IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper R

Difficulty Rating: 4.0300/1.4213

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.

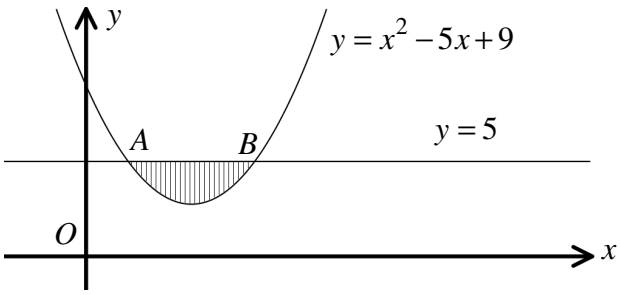
Question 1

Find the binomial expansion of

$$\left(x+\frac{2}{x}\right)^6,\ x\neq 0,$$

simplifying each term of the expansion. **(4)**

Question 2



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

$$y=x^2-5x+9 \quad \text{and} \quad y=5.$$

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

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

b) Calculate the exact area of the finite region bounded by the quadratic curve and the straight line, shown shaded in the above figure. **(6)**

Question 3

The curve C_1 has equation

$$y = \frac{a}{x},\ x \neq 0,$$

where a is a positive constant.

a) Describe geometrically the transformation that maps the graph of C_1 onto the graph of C_2 whose equation is $y = \frac{a}{x} + 1$. **(2)**

b) Sketch the graph of C_2.

The sketch must include the coordinates of …

- … all the points where the curves meet the coordinate axes.
- … the equations of any asymptotes of the curves. **(3)**

The line with equation $y = x$ intersects C_2 at the point $A(-2,-2)$ and B.

c) Determine …

i. … the value of a. **(3)**

ii. … the coordinates of B. **(3)**

Question 4

Use **proof by exhaustion** to show that if $m \in \mathbb{N}$ and $n \in \mathbb{N}$, then

$$m^2 - n^2 \neq 102. \quad \textbf{(5)}$$

Question 5

A circle has equation

$$x^2 + y^2 - 4x - 2y = 13 .$$

a) Find the coordinates of the centre of the circle and the size of its radius. **(3)**

The points A and B lie on the circle such that the length of AB is 6 units.

b) Show that $\angle ACB = 90°$, where C is the centre of the circle. **(2)**

A tangent to the circle has equation $y = k - x$, where k is a constant.

c) Show clearly that

$$2x^2 - 2(k+1)x + k^2 - 2k - 13 = 0 . \quad \textbf{(3)}$$

d) Determine the possible values of k. **(5)**

Question 6

A quartic curve C has equation

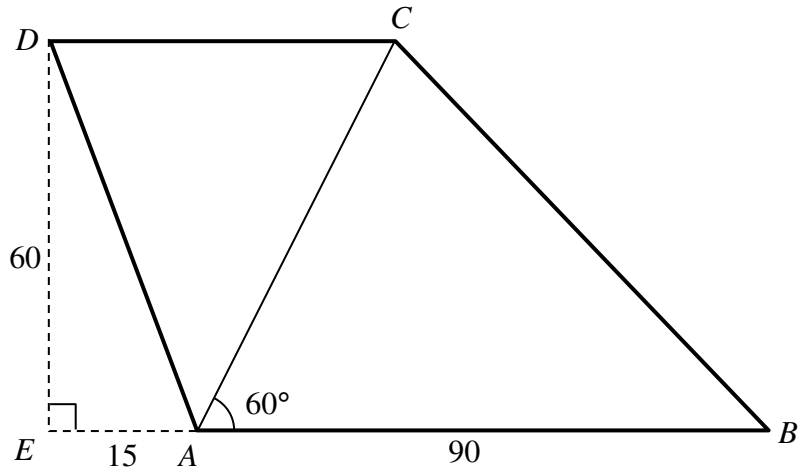
$$y = x^3(x+2), \ x \in \mathbb{R} .$$

a) Sketch the graph of C.

The sketch must contain the coordinates of any stationary points and the coordinates of the points of intersection with the coordinate axes. **(8)**

b) Show that there is only one point on C where the gradient is 10. **(7)**

Question 7



$ABCD$ is a trapezium where AB is parallel to DC.

The angle CAB is $60°$ and $|AB| = 90$. The side AB is extended from A to E so that $\measuredangle AED = 90°$, as shown in the figure above.

It is further given that $|EA| = 15$ and $|ED| = 60$.

a) Find, correct to 1 decimal place, the value of $|BC|$ and the value of $|CD|$. **(4)**

b) Calculate, correct to 1 decimal place, the angle DAC. **(3)**

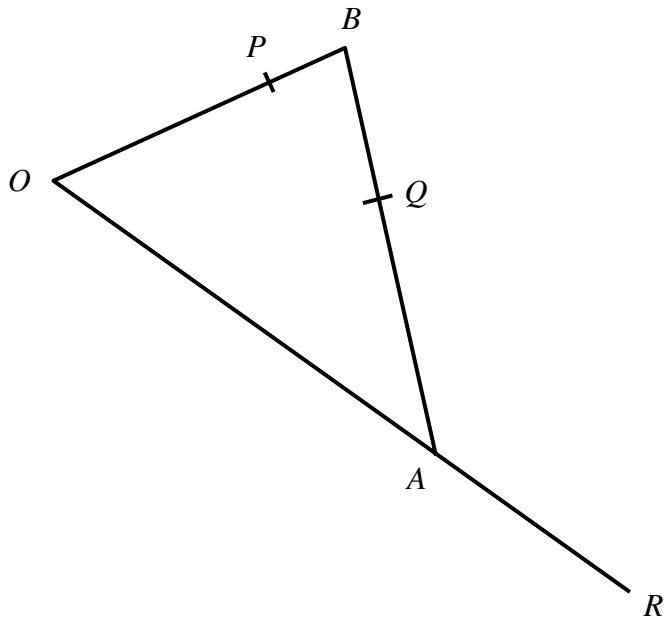
Question 8

Solve the following simultaneous logarithmic equations.

$$\log_2\left(x^2 y\right) = 2$$

$$\frac{1}{2}\log_2 y = -11 + 3\log_2 x\,. \qquad \textbf{(7)}$$

Question 9



The figure above shows a triangle OAB, where O is a fixed origin.

- The point A has coordinates $(6,-8)$.
- The point P, whose coordinates are $(4,1)$, lies on OB so that $OP:PB=4:1$.
- The point Q lies on AB so that $AQ:QB=3:2$
- The side OA is extended to the point R so that $OA:AR=5:3$.

a) Use vector methods to determine the coordinates of Q. **(4)**

b) Determine expressions, in terms of $\mathbf{i}$ and $\mathbf{j}$, for the vectors $\overrightarrow{PQ}$ and $\overrightarrow{QR}$ **(4)**

c) Deduce, showing your reasoning, that P, Q and R are collinear and state the ratio of $PQ:QR$. **(3)**

Question 10

The points A and B have coordinates $(-3,10)$ and $(9,6)$, respectively.

a) Find an equation for the straight line L_1 which passes through the point B and is perpendicular to AB, in the form $y = mx + c$, where m and c are constants. **(3)**

L_1 crosses the x axis at the point C.

b) Determine the value of $\tan\theta$, where θ is the angle that BC makes with the positive x axis. **(2)**

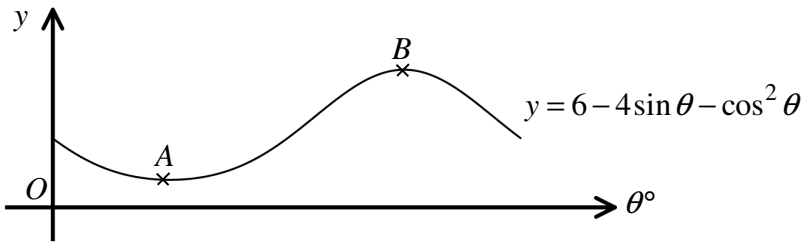
c) Find an equation for the straight line L_2 which passes through the point C and is parallel to AB, in the form $ax + by = c$, where a, b and c are integers. **(2)**

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

d) Show that the coordinates of D are $(-5,4)$. **(2)**

e) Find the area of the rectangle $ABCD$. **(3)**

Question 11



The figure above shows the graph of the curve with equation

$$y = 6 - 4\sin\theta - \cos^2\theta, \quad 0° \le \theta \le 360°.$$

The curve has a minimum at the point A and a maximum at the point B.

Determine the coordinates of A and B. **(6)**