IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper D

Difficulty Rating: 3.575/1.1546

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) Evaluate the following indicial expression, giving the final answers as an exact simplified fraction.

$$4\times 4^{\frac{5}{2}}+8^{-\frac{1}{3}}.$$

The answer to this part of the question must be fully supported by a detailed method, justifying each step in the evaluation. **(3)**

b) Simplify fully the following expression

$$\left(2pq^2\right)^4\times 5p\sqrt{q^6}\ . \qquad \textbf{(3)}$$

Question 2

Show that the quadratic equation

$$(k+1)x^2+2kx+k=1$$

has two distinct real roots for all real values of the constant k, except for one value which must be stated. **(5)**

Question 3

A curve is defined as

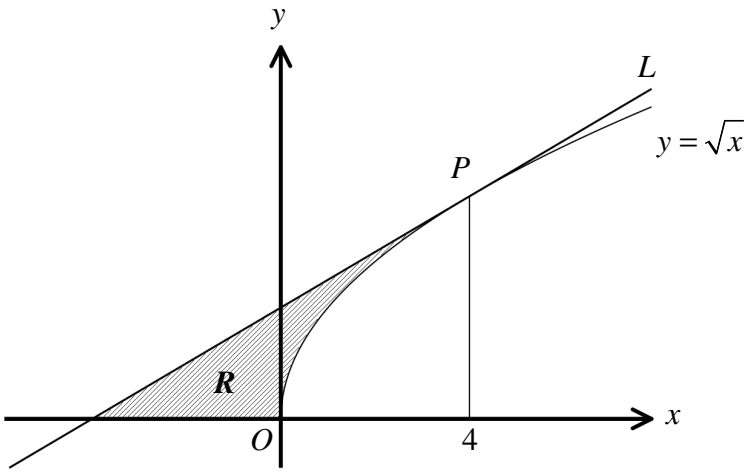
$$f(x)\equiv(4-x)(x+3)\ \ ,\ \ x\in\mathbb{R},$$

a) Sketch the graph of $f(x)$, clearly indicating the coordinates of its vertex and the coordinates of any points where the graph meets the coordinate axes. **(5)**

The graph of the curve with equation $y=f(kx)$, where k is a constant, passes through the point with coordinates $(1,0)$.

b) Determine the two possible values of k. **(2)**

Question 4



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

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

The point P lies on C where $x = 4$.

The straight line L is the tangent to C at P.

a) Find an equation of L. **(5)**

The finite region R, shown shaded in the figure, is bounded by C, L and the x axis.

b) Find the exact area of R. **(5)**

Question 5

It is given that

$$(1-2x)^2(2+kx)^4 \equiv A + Bx - 104x^2 + \ldots ,$$

where k, A and B are non zero constants.

Determine the possible values of B. **(10)**

Question 6

An area is to be replanted with eucalyptus trees after a large fire.

The height, H m, of one such tree is given by the formula

$$H = 25 - 24\mathrm{e}^{-0.1t},\ t \geq 0,$$

where t is the time in years since the tree was planted.

a) State the height of a newly planted tree. **(1)**

b) Find the height of a tree, after 2 years. **(1)**

c) Calculate, to the nearest integer, the value of t when the height of a tree has reached 80% of its eventual height. **(5)**

Question 7

$$y = \sqrt[3]{x} + \frac{27}{x},\ x \neq 0.$$

Find the range of values of x for which y is increasing. **(7)**

Question 8

Differentiate from first principles

$$\frac{1}{x^2},\ x \neq 0.$$ **(6)**

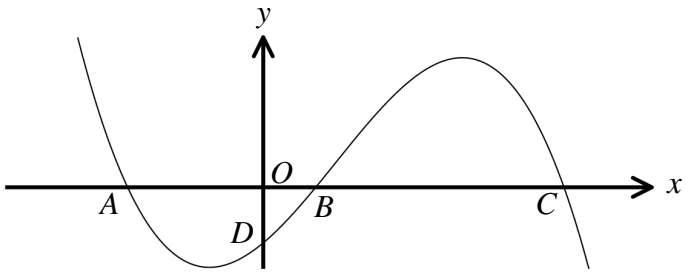
Question 9

$$x - \frac{14}{x} = 6\sqrt{2},\ x \neq 0.$$

Solve the above equation giving the answers in the form $p\sqrt{2}$, where p is a constant.

Detailed working must be shown in this question **(6)**

Question 10



The figure above shows the graph of a cubic polynomial $f(x)$ given by

$$f(x) = -x^3 + 5x^2 + 17x - 21,\ x \in \mathbb{R}.$$

The graph meets the coordinate axes at four distinct points, labelled A, B, C and D.

Given that the coordinates of the point A are $(-3,0)$, determine the coordinates of the points B, C and D. **(6)**

Question 11

$$2CT - 2C + T - 1$$

a) Write the above expression as a product of two linear factors. **(2)**

b) Hence solve the trigonometric equation

$$2\cos\theta\tan\theta - 2\cos\theta + \tan\theta = 1,$$

for $0° \le \theta < 360°$. **(5)**

Question 12

A straight line L and a curve C have the following equations.

$$L:\ \left(\frac{1}{x}+1\right)\left(\frac{1}{y}+1\right)=1 \quad \text{and} \quad C:\ xy+2=0.$$

a) Find the coordinates of the points of intersection between L and C. **(6)**

b) Sketch the graphs of L and C in the same set of axes. **(4)**

Question 13

A circle C_1 has equation

$$x^2+y^2-10x+4y=71.$$

a) Find the coordinates of the centre of C_1 and the size of its radius. **(3)**

Another circle C_2 is centred at the point with coordinates $(-4,10)$ and has radius 5.

b) Show that C_1 and C_2 **touch** each other. **(3)**

The two circles touch each other at the point P and the straight line L is the **common** tangent of C_1 and C_2.

c) Determine the coordinates of P. **(3)**

d) Show that an equation of L is

$$4y=3x+27.$$ **(4)**
