

6673/01

Edexcel GCE

Pure Mathematics

Unit P3 Mock Paper

Advanced Subsidiary / Advanced

Time: 1 hour 30 minutes

Materials required for the examination

Answer Book (AB04)
Graph Paper (GP02)
Mathematical Formulae

Items included with these question papers

Nil

Candidates may use only a SCIENTIFIC calculator when answering this paper.

Instructions to Candidates

In the boxes on the Answer Book provided, write the name of the Examining Body (Edexcel), your Centre Number, Candidate Number, the Unit Title (Pure Mathematics P3), the Paper Reference (6673), your surname, other names and signature.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.

This paper has 8 questions. There are no blank pages.

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 will gain no credit.

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1.
$$f(x) = ax^3 + 3x^2 + bx + 1,$$

where a and b are constants.

When $f(x)$ is divided by $(x - 1)$ there is a remainder of 5. When $f(x)$ is divided by $(x + 2)$ there is a remainder of -1 .

Find the value of a and the value of b . **(5 marks)**

2. The binomial expansion of $(1 + 12x)^{\frac{3}{4}}$ in ascending powers of x up to and including the term in x^3 is

$$1 + 9x + px^2 + qx^3, \quad |12x| < 1.$$

(a) Find the value of p and the value of q . **(4 marks)**

(b) Use this expansion with your values of p and q together with an appropriate value of x to obtain an estimate of $(1.6)^{\frac{3}{4}}$. **(2 marks)**

(c) Obtain $(1.6)^{\frac{3}{4}}$ from your calculator and hence make a comment on the accuracy of the estimate you obtained in part (b). **(2 marks)**

3. The curve C has parametric equations

$$x = a \sec t, \quad y = b \tan t, \quad 0 < t < \frac{\pi}{2},$$

where a and b are positive constants.

(a) Prove that $\frac{dy}{dx} = \frac{b}{a} \operatorname{cosec} t$. **(4 marks)**

(b) Find the equation in the form $y = px + q$ of the tangent to C at the point where $t = \frac{\pi}{4}$. **(4 marks)**

4. Given that $y = 1$ at $x = \pi$, solve the differential equation

$$\frac{dy}{dx} = yx^2 \cos x, \quad y > 0. \quad \text{span style="float: right;">**(9 marks)**$$

5.
$$g(x) = \frac{5x + 8}{(1 + 4x)(2 - x)}.$$

(a) Express $g(x)$ in the form $\frac{A}{(1 + 4x)} + \frac{B}{(2 - x)}$, where A and B are constants to be found.

(3 marks)

The finite region R is bounded by the curve with equation $y = g(x)$, the coordinate axes and the line $x = \frac{1}{2}$.

(b) Find the area of R , giving your answer in the form $a \ln 2 + b \ln 3$.

(7 marks)

6. Use the substitution $u^2 = (x - 1)$ to find

$$\int \frac{x^2}{\sqrt{(x-1)}} dx,$$

giving your answer in terms of x .

(10 marks)

7. The points A , B and C have position vectors $2\mathbf{i} + \mathbf{j} + \mathbf{k}$, $5\mathbf{i} + 7\mathbf{j} + 4\mathbf{k}$ and $\mathbf{i} - \mathbf{j}$ respectively, relative to a fixed origin O .

(a) Prove that the points A , B and C lie on a straight line l .

(4 marks)

The point D has position vector $2\mathbf{i} + \mathbf{j} - 3\mathbf{k}$.

(b) Find the cosine of the acute angle between l and the line OD .

(3 marks)

The point E has position vector $-3\mathbf{j} - \mathbf{k}$.

(c) Prove that E lies on l and that OE is perpendicular to OD .

(4 marks)

8. The cartesian equation of the circle C is

$$x^2 + y^2 - 8x - 6y + 16 = 0.$$

(a) Find the coordinates of the centre of C and the radius of C .

(4 marks)

(b) Sketch C .

(2 marks)

(c) Find parametric equations for C .

(3 marks)

(d) Find, in cartesian form, an equation for each tangent to C which passes through the origin O .

(5 marks)

END