IYGB GCE

Core Mathematics C1

Advanced Subsidiary

Practice Paper S

Time: 2 hours 30 minutes

Calculators may NOT be used in this examination.

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 11 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.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1

The curve C has equation

$$y = 2x^3 - 3x + \frac{4}{x}, \; x \neq 0$$

The point $P(2,12)$ lies on C.

a) Find the gradient at P. **(2)**

b) Determine the coordinates of another point Q that lies on C, so that the gradient at Q is the same as the gradient as P. **(6)**

Question 2

$$f(x) \equiv x^2 - 10x + 50, \; x \in \mathbb{R}.$$

a) Express $f(x)$ in the form $(x+a)^2 + b$, where a and b are constants. **(1)**

b) Hence write down the minimum value of $f(x)$. **(1)**

The point A has coordinates $(20,-3)$.

The variable point B lies on the straight line with equation $y = 3x - 13$.

c) Show clearly that

$$|AB|^2 = 10x^2 - 100x + 500.$$ **(3)**

d) Use parts (a) and (b) to determine the shortest distance between A and B. **(2)**

e) Hence write down the coordinates of B when the distance between A and B is shortest. **(1)**

Question 3

Solve the following indicial equation

$$6^{x+2} \times 2^{1-x} = \frac{8}{3}.$$

You must show full workings. **(6)**

Question 4

The n^{th} term of the sequence is given by

$$u_n = \frac{n+2}{2n+1}, \; n \in \mathbb{N}, \; n \geq 1.$$

Show that the same sequence can be generated by the recurrence relation

$$u_{n+1} = \frac{Au_n - 1}{Bu_n + 1}, \; u_1 = 1, \; n \in \mathbb{N}, \; n \geq 1,$$

where A and B are integers to be found. **(6)**

Question 5

Solve the simultaneous equations

$$15y - 8x = 39$$
$$(x+3)^2 + (y-1)^2 = 289$$

(7)

Question 6

A curve C has equation

$$y = 2x^2 + 4(p+2)x + 8p + q + 8,$$

where p and q are constants.

The curve meets the y axis at $y = 18$.

Given further that C has no x intercepts, show that

$$2 < q < 50.$$

(8)

Question 7

Find the shortest distance between the parallel lines with equations

$$x + 2y = 10 \quad \text{and} \quad x + 2y = 20.$$

[*You may not use a standard formula which determines the shortest distance of a point from a straight line in this question*]

(7)

Question 8

Solve the following quadratic equation

$$\left(\sqrt{3}-1\right)x^2 - 2\sqrt{3}x = 3 + 3\sqrt{3}.$$

Give one of the roots in the form $p + q\sqrt{3}$ and the other root in the form $r\sqrt{3}$, where p, q and r are integers.

(8)

Question 9

Make x the subject of the equation

$$x^2 + y^2 = 2xy + z^2 .$$ **(2)**

Question 10

The r^{th} term of an arithmetic progression is denoted by u_r and satisfies

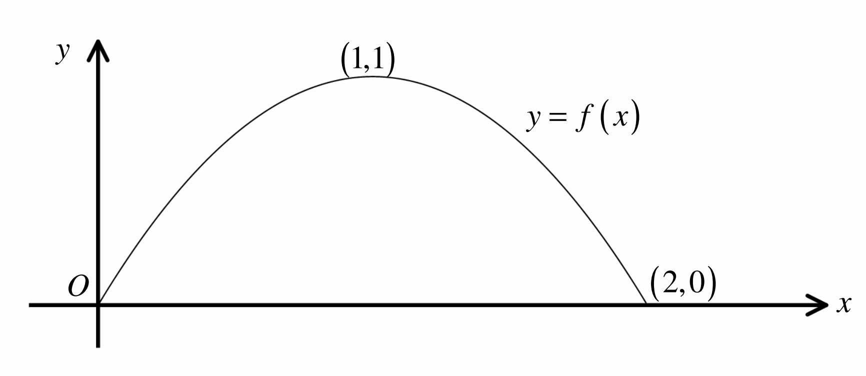
$$u_r = 4r - 7 .$$

Solve the simultaneous equations

$$\sum_{r=K+1}^{N} u_r - \sum_{r=1}^{K} u_r = 400$$

$$u_N - u_K = 40 .$$ **(10)**

Question 11



The figure above shows **part** of the graph of the function with equation $y = f(x)$.

The graph meets the x axis at $(2,0)$ and at the origin, and has a maximum at $(1,1)$.

It is given that $f(x)$ is defined for $0 \le x \le 4$ and $f(4-x) = -f(x)$.

Sketch on separate diagrams the graph of …

a) … $y = f(x)$, $0 \le x \le 4$. **(3)**

b) … $y = f(2x)$, $0 \le x \le 2$. **(1)**

c) … $y = f(4-x)$, $0 \le x \le 4$. **(1)**

The sketches must include the coordinates of any points where each of the graphs meets the coordinate axes and the coordinates of any minimum or maximum points.