IYGB GCE

Core Mathematics C3

Advanced

Practice Paper K

Difficulty Rating: 3.5333/1.6216

Time: 1 hour 30 minutes

Candidates may use any calculator allowed by the Regulations of the Joint Council for Qualifications.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
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 9 questions in this question paper.
The total mark for this paper is 75.

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

Solve the following equation

$$4x+|3x+2|=1. \qquad (5)$$

Question 2

The curve with equation $y=2^x$ intersects the straight line with equation $y=3-2x$ at the point P, whose x coordinate is α.

a) Show clearly that …

i. … $0.5<\alpha<1$. **(3)**

ii. … α is the solution of the equation

$$x=\frac{\ln(3-2x)}{\ln 2}. \qquad (3)$$

An iterative formula based on the equation of part **(a_{ii})** is used to find α.

b) Starting with $x_0=0.5$, find the value of x_1, x_2 and x_3, explaining why a valid value of x_4 cannot be produced. **(3)**

c) Use the iterative formula

$$x_{n+1}=\frac{3-2^{x_n}}{2}, \quad x_0=0.5,$$

with as many iterations as necessary, to determine the value of α correct to 2 decimal places. **(2)**

Question 3

The functions f and g are defined by

$$f : x \mapsto 4 - x^2, \; x \in \mathbb{R}$$

$$g : x \mapsto \frac{5x}{2x-1}, \; x \in \mathbb{R}, \; x \neq \frac{1}{2}.$$

a) Evaluate $fg^{-1}(3)$. **(4)**

b) Solve the equation

$$g^{-1}f(x) = \frac{7}{5}.$$ **(5)**

Question 4

Differentiate each of the following expressions with respect to x.

a) $y = \dfrac{4}{(2x-1)^2}$. **(2)**

b) $y = x^3 \mathrm{e}^{-2x}$. **(3)**

c) $y = \dfrac{2x^2+1}{3x^2+1}$. **(3)**

Question 5

$$\frac{4x-1}{2(x-1)}-\frac{3}{2(x-1)(2x-1)}-2,\ x\neq\frac{1}{2},\ x\neq 1.$$

a) Show that the above expression can be simplified to $\dfrac{3}{2x-1}$. **(4)**

b) Sketch the graph of the curve with equation

$$y=\frac{3}{2x-1},\ x\neq\frac{1}{2},$$ **(3)**

c) Hence sketch the graph of the curve with equation

$$y=\frac{3}{2|x|-1},\ x\neq\pm\frac{1}{2},$$ **(2)**

Each of sketches in parts **(b)** and **(c)**, must include the equation of the vertical asymptote of the curve, and the coordinates of any points where the curve meets the coordinate axes.

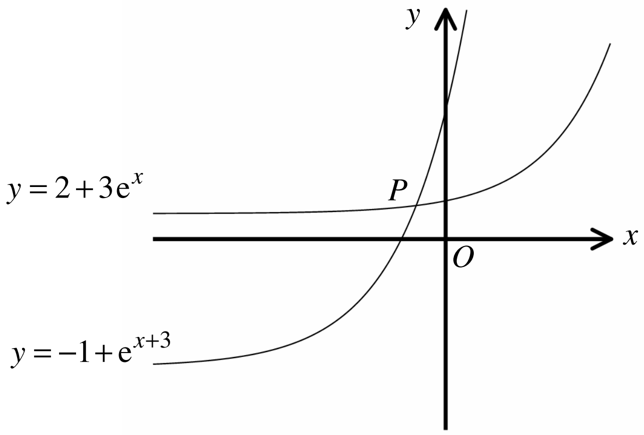
Question 6

Solve each of the following trigonometric equations.

i. $\dfrac{\sec^2 x+8}{4-\tan x}=3\tan x,\qquad 0\leq x<2\pi,\ \ \tan x\neq 4.$ **(7)**

ii. $\cos 2\theta=\sin\theta,\qquad 0\leq\theta<360°.$ **(6)**

Question 7



The figure above shows the graphs of

$$y = 2 + 3e^{x} \quad \text{and} \quad y = -1 + e^{x+3}.$$

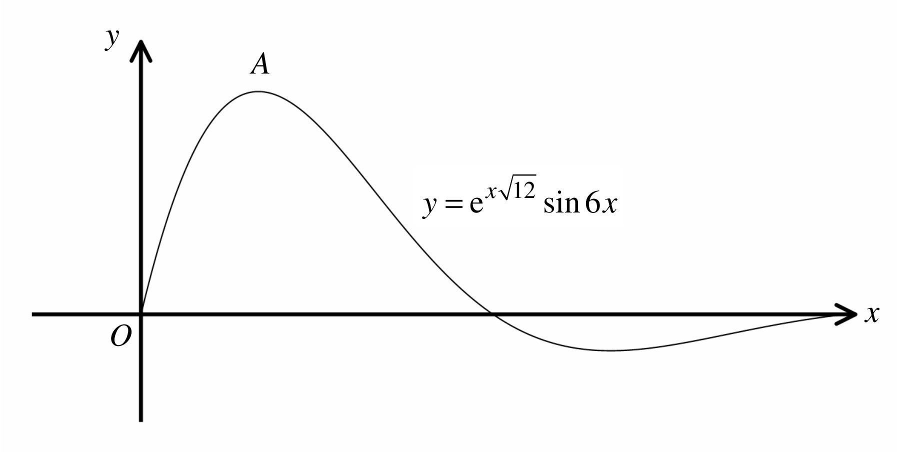
The graphs meet at the point P.

Show that the y coordinate of P is

$$\frac{2e^{3}+3}{e^{3}-3}.$$

(5)

Question 8



The figure above shows the graph of the curve with equation

$$y = e^{x\sqrt{12}} \sin 6x, \ 0 \le x \le \frac{\pi}{3}.$$

The curve has a local maximum at the point A.

Find, in terms of π, the x coordinate of A. **(6)**

Question 9

$$f(x) = 2\sin x + 2\cos x, \ x \in \mathbb{R}.$$

a) Express $f(x)$ in the form $R\sin(x+\alpha)$, $R>0$, $0<\alpha<\frac{\pi}{2}$. **(3)**

b) State the minimum and the maximum value of …

i. … $y = f\left(x - \frac{\pi}{2}\right)$. **(2)**

ii. … $y = 2f(x)+1$. **(2)**

iii. … $y = \left[f(x)\right]^2$. **(1)**

iv. … $y = \dfrac{10}{f(x)+3\sqrt{2}}$. **(1)**
