IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper Q

Difficulty Rating: 3.3850/1.0707

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 11 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.

Question 1

Show that $a^3 - a + 1$ is odd for all positive integer values of a. **(5)**

Question 2

Find the value of the constant k if

$$\int_1^3 6x^2 + kx \ \ dx = 8 .$$ **(5)**

Question 3

$$f(x) = x^2 , \ \ x \in \mathbb{R} .$$

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

$$f'(x) = 2x .$$ **(5)**

Question 4

The graph of the curve with equation

$$y = 2\sin(2x + k)° , \ \ 0 \le x < 360 ,$$

where k is a constant so that $0 < k < 90$, passes through the points with coordinates $P(55,1)$ and $Q(\alpha, \sqrt{3})$.

a) Show, without verification, that $k = 40$. **(5)**

b) Determine the possible values of α. **(5)**

Question 5

The variables x and y are thought to obey a law of the form

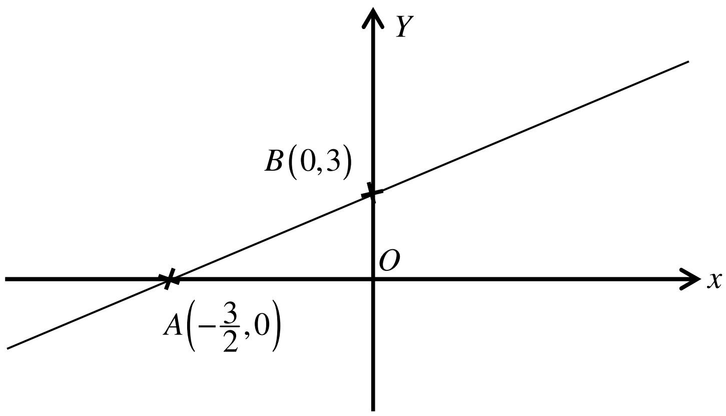
$$y = a \times k^x,$$

where a and k are positive constants.

Let $Y = \log_{10} y$.

a) Show there is a linear relationship between x and Y. **(4)**

The figure below shows the graph of Y against x.



b) Determine the value of a and the value of k. **(4)**

Question 6

The triangle ABC has $AB = 13$ cm and $BC = 15$ cm.

Given that $\measuredangle BCA = 60°$, determine the possible values of AC. **(5)**

Question 7

The points A, B and C have coordinates $(2,1)$, $(4,0)$ and $(6,4)$ respectively.

a) Determine an equation of the straight line L which passes through C and is parallel to AB. **(4)**

b) Show that the angle ABC is $90°$. **(3)**

c) Calculate the distance AC. **(2)**

A circle passes through the points A, B and C.

d) Show that the equation of this circle is given by

$$x^2 + y^2 - 8x - 5y + 16 = 0.$$ **(5)**

e) Find the coordinates of the point other than the point C where L intersects the circle. **(5)**

Question 8

A cubic curve C_1 has equation

$$y = (x-8)\left(x^2 - 4x + 3\right).$$

A quadratic curve C_2 has equation

$$y = (2x-3)(8-x).$$

a) Sketch on separate set of axes the graphs of C_1 and C_2.

The sketches must contain the coordinates of the points where each of the curves meet the coordinate axes. **(5)**

b) Hence find the solutions of the following equation.

$$(x-8)\left(x^2 - 4x + 3\right) = (2x-3)(8-x).$$ **(6)**

Question 9

The points A and C have coordinates $(3,2)$ and $(5,6)$, respectively.

a) Find an equation for the perpendicular bisector of AC, giving the answer in the form $ax+by=c$, where a, b and c are integers. **(5)**

The perpendicular bisector of AC crosses the y axis at the point B.

The point D is such so that $ABCD$ is a rhombus.

b) Show that the coordinates of D are $(8,2)$. **(3)**

c) Calculate the area of the rhombus $ABCD$. **(4)**

Question 10

The point P, whose x coordinate is $\frac{1}{4}$, lies on the curve with equation

$$y=\frac{k+4x\sqrt{x}}{7x}, \quad x\in\mathbb{R}, \quad x>0,$$

where k is a non zero constant.

a) Determine, in terms of k, the gradient of the curve at P. **(5)**

The tangent to the curve at P is parallel to the straight line with equation

$$44x+7y-5=0.$$

b) Find an equation of the tangent to the curve at P. **(7)**

Question 11

Find the exact solutions of the equation

$$2e^{2x}-5e^{x}+3e^{-x}=4.$$ **(8)**
