IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper N

Difficulty Rating: 3.2250/1.0090

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 15 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

$$f(x) \equiv x^3 - 3x^2 + 6x - 40 .$$

a) Show that $(x-5)$ is **not** a factor of $f(x)$. **(2)**

b) Find a linear factor of $f(x)$. **(2)**

Question 2

A circle C has equation

$$x^2 + y^2 - 10x + 6y - 15 = 0$$

a) Find the coordinates of the centre of C and determine the size of its radius. **(4)**

The circle intersects the x axis at the points A and B.

b) Find, in exact surd form, the x coordinate of A and the x coordinate of B and hence state the distance AB. **(4)**

Question 3

Show that the quadratic equation

$$x^2 + (2k+3)x + k^2 + 3k + 1 = 0$$

has two distinct real roots in x, for all values of the constant k. **(4)**

Question 4

a) Find the first four terms, in ascending powers of x, of the binomial expansion of $(1+2x)^7$. **(3)**

b) Hence determine the coefficient of x in the expansion of

$$(1+2x)^7(3+2x)^4. \quad \textbf{(3)}$$

Question 5

A curve C has equation

$$y=\frac{1}{x^2},\ x\in\mathbb{R},\ x\neq 0. \quad \textbf{(2)}$$

a) Sketch the graph of C.

b) Sketch on separate set of axes the graph of ...

i. ... $y=\frac{1}{x^2}+1,\ x\in\mathbb{R},\ x\neq 0.$ **(2)**

ii. ... $y=\frac{1}{(x+1)^2},\ x\in\mathbb{R},\ x\neq -1.$ **(3)**

Mark clearly in each sketch the equations of any asymptotes to these curves and the coordinates of any intersections with the coordinate axes.

Question 6

The quadratic equation given below

$$2x^2 + x + k = 0,$$

where k is a constant, has solutions $x = \frac{3}{2}$ and $x = x_0$.

Find the value of x_0. **(5)**

Question 7

$$C: \quad y = x^2 + bx + c$$
$$L: \quad y = mx + 4$$

The quadratic curve C intersects the straight line L at the points with coordinates $(k, 6)$ and $(3, -2)$, where k, m, b and c are constants.

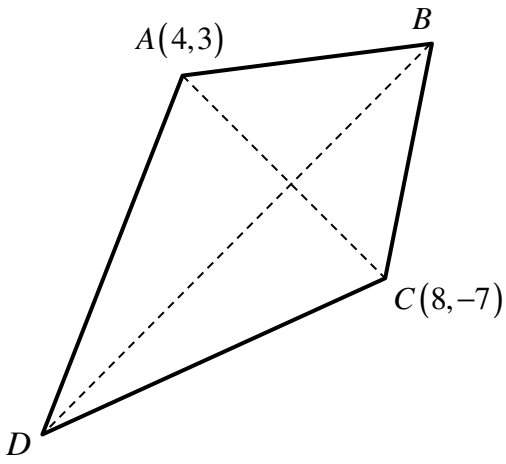
Find the value of k, m, b and c. **(7)**

Question 8

Solve the following trigonometric equation in the range given.

$$2\cos x = 3\tan x, \ 0° \leq x < 360°. \quad \textbf{(8)}$$

Question 9



The figure above shows a kite $ABCD$, where the vertices A and C have coordinates $(4,3)$ and $(8,-7)$, respectively.

The diagonal BD is a line of symmetry of the kite.

Find an equation for the diagonal BD. **(6)**

Question 10

Given that

$$p = \log_2 3 \quad \text{and} \quad q = \log_2 5,$$

express each of the following logarithms in terms of p and q.

a) $\log_2 45$ **(2)**

b) $\log_2 0.3$ **(3)**

The final answers may not contain any logarithms.

Question 11

a) If x is a real number, solve the following indicial equation.

$$x\left(x^{\frac{1}{2}}-2x^{-\frac{1}{2}}\right)^2=0\,. \qquad (3)$$

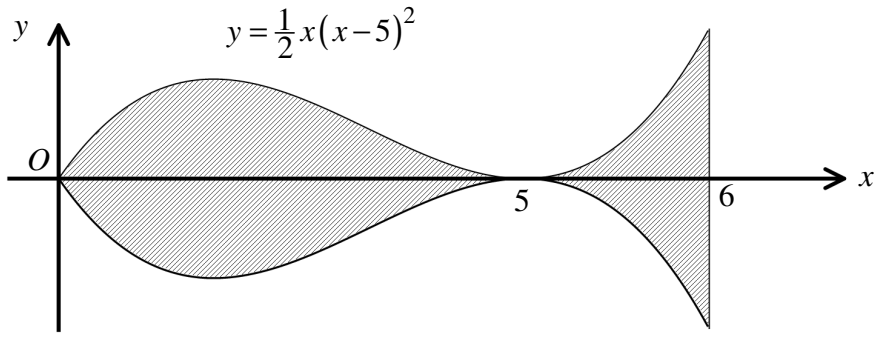
b) Express

$$\frac{\sqrt{98}-\sqrt{8}}{1+\sqrt{2}},$$

in the form $a+b\sqrt{2}$, where a and b are integers. (3)

Detailed workings must be shown in this question.

Question 12



A fish logo is generated by the curve C with equation

$$y=\tfrac{1}{2}x(x-5)^2,\quad 0\le x\le 6,$$

and its reflection in the x axis.

The curve C meets the x axis at the origin O and at the point $(5,0)$.

The finite region R is bounded by C, its reflection in the x axis and the straight line with equation $x=6$.

Show that the area of R, shown shaded in the figure, is 54 square units. **(6)**

Question 13

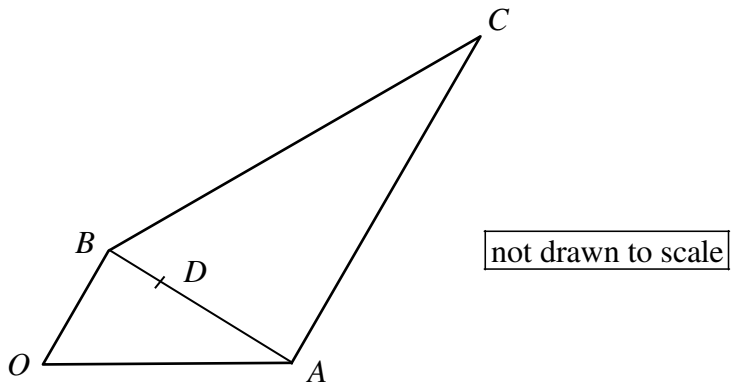
$$f(x)=\ln\left(5x^2+9x+5\right),\ x\in\mathbb{R}.$$

Show that the statement

"$f(x)$ *is positive for all real values of* x"

is in fact false. **(6)**

Question 14



The figure above shows a trapezium $OBCA$ where OB is parallel to AC.

The point D lies on BA so that $BD:DA=1:2$.

It is further given that $\overrightarrow{OA}=7\mathbf{i}-4\mathbf{j}$, $\overrightarrow{OB}=3\mathbf{i}+2\mathbf{j}$ and $\overrightarrow{AC}=2\overrightarrow{OB}$, where $\mathbf{i}$ and $\mathbf{j}$ are mutually perpendicular unit vectors lying on the same plane.

a) Determine simplified expressions, in terms of $\mathbf{i}$ and $\mathbf{j}$, for each of the vectors $\overrightarrow{OC}$, $\overrightarrow{AB}$, $\overrightarrow{AD}$ and $\overrightarrow{OD}$. **(5)**

b) Deduce, showing your reasoning, that O, D and C are collinear and state the ratio of $OC:OD$. **(2)**

c) Show that $\measuredangle OBA=90°$ and hence find the area of the trapezium $OBCA$. **(6)**

d) State the size of the angle $\measuredangle ABC$. **(1)**

Question 15

Use differentiation to establish the number of real solutions of the equation

$$3x^4-4x^3-12x^2+15=0.$$

You are not expected to solve the equation. **(8)**