IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper V

Difficulty Rating: 4.1150/1.4854

Time: 2 hours 30 minutes

Candidates may use any calculator allowed by the regulations of this examination.

Information for Candidates

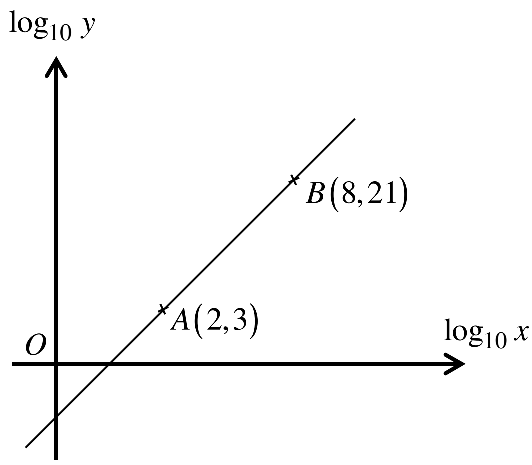
This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

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



The figure above shows a set of axes where $\log_{10} y$ is plotted against $\log_{10} x$.

A straight line passes through the points $A(2,3)$ and $B(8,21)$.

Express y in terms of x. **(6)**

Question 2

Determine the range of values of x that satisfy **both** the inequalities given below.

$$5x+8 \geq 4(x+1)$$

$$(x+1)^2 - 8(x+1)(x+2) < 0.$$ **(8)**

Question 3

Differentiate $\frac{1}{2+x^2}$ from first principles. **(6)**

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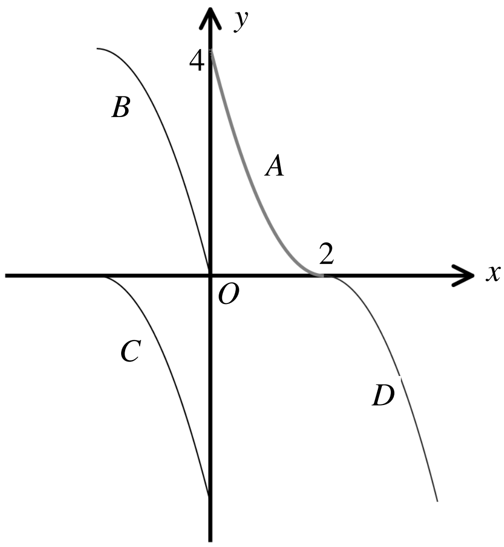
Question 4

Find the possible solutions of the quadratic equation

$$x^2 + (3-m)x + 5 = m^2,$$

where m is a constant, given that the equation has repeated roots. **(8)**

Question 5



The figure above shows four distinct graphs, each located within a separate quadrant, labelled as A, B, C and D.

The equation of A is

$$y = (x-2)^2, \quad 0 \le x \le 2, \quad 0 \le y \le 4.$$

Find the equations for each of the remaining sections, B, C and D, giving each of the equations in a simplified form $y = f(x)$. **(6)**

Question 6

If $x = \sqrt[3]{120}$, show clearly that

$$x^2 + \frac{240}{x} = 12\sqrt[3]{225} .$$ **(5)**

Question 7

The three angles in a triangle are denoted as α , β and γ.

It is further given that

$$\tan\alpha = -4.705 \qquad \text{and} \qquad \tan(\beta - \gamma) = 0.404$$

Determine, in degrees, the size of each of the angles α , β and γ. **(7)**

Question 8

A curve has equation

$$y = 6\sqrt[3]{x^5} - 15\sqrt[3]{x^4} - 80x + 16 , \qquad x \in \mathbb{R} , \qquad x \geq 0 .$$

Find the coordinates of the stationary point of the curve and determine whether it is a local maximum, a local minimum or a point of inflexion. **(12)**

Question 9

Given that $k \in \mathbb{N}$, use algebra to prove that

$$\frac{2k+2}{2k+3} > \frac{2k}{2k+1} .$$ **(5)**

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Question 10

Two circles have equations

$$x^2 + y^2 - 8x - 2y + 13 = 0,$$

$$x^2 + y^2 - 2x - 2y + 1 = k,$$

where k is a constant.

a) Find the values of k, for which the two circles touch each other. **(6)**

b) Hence state the range of values of k, for which the two circles intersect each other at exactly two points. **(1)**

Question 11

If $k > 0$ and n is a positive integer, then

$$(1 + kx)^n \equiv 1 + \frac{7}{2}x + Bx^2 + Bx^3 + \ldots,$$

where B is a non zero constant.

By considering the coefficients of x^2 and x^3, show that

$$nk = 2k + 3,$$

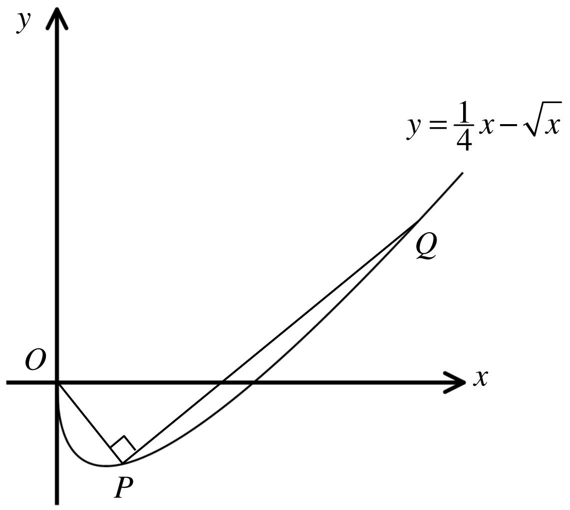
and hence find the value of n and the value of k. **(9)**

Question 12

Find, in exact form, the solutions of the following equation

$$\frac{2 - \ln x^7}{7 - \ln x^2} + (\ln x)^2 = 0.$$ **(9)**

Question 13



The figure above shows the curve with equation

$$y = \frac{1}{4}x - \sqrt{x}\ ,\ x \in \mathbb{R},\ x \geq 0.$$

The points $P(0.04, -0.19)$ and Q lie on the curve, so that $\measuredangle OPQ = 90°$, where O is the origin.

Show that the y coordinate of Q is $\frac{k}{900}$, where k is a six digit integer. **(12)**

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