

GCE Examinations
Advanced / Advanced Subsidiary

Core Mathematics C2

Paper H

Time: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures, unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphic calculator in this paper.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 72.
- **You are reminded of the need for clear presentation in your answers.**



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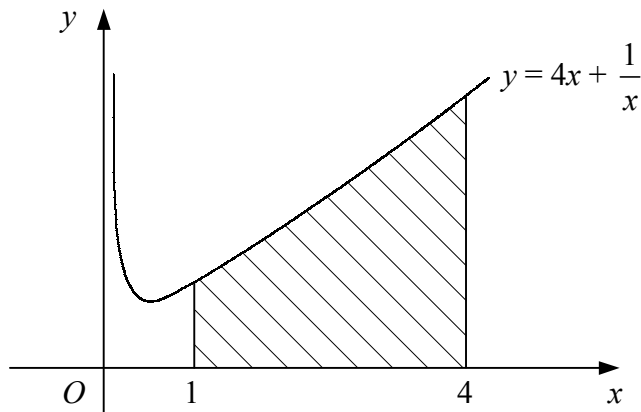
1. $f(x) = 3x^3 - 2x^2 + kx + 9.$

Given that when $f(x)$ is divided by $(x + 2)$ there is a remainder of $-35,$

(i) find the value of the constant $k,$ [2]

(ii) find the remainder when $f(x)$ is divided by $(3x - 2).$ [2]

2.



The diagram shows the curve with equation $y = 4x + \frac{1}{x}, x > 0.$

Use the trapezium rule with three intervals, each of width 1, to estimate the area of the shaded region bounded by the curve, the x -axis and the lines $x = 1$ and $x = 4.$ [4]

3. The sides of a triangle have lengths of 7 cm, 8 cm and 10 cm.

Find the area of the triangle correct to 3 significant figures. [5]

4. Find all values of x in the interval $0 \leq x < 360^\circ$ for which

$$2 \sin^2 x - 2 \cos x - \cos^2 x = 1,$$

giving non-exact answers to 1 decimal place. [8]

5. (i) Describe fully a single transformation that maps the graph of $y = 3^x$ onto the graph of $y = (\frac{1}{3})^x$. [1]

- (ii) Sketch on the same diagram the curves $y = (\frac{1}{3})^x$ and $y = 2(3^x)$, showing the coordinates of any points where each curve crosses the coordinate axes. [3]

The curves $y = (\frac{1}{3})^x$ and $y = 2(3^x)$ intersect at the point P .

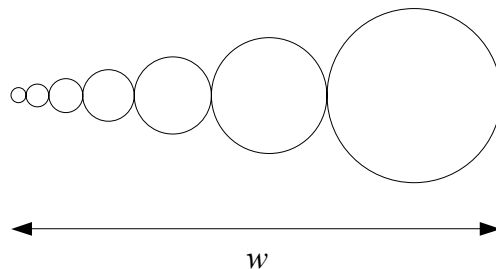
- (iii) Find the x -coordinate of P to 2 decimal places and show that the y -coordinate of P is $\sqrt{2}$. [5]

6. Evaluate

(i) $\int_1^4 (x^2 - 5x + 4) dx$, [5]

(ii) $\int_{-\infty}^{-1} \frac{1}{x^4} dx$. [5]

- 7.



The diagram shows part of a design being produced by a computer program.

The program draws a series of circles with each one touching the previous one and such that their centres lie on a horizontal straight line.

The radii of the circles form a geometric sequence with first term 1 mm and second term 1.5 mm. The width of the design is w as shown.

- (i) Find the radius of the fourth circle to be drawn. [2]

- (ii) Show that when eight circles have been drawn, $w = 98.5$ mm to 3 significant figures. [3]

- (iii) Find the total area of the design in square centimetres when ten circles have been drawn. [5]

Turn over

8. Given that for small values of x

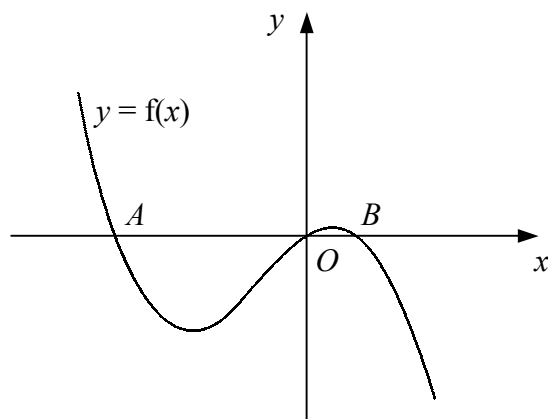
$$(1 + ax)^n \approx 1 - 24x + 270x^2,$$

where n is an integer and $n > 1$,

(i) show that $n = 16$ and find the value of a , [7]

(ii) use your value of a and a suitable value of x to estimate the value of $(0.9985)^{16}$, giving your answer to 5 decimal places. [3]

9.



The diagram shows the curve with equation $y = f(x)$ which crosses the x -axis at the origin and at the points A and B .

Given that

$$f'(x) = 4 - 6x - 3x^2,$$

(i) find an expression for y in terms of x , [5]

(ii) show that A has coordinates $(-4, 0)$ and find the coordinates of B , [2]

(iii) find the total area of the two regions bounded by the curve and the x -axis. [5]