IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper J

Difficulty Rating: 3.68/1.2069

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

a) Simplify fully each of the following expressions, writing the final answer in terms of $\sqrt{3}$.

i. $\sqrt{108}+\sqrt{3}$. **(1)**

ii. $\dfrac{\sqrt{6}+\sqrt{3}}{\sqrt{2}+1}$. **(3)**

b) Solve the equation

$$(5-x)^{\frac{3}{2}}=8. \quad \textbf{(3)}$$

Detailed working must be shown in this question.

Question 2

Relative to a fixed origin O, the point A has coordinates $(-2,4)$.

The point B is such so that $\overrightarrow{BA}=5\mathbf{i}-\mathbf{j}$, where $\mathbf{i}$ and $\mathbf{j}$ are mutually perpendicular unit vectors lying on the same plane.

a) Determine the distance of B from O. **(3)**

b) Calculate the angle OAB. **(4)**

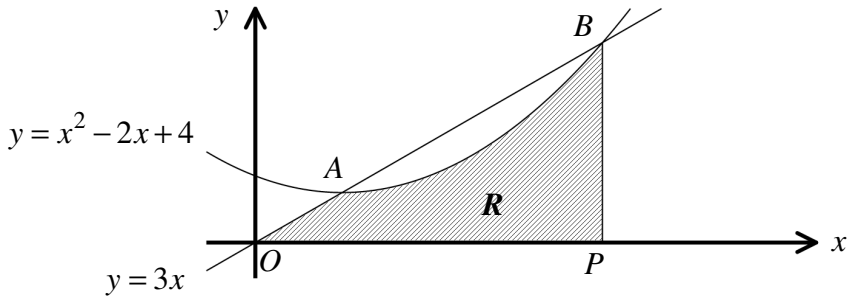
Question 3

The curve C has equation

$$y=\sqrt{2x},\ x\geq 0$$

Find an equation of the normal to C at the point where $x=2$, giving the answer in the form $y=mx+c$, where m and c are constants. **(6)**

Question 4



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

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

intersected by the straight line L with equation

$$y = 3x,\ x \in \mathbb{R}.$$

The curve meets the straight line at the points A and B.

The point P is located on the x axis so that the straight line segment BP is parallel to the y axis.

The finite region R is bounded by C, L, BP and the x axis.

Show that the area of R, shown shaded in the figure, is $\frac{39}{2}$. **(10)**

Question 5

Solve the following trigonometric equation in the range given.

$$3\cos^2 2\varphi - 4\sin^2 2\varphi = 15\cos 2\varphi - 6,\ \ 0° \le \varphi < 360°.$$ **(7)**

Question 6

A reciprocal curve has equation

$$y = \frac{1}{x},\ x \neq 0.$$

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

$$\frac{dy}{dx} = -\frac{1}{x^2}. \qquad \textbf{(6)}$$

Question 7

A circle C has equation

$$x^2 + y^2 + ax + by + 43 = 0,$$

where a and b are constants.

a) Given that the points $(-4,7)$ and $(-2,5)$ lie on C, determine the coordinates of the centre of C and the size of its radius. **(6)**

A straight line passes through the point $P(4,5)$ and is a tangent to C at the point Q.

b) Show that the length of PQ is $4\sqrt{3}$. **(3)**

Question 8

$$f(x) = (3-2x)^2(1+2x)^6.$$

Find the binomial expansion of $f(x)$ in ascending powers of x, up and including the term in x^3. **(6)**

Question 9

The curve C has equation

$$y = 5x - 4x^2 - x^3 .$$

a) Express y as a product of linear factors. **(2)**

b) Sketch the graph of C.

The sketch must include the coordinates of all the points where the curve meets the coordinate axes. **(3)**

c) Hence sketch the curve with equation

$$y = 5(x-2) - 4(x-2)^2 - (x-2)^3,$$

clearly showing the coordinates of all the points where the curve meets the coordinate axes. **(3)**

Question 10

Find the range of values of the non zero constant k, given that the quadratic equation

$$3kx^2 - 2kx - 4x + 3 = 0$$

has two different real roots. **(7)**

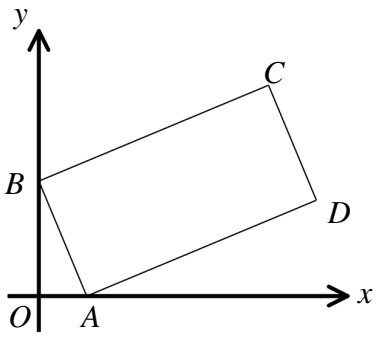
Question 11

Find the exact solution of the following simultaneous equations

$$x + e^y = 1$$

$$\ln(x+1)^2 - 2y = 2 . \quad \textbf{(8)}$$

Question 12



The figure above shows the rectangle $ABCD$, with $A(5,0)$, $B(0,12)$ and $C(24,k)$.

a) Show that $k = 22$ and hence calculate the area of the rectangle $ABCD$. **(7)**

b) Determine the coordinates of D. **(2)**

Question 13

The curve C has equation

$$y = 4x^2 + 24x + A,$$

where A is a non zero constant.

a) Express y in the form $p(x+q)^2 + r$, where p, q and r are constants. **(3)**

The straight line L has equation

$$y = Bx + 10,$$

where B is a non zero constant.

b) Given that C and L meet at the points with $x = -1$ and $x = -\frac{21}{4}$, determine the value of A and the value of B. **(7)**
