IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper A

Difficulty Rating: 3.46/1.1024

Time: 2 hours

Candidates may use any calculator allowed by the regulations of this examination.

Information for Candidates

This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

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 13 questions in this question paper.
The total mark for this paper is 100.

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

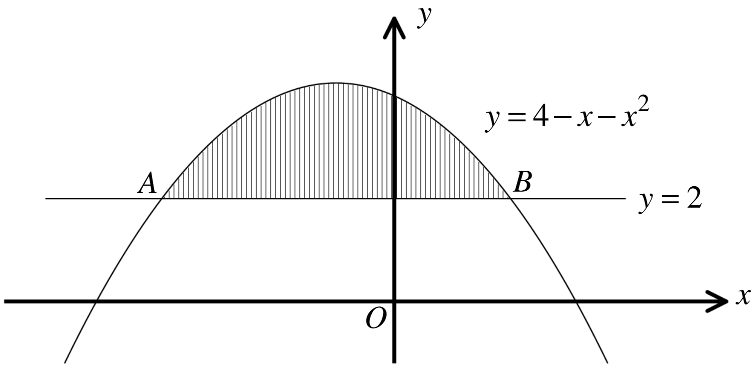
The straight line l_1 passes through the points $A(3,20)$ and $B(13,0)$.

The straight line l_2 has gradient $\frac{1}{3}$ and passes through the point $C(0,5)$.

The point D is the intersection of l_1 and l_2.

Show that the length of AD is $k\sqrt{5}$, where k is an integer. **(8)**

Question 2



The figure above shows a quadratic curve and a straight line with respective equations

$$y = 4 - x - x^2 \quad \text{and} \quad y = 2.$$

The points A and B are the points of intersection between the quadratic curve and the straight line.

a) Find the coordinates of A and B. **(3)**

b) Determine the exact area of the finite region bounded by the quadratic curve and the straight line, shown shaded in the above figure. **(5)**

Question 3

A circle C with centre at the point P and radius r, has equation

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

a) Find the value of r and the coordinates of P. **(3)**

b) Determine the coordinates of the points where C meets the coordinate axes. **(3)**

The points A, B and $Q(8,2)$ lie on C.

The straight line AB is diameter of the circle so that PQ is perpendicular to AB.

c) Calculate the coordinates of A and B. **(6)**

Question 4

A polynomial $f(x)$ is defined in terms of the constants a, b and c as

$$f(x) = 2x^3 + ax^2 + bx + c, \quad x \in \mathbb{R}.$$

It is further given that

$$f(2) = f(-1) = 0 \quad \text{and} \quad f(1) = -14.$$

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

b) Sketch the graph of $f(x)$.

The sketch must include any points where the graph of $f(x)$ meets the coordinate axes. **(4)**

Question 5

Solve the following trigonometric equation in the range given.

$$\frac{5\cos 2x + \sin 2x}{3\sin 2x} = 7, \quad -90° \le x < 90°.$$ **(6)**

Question 6

$$x^3 - 4x + 1 = 0.$$

The above cubic equation has three real roots x_1, x_2 and x_3.

Use transformation arguments to find, in a simplified form, another cubic equation whose roots are

$$x_1 + 1, \quad x_2 + 1, \quad x_3 + 1.$$ **(4)**

Question 7

A curve C has equation

$$y = 4x^3 + 7x^2 + x + 11, \quad x \in \mathbb{R}.$$

The point P lies on C, where $x = -1$.

a) Find an equation of the tangent to C at P. **(4)**

The tangent to C at P meets C again at the point Q.

b) Determine the x coordinate of Q. **(5)**

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Question 8

A quadratic curve has equation

$$f(x) \equiv 12x^2 + 4x - 161, \ x \in \mathbb{R}.$$

Express the above equation as the product of two linear factors.

A detailed method must be shown in this question. **(5)**

Question 9

Show that if x is numerically small

$$\left(2 + x - x^2\right)^5 \approx A + Bx + Cx^3$$

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

Question 10

$$f(x) = x^4 - 4x, \ x \in \mathbb{R}.$$

a) Find a simplified expression for

$$f(2+h) - f(2).$$ **(4)**

b) Use the formal definition of the derivative as a limit, to show that

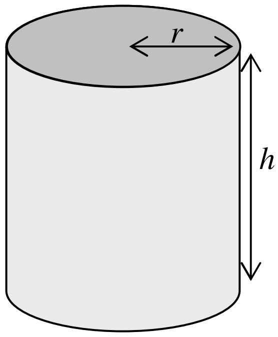
$$f'(2) = 28.$$ **(3)**

Question 11

Find, **without** the use of any calculating aid, the solution of the equation

$$\frac{1}{2} \times 4^{2x} = 64^{64}.$$ **(5)**

Question 12



The figure above shows a **closed** cylindrical can, of radius r cm and height h cm.

a) If the volume of the can is 330 cm^3, show that surface area of the can, $A \text{ cm}^2$, is given by

$$A = 2\pi r^2 + \frac{660}{r}.$$ **(4)**

b) Find the value of r for which A is stationary. **(6)**

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

d) Hence calculate the minimum value of A. **(1)**

Question 13

Solve the following simultaneous logarithmic equations.

$$\log_2(y-1) = 1 + \log_2 x$$

$$2\log_3 y = 2 + \log_3 x$$ **(8)**
