Rewarding Learning

Centre Number

Candidate Number

ADVANCED
General Certificate of Education
2017

Mathematics

Assessment Unit C3
assessing
Module C3:
Core Mathematics 3

AMC31

[AMC31]
THURSDAY 1 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer **all eight** questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen**.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit**.
Answers should be given to three significant figures unless otherwise stated.
You are permitted to use a graphic or scientific calculator in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A copy of the **Mathematical Formulae and Tables booklet** is provided.
Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$

1 The tray on a child's high chair can be modelled as the area between the curves

$$y = 20 \cos x$$

and $y = 4 \cos x$

from $x = \frac{-\pi}{2}$ to $x = \frac{\pi}{2}$

Find the area of the tray. [5]

[Turn over

2 The speed, y m s^{-1}, of an accelerating car is recorded every second, x, for six seconds.

Time x	0	1	2	3	4	5	6
Speed y	0	5.3	8.1	10.3	11.9	13.0	14.1

Use Simpson's rule to estimate the distance the car travels during the six seconds. [4]

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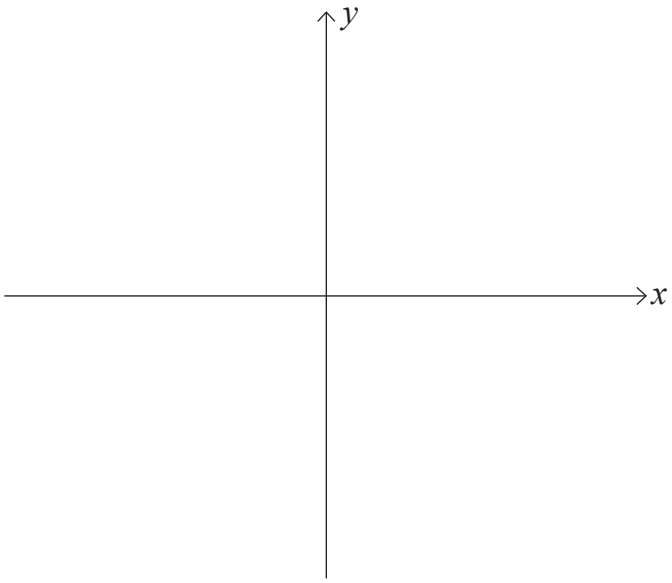
3 The function f(x) is defined as

$$f(x) = |2x - 1|$$

(i) On the axes below sketch the graph of $y = f(x)$. [2]



(ii) Describe fully the two successive transformations that will map $y = f(x)$ onto

$$y = 3 - f(x)$$ [4]

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[Turn over

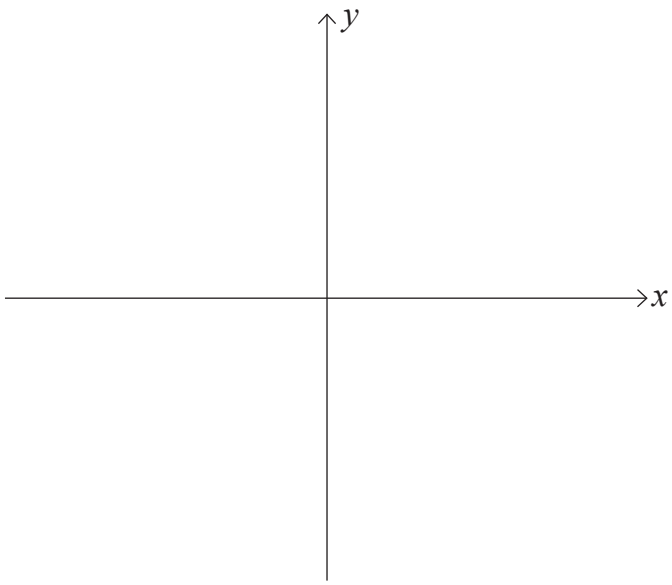
4 **(a)** Eliminate θ from the following pair of equations

$$x = 3 \tan \theta \qquad y = 2 \sec \theta$$ [4]

(b) Prove the following identity

$$\frac{\text{cosec } \theta}{\text{cosec } \theta - \sin \theta} \equiv \sec^2 \theta \qquad [5]$$

5 **(i)** Sketch on the axes below the curve $y = \ln x$ and the straight line $y = 5 - x$ [2]



(ii) State why the equation

$$5 - x = \ln x$$

has only 1 root. [1]

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(iii) Show that this root lies between 3.6 and 3.7 [3]

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(iv) Starting with $x = 3.7$ and using the Newton–Raphson method once, find a better approximation to this root. [4]

[Turn over

6 Find the turning point on the curve

$$y = e^{2x} - 5e^{x}$$

and state if it is a maximum or a minimum. [9]

[Turn over

7 **(i)** Write in partial fractions

$$\frac{6x^2}{(1-x)(1+2x)}$$ [8]

10387

[Turn over

(ii) Hence find, in ascending powers of x, the binomial expansion of

$$\frac{6x^2}{(1-x)(1+2x)}$$

as far as the term in x^3 [8]

[Turn over

8 (a) (i) Differentiate $\sqrt{\dfrac{x}{x^2+1}}$ [5]

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(ii) Differentiate $e^{\sqrt{x}} \ln (3x^2 - 1)$ [5]

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[Turn over

(b) Find

$$\int \frac{2x^2}{x^3 - 1} + \text{cosec}^2 (3 - 7x) + \frac{x + 1}{x^2} \, dx$$

[6]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number