IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper Q

Difficulty Rating: 3.5067/1.6043

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 10 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

$$x^2 + y^2 - 2x - 2y = 8$$

The circle with the above equation has radius r and has its centre at the point C.

a) Determine the value of r and the coordinates of C. **(3)**

The point $P(4,2)$ lies on the circle.

b) Show that an equation of the tangent to the circle at P is **(4)**

$$y = 14 - 3x.$$

Question 2

Find the value of the constant a if

$$\int_2^a a - 2x \ dx = -5. \quad \textbf{(4)}$$

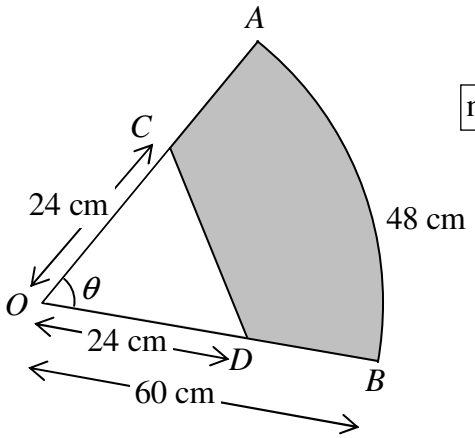
Question 3

The curve C has equation

$$y = x^4 - 2x^3 + 1, \ x \in \mathbb{R}.$$

Find the coordinates of the stationary points of C and determine their nature. **(9)**

Question 4



not drawn accurately

The figure above shows a circular sector OAB whose centre is at O.

The radius of the sector is 60 cm.

The points C and D lie on OA and OB respectively, so that $|OC| = |OD| = 24$ cm.

Given that the length of the arc AB is 48 cm, find the area of the shaded region $ABDC$, correct to the nearest cm^2. **(7)**

Question 5

The manufacturer of a certain brand of washing machine is to replace an old model with a new model. There will be a "phase out" period for the old model and a "phase in" period for the new model, both lasting 24 months and starting at the same time.

On the first month of the phase out period 5000 old washing machines will be produced and each month thereafter, this figure will reduce by 20%.

a) Show that on the fifth month of the "phase out" period 2048 old washing machines will be produced. **(3)**

b) Find how many old washing machines will be produced during the "phase out" period. **(2)**

On the first month of the "phase in" period 1000 new washing machines will be produced and each month thereafter, this figure will increase by 5%.

c) Calculate how many new washing machines will be produced on the last month of the "phase in" period. **(2)**

On the k^{th} month of the "phase in/phase out" period, for the first time more new washing machines will be produced than old washing machines.

d) Show that k satisfies

$$\left(\frac{21}{16}\right)^{k-1} > 5. \qquad \textbf{(2)}$$

e) Use logarithms to determine the value of k. **(4)**

Question 6

Solve the following trigonometric equation in the range given.

$$\frac{1}{2}\tan x - \sin x = 0, \quad 0° \le x < 360°. \qquad \textbf{(7)}$$

Question 7

In 1970 the average weekly pay of footballers in a certain club was £100.

The average weekly pay, £P, is modelled by the equation

$$P = A \times b^t,$$

where t is the number of years since 1970, and A and b are positive constants.

In 1991 the average weekly pay of footballers in the same club had risen to £740.

a) Find the value of A and show that $b = 1.10$, correct to 3 significant figures. **(4)**

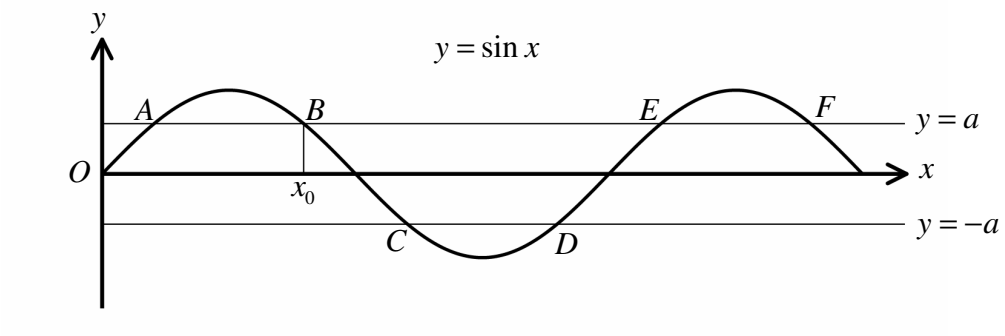
b) Use logarithms to determine the year when the average weekly pay of footballers in this club will first exceed £10000. **(5)**

Question 8

$$f(x) = x^3 - 9x^2 + 24x - 20$$

Given that when $f(x)$ is divided by $(x-k)$ the remainder is -4, find the possible values of k. **(6)**

Question 9



The figure above shows the graph of the curve with equation

$$y = \sin x,\ 0 \leq x \leq 3\pi .$$

The graph is intersected by the straight lines with equations

$$y = \pm a,\ 0 < a < 1.$$

These intersections are labelled in the figure by the points A, B, C, D, E and F.

The x coordinate of the point B is x_0.

Express, in terms of x_0 and π, the x coordinates of the points A, D and E. **(3)**

Question 10

$$(2+ax)(1+bx)^7 = 2-41x+357x^2+\ldots,$$

where a and b are integers.

Show that $b = -3$ and find the value of a. **(10)**
