IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper L

Difficulty Rating: 3.5150/1.1268

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 14 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

Solve each of the following inequalities.

a) $\dfrac{x+2}{3} < 3x-1$. **(2)**

b) $x+6\left(x^2+x\right) > 20$. **(4)**

Question 2

Find the binomial expansion of

$$\left(x+\frac{2}{x}\right)^4,\ x \neq 0,$$

simplifying each term of the expansion. **(3)**

Question 3

Solve the following trigonometric equation in the range given.

$$2\sin y + 5\cos y = 2\cos y, \quad 0° \leq y < 360°. \qquad \textbf{(4)}$$

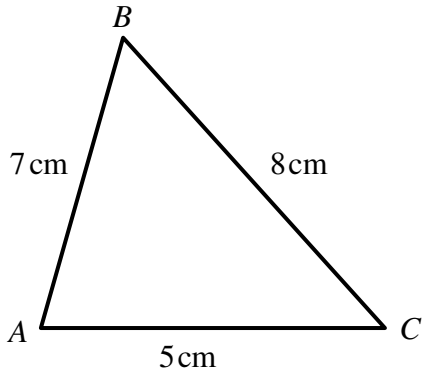
Question 4

$$y = x^3 - 4x + 1,\ x \in \mathbb{R}.$$

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

$$\frac{dy}{dx} = 3x^2 - 4. \qquad \textbf{(5)}$$

Question 5



The figure above shows a triangle ABC where the following information is given.

$$|AB| = 7 \text{ cm}, \quad |BC| = 8 \text{ cm} \text{ and } \quad |AC| = 5 \text{ cm}.$$

Find the size of the angle $\measuredangle ACB$ in degrees, and hence determine as an exact surd the area of the triangle ABC. **(5)**

Question 6

Relative to a fixed origin O, the point A has coordinates $(2,-3)$.

The point B is such so that $\overrightarrow{AB} = 3\mathbf{i} - 7\mathbf{j}$.

Determine the distance of B from O. **(4)**

Question 7

$$f(x)=\frac{1}{x-2},\ x\in\mathbb{R},\ x\neq 2.$$

$$g(x)=1+\frac{1}{x},\ x\in\mathbb{R},\ x\neq 0.$$

a) Describe mathematically the transformation that maps the graph of $y=\frac{1}{x}$ onto the graph of …

i. … $f(x)$. **(1)**

ii. … $g(x)$. **(1)**

b) Sketch in the same diagram the graphs of $f(x)$ and $g(x)$.

The sketch must include …

- … the coordinates of any the points where the curves meet the coordinate axes.
- … the equations of any asymptotes of the curves. **(5)**

c) Find as exact surds the coordinates of the points of intersection of the graphs of $f(x)$ and $g(x)$. **(7)**

Question 8

$$f(x) \equiv x^3 - 3x^2 - 6x + 8\,,\ x \in \mathbb{R}\,.$$

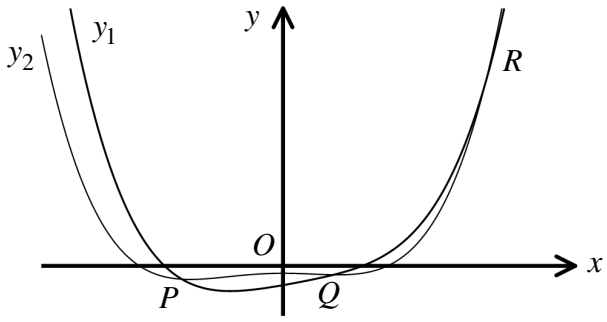
a) Show that $(x-1)$ is a factor of $f(x)$. **(2)**

b) Hence factorize $f(x)$ into three linear factors. **(3)**

c) Sketch the graph of $f(x)$.
The sketch must include the coordinates of any points where the graph of $f(x)$ meets the coordinate axes. **(3)**

The figure below shows the graphs of the curves with equations

$$y_1 = x^4 + x^3 - 4x^2 - 10 \qquad \text{and} \qquad y_2 = x^4 - x^3 + 2x^2 + 12x - 26\,.$$



The two graphs meet at the points P, Q and R.

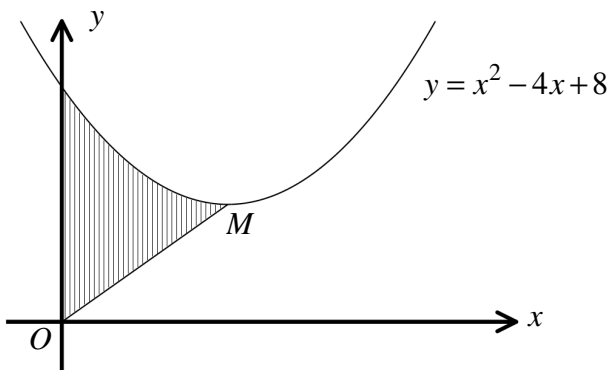
d) Determine the coordinates of P, Q and R. **(4)**

Question 9

Solve the following logarithmic equation

$$\ln x^2 + \frac{3}{\ln x} = 7\,. \qquad \textbf{(6)}$$

Question 10



The figure above shows the curve with equation

$$y = x^2 - 4x + 8, \ x \in \mathbb{R}.$$

The point M is the minimum point of the curve.

Find the area of the shaded region, bounded by the curve, the y axis and the straight line segment from O to M. **(7)**

Question 11

The points A, B and C have coordinates $(2,0)$, $(-7,2)$ and $(5,5)$, respectively.

The straight line through A, which is perpendicular to the straight line BC, intersects BC at the point D.

Find the coordinates of D. **(7)**

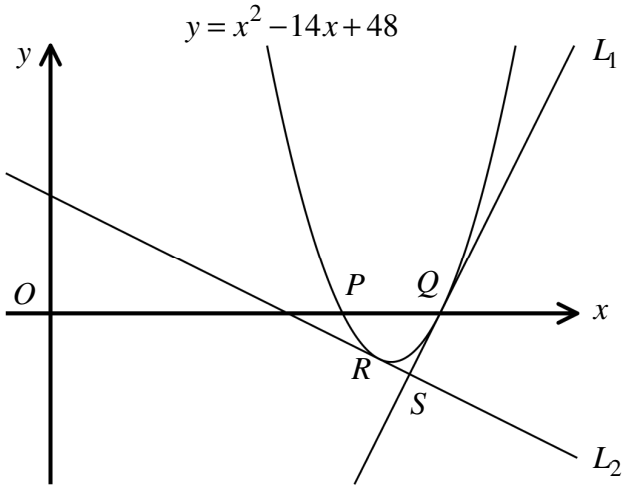
Question 12

Given that $k > 0$, use algebra to show that

$$\frac{k+1}{\sqrt{k}},$$

has a least value of 2. **(4)**

Question 13



The figure above shows the curve with equation

$$y = x^2 - 14x + 48 .$$

The curve crosses the x axis at the points $P(x_1, 0)$ and $Q(x_2, 0)$, where $x_2 > x_1$.

The tangent to the curve at Q is the straight line L_1.

The tangent to the curve at some point R is denoted by L_2.

Given further that L_1 meets L_2 at right angles, find the coordinates of the point of intersection between L_1 meets L_2, denoted in the figure by S. **(10)**

Question 14

A circle has equation

$$x^2 + y^2 = 8y \, .$$

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

b) Sketch the circle. **(2)**

The line with equation $x + y = k$, where k is a constant, is a tangent to this circle.

c) Determine, as exact surds, the possible values of k. **(8)**