Centre No.						Paper Reference								Surname	Initial(s)
Candidate No.							6	6	7	2	/	0	1	Signature	

Paper Reference(s)

6672

Edexcel GCE

Pure Mathematics P2

Advanced/Advanced Subsidiary

Monday 21 June 2004 – Morning

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Materials required for examination
Mathematical Formulae (Lilac)

Items included with question papers
Nil

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
You must write your answer for each question in the space following the question.
If you need more space to complete your answer to any question, use additional answer sheets.
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.
Full marks may be obtained for answers to ALL questions.
This paper has 8 questions.

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 gain no credit.

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Turn over

Edexcel
Success through qualifications

1. Express as a single fraction in its simplest form

$$\frac{x^2-8x+15}{x^2-9}\times\frac{2x^2+6x}{(x-5)^2}.$$

(4)

2. (i) Given that $\sin x=\frac{3}{5}$, use an appropriate double angle formula to find the exact value of $\sec 2x$.

(4)

(ii) Prove that

$$\cot 2x+\operatorname{cosec} 2x\equiv\cot x,\qquad \left(x\neq\frac{n\pi}{2},n\in\mathbb{Z}\right).$$

(4)

3. For the binomial expansion, in descending powers of x, of

$$\left(x^3-\frac{1}{2x}\right)^{12},$$

(a) find the first 4 terms, simplifying each term.

(5)

(b) Find, in its simplest form, the term independent of x in this expansion.

(3)

4.

Figure 1

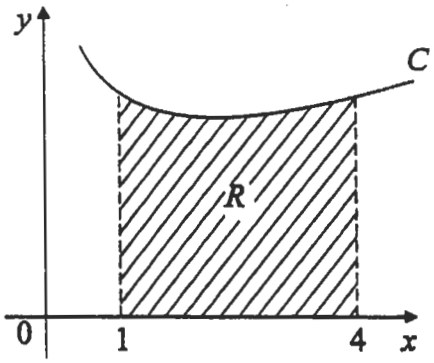

Figure 1 shows parts of the curve C with equation

$$y = \frac{x+2}{\sqrt{x}}.$$

The shaded region R is bounded by C, the x-axis and the lines $x = 1$ and $x = 4$.

This region is rotated through 360° about the x-axis to form a solid S.

(a) Find, by integration, the exact volume of S.

(7)

The solid S is used to model a wooden support with a circular base and a circular top.

(b) Show that the base and the top have the same radius.

(1)

Given that the actual radius of the base is 6 cm,

(c) show that the volume of the wooden support is approximately 630 cm^3.

(2)

5. $f(x) = x^3 + x^2 - 4x - 1.$

The equation $f(x) = 0$ has only one positive root, α.

(a) Show that $f(x) = 0$ can be rearranged as

$$x = \sqrt{\left(\frac{4x+1}{x+1}\right)}, \quad x \neq -1.$$

(2)

The iteration formula $x_{n+1} = \sqrt{\left(\frac{4x_n + 1}{x_n + 1}\right)}$ is used to find an approximation to α.

(b) Taking $x_1 = 1$, find, to 2 decimal places, the values of x_2, x_3 and x_4.

(3)

(c) By choosing values of x in a suitable interval, prove that $\alpha = 1.70$, *correct* to 2 decimal places.

(3)

(d) Write down a value of x_1 for which the iteration formula $x_{n+1} = \sqrt{\left(\frac{4x_n + 1}{x_n + 1}\right)}$ does *not* produce a valid value for x_2.

Justify your answer.

(2)

6. Given that $\log_5 x = a$ and $\log_5 y = b$, find, in terms of a and b,

(a) $\log_5\left(\frac{x^2}{y}\right)$,

(2)

(b) $\log_5(25x\sqrt{y})$.

(3)

It is given that $\log_5\left(\frac{x^2}{y}\right) = 1$ and that $\log_5(25x\sqrt{y}) = 1$.

(c) Form simultaneous equations in a and b.

(1)

(d) Show that $a = -0.25$ and find the value of b.

(2)

Using the values of a and b, or otherwise,

(e) calculate, to 3 decimal places, the value of x and the value of y.

(3)

7. $f(x) = x + \frac{e^x}{5}, \quad x \in \mathbb{R}.$

(a) Find $f'(x)$.

(2)

The curve C, with equation $y = f(x)$, crosses the y-axis at the point A.

(b) Find an equation for the tangent to C at A.

(3)

(c) Complete the table, giving the values of $\sqrt{\left(x + \frac{e^x}{5}\right)}$ to 2 decimal places.

x	0	0.5	1	1.5	2
$\sqrt{\left(x + \frac{e^x}{5}\right)}$	0.45	0.91			

(2)

(d) Use the trapezium rule, with all the values from your table, to find an approximation for the value of

$$\int_0^2 \sqrt{\left(x + \frac{e^x}{5}\right)}\, dx.$$

(4)

8. The function f is given by

$$f: x \mapsto \ln(3x - 6), \quad x \in \mathbb{R}, \quad x > 2.$$

(a) Find $f^{-1}(x)$.

(3)

(b) Write down the domain of f^{-1} and the range of f^{-1}.

(2)

(c) Find, to 3 significant figures, the value of x for which $f(x) = 3$.

(2)

The function g is given by

$$g: x \mapsto \ln|3x - 6|, \quad x \in \mathbb{R}, \quad x \neq 2.$$

(d) In the space at the top of page 15, sketch the graph of $y = g(x)$.

(3)

(e) Find the exact coordinates of all the points at which the graph of $y = g(x)$ meets the coordinate axes.

(3)