r.

a) Determine …

i. … the coordinates of C. **(2)**

ii. … the length of r. **(1)**

The point $P(4,4)$, lies on this circle.

b) Find the gradient of CP. **(2)**

c) Hence find an equation of the tangent to the circle at P. **(2)**

Question 4

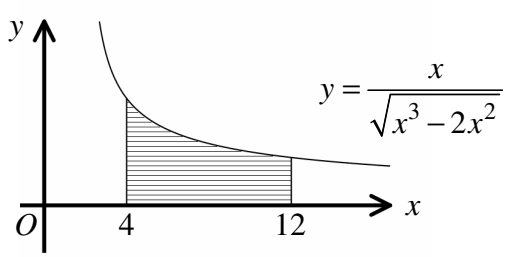
In the binomial expansion of

$$(1+kx)^6 ,$$

where k is a constant, the coefficient of x^3 is twice as large as the coefficient of x^2.

Find the value of k. **(5)**

Question 5



The figure above shows part of the curve C with equation

$$y = \frac{x}{\sqrt{x^3 - 2x^2}}.$$

a) Use the trapezium rule with 4 equally spaced strips to estimate, correct to 3 significant figures, the area bounded by C, the x axis and the straight lines with equations $x = 4$ and $x = 12$. **(5)**

b) State how the estimate obtained in part **(a)** can be improved. **(1)**

c) Explain with the aid of a diagram whether the estimate obtained in part **(a)** is an underestimate or an overestimate for the actual value of this area. **(1)**

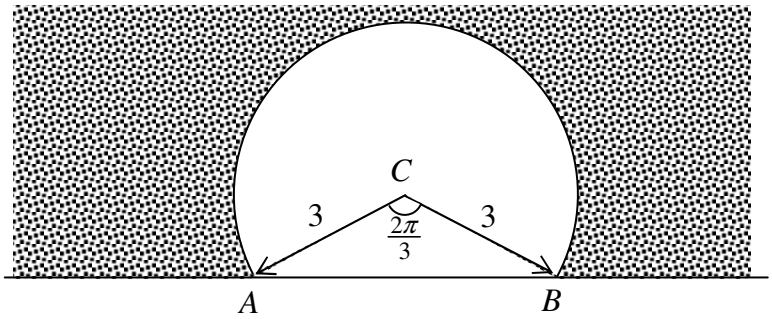
Question 6

Solve, in **radians**, the trigonometric equation

$$\frac{1}{\tan^2 \varphi} = 3, \quad 0 \le \varphi < 2\pi,$$

giving the answers in terms of π. **(6)**

Question 7



The figure below shows the cross section of a railway tunnel, modelled as the **major segment** of a circle, centre at C and radius of 3 m.

The angle ACB is $\frac{2\pi}{3}$ radians.

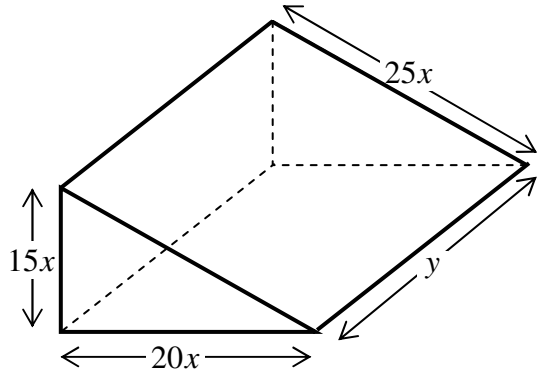
a) Find the exact length of AB. **(2)**

b) Determine the area of the triangle ACB. **(2)**

c) Show that the cross sectional area of the tunnel is

$$6\pi + \frac{9}{4}\sqrt{3}\,.$$ **(4)**

Question 8



The figure above shows a solid triangular prism with a **total** surface area of $3600\ \text{cm}^2$.

The triangular faces of the prism are right angled with a base of $20x$ cm and a height of $15x$ cm. The length of the prism is y cm.

a) Show that the volume of the prism, $V\ \text{cm}^3$, is given by

$$V = 9000x - 750x^3 . \qquad \textbf{(4)}$$

b) Find the value of x for which V is stationary. **(3)**

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

d) Determine the value of y when V is maximum. **(2)**

Question 9

The first three terms of a geometric series are given below as functions of x.

$$x^2, \quad (x+12) \quad \text{and} \quad (2x-3).$$

a) Show that x is a solution of the equation

$$x^3 - 2x^2 - 12x - 72 = 0. \qquad (4)$$

b) Show clearly that $x = 6$ is the only solution of the above equation. (3)

c) Find the sum to infinity of the series. (3)

Question 10

Solve each of the following equations.

a) $6 \times \left(\frac{1}{2}\right)^{\frac{x-4}{3}} = 1.89.$ (4)

b) $\log_2(8y-1) - 2\log_2(y+1) = 3 - \log_2(y+4).$ (6)