IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper I

Difficulty Rating: 3.58/1.1570

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.

Question 1

The points A and B have coordinates $(-4,5)$ and $(0,4)$, respectively.

a) Find an equation of the straight line which passes through A and B. **(3)**

The point C lies on the straight line through A and B, so that the distance of AB is the same as the distance of BC.

b) Find the coordinates of C. **(2)**

Question 2

Write each of the following surd expressions as simple as possible.

a) $5\sqrt{2}\times 4\sqrt{3}-6\sqrt{24}$. **(3)**

b) $\dfrac{3+\sqrt{6}}{\sqrt{3}}$. **(3)**

Detailed workings must be shown in this question

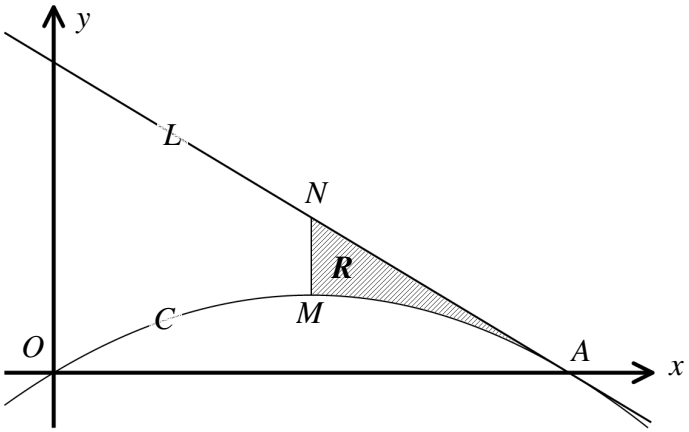
Question 3

a) Find, in ascending powers of x, the binomial expansion of $(2+x)^5$. **(4)**

b) By using the expression obtained in part **(a)**, or otherwise, find the binomial expansion of $\left(2-x^2\right)^5$. **(2)**

c) Use the expression obtained in part **(b)** to estimate, correct to 3 decimal places, the value of 1.99^5. **(3)**

Question 4



The figure above shows the graph of the curve C with equation

$$y = 6x - x^2,\ x \in \mathbb{R}.$$

The curve meets the x axis at the origin O and at the point A. The straight line L is the tangent to C at A.

a) Find an equation of L. **(4)**

The point M is the maximum point of C. The point N lies on L so that MN is parallel to the y axis. The finite region R, shown shaded in the figure above, is bounded by C, L and the straight line segment MN.

b) Determine the area of R. **(7)**

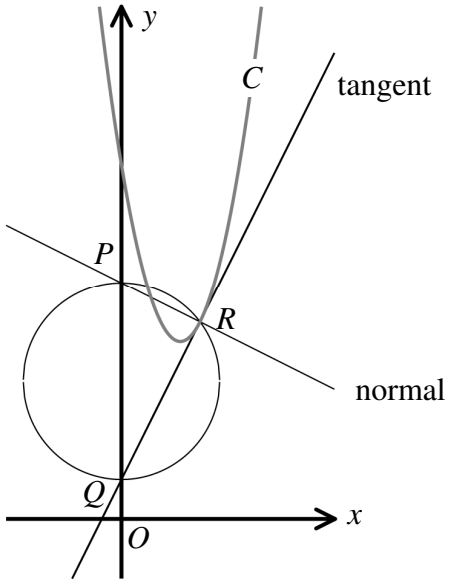
Question 5

Determine the value of k.

$$\frac{2^{288} + 2^{285}}{9} = 2^k.$$ **(4)**

You must show full workings.

Question 6



The point $R(4,10)$ lies on the curve C whose equation is

$$y = x^2 - 6x + 18\,,\ x \in \mathbb{R}\,.$$

The tangent and the normal to C at R meet the y axis at the points Q and P, respectively, as shown in the figure above.

a) Find the coordinates of Q and the coordinates of P. **(7)**

A circle passes through the points P, Q and R.

b) Determine an equation for the circle. **(4)**

Question 7

Solve the following trigonometric equation in the range given.

$$\frac{3+\sin^2\theta}{\cos\theta - 2} = 3\cos\theta\,, \quad 0° \le \theta < 360°\,. \qquad \textbf{(8)}$$

Question 8

$$f(n) = 5^{2n} - 1,\ n \in \mathbb{N}.$$

Without using proof by induction, show that $f(n)$ is a multiple of 8. **(5)**

Question 9

$$f(x) = x^2 - 12x + 30,\ x \in \mathbb{R}.$$

a) Find in exact surd form the solutions of the equation $f(x) = 0$. **(3)**

b) Hence solve the inequality …

i. … $f(x) < 0$. **(2)**

ii. … $n^2 - 12n + 30 < 0$, where n is an **integer**. **(1)**

Question 10

The straight line with equation

$$y = 2x + k,$$

where k is constant, is a tangent to the curve with equation

$$y = x^2 - 8x + 1.$$

By **using the discriminant** of a suitable quadratic, determine the value of the constant k and hence find the point of contact between the tangent and the curve. **(8)**

Question 11

$$f(x) \equiv x^3 - 6x^2 + 10x - 3,\ x \in \mathbb{R}.$$

The graph of $f(x)$ is translated by the vector $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$, forming the graph of a new curve, C.

Find, in its simplest form, the equation of C, stating further the coordinates of the point where the graph of C crosses the y axis. **(7)**

Question 12

Solve each of the following equations.

a) $\frac{1}{2} \times 4^{3x+1} = 600^{600}$. **(6)**

b) $\log_3(2y+5) = 1 - \log_3 y$. **(6)**

Question 13

$$x^3 + \left(2 - \tfrac{1}{5}k\right)x^2 - (2k+1)x + 20 = 0.$$

a) Determine the value of the real constant k, if the above equation is to have $x = 1$ as one of its roots. **(3)**

b) Solve the equation, using the value of k, found in part **(a)**. **(5)**