

ADVANCED
General Certificate of Education
2019

	Cent	re Nu	mber
Car	ndida	te Nu	mber

## **Mathematics**

Assessment Unit C3

assessing

Module C3:

Core Mathematics 3



\*AMC31\*

[AMC31]

**THURSDAY 30 MAY, MORNING** 

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

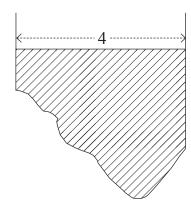
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

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 An engineer wishes to know roughly how much water is in a drainage channel. **Fig. 1** below shows the cross section of the channel.



DE 7 Learning

20 7 Loaning

20

20

DED , Learning

20 7 Learning

Learning

Constitution

Research

DED , Learning

D 7 Learning

200 1 Learning

Fig. 1

The drainage channel is straight.

It is 4 m wide and 500 m long.

The depth d metres at a distance s metres from one bank is shown in the table below.

S	0	1	2	3	4
d	1.6	2.4	3.8	5.0	3.7

Use Simpson's Rule to find an approximate area of the cross section and hence the approximate volume of water in the drainage channel.

[You may assume that the cross section's area is constant.] [5	]
	• •
	• •

11787

	[Turn over
11787	[Turn over

Comments of the control of the contr



Solve the equation $ 5x-1 =8$	[
	•••••
	• • • • • • • • • • • • • • • • • • • •
	•••••

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

DED , Lecombry

Remarks

G.

Learning Research

Dayling Learning Research

Proventing J. Learning Revolution

Louving
Reserving
J. Louving
Reserving

Roserdo

Por Roserdo

Remarks

Population

Remarding

J. Serving

Remarding

Remarding

Remarks

Parenting

Tuesday

G:



<b>(b)</b> Simplify	$\frac{x^2 - 9}{4x^2 - 16x - 20} \ .$	$\div \frac{2x^2 + 7x + 3}{4x - 20}$	
			••••••
•••••			
		•••••	



	$(1+2x)^{-3}$
in	ascending powers of $x$ , up to and including the term in $x^3$ [5]
••••	
•••	
•••	
• • •	
•••	
• •	
• • •	

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Theoreting

Pleasering

Theoreting

Theoreting

Theoreting

De p Learning

| Commission | C

D 7 Learning

Researche

Powerfor

Research

Research

Research

Research

Research

De paratria

De l'entre le l'entre

Daning Leaving

Research

J. Learning

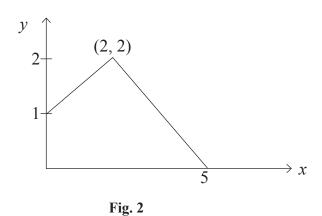
G. Rosensin

Remarks

A Learning

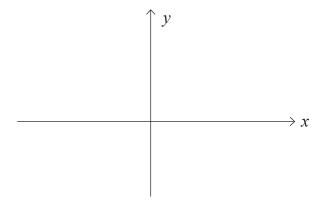


4 (a) The graph of the function y = f(x) is sketched in Fig. 2 below.

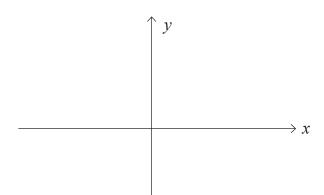


On the axes below, sketch the graphs of

(i) 
$$y = 4 + f(-x)$$
 [2]



(ii) 
$$y = 3f(x-1)$$
 [2]



[Turn over

(b)	Write $6r^3 - 3r^2 + 3r - 23$	
	$\frac{6x^3 - 3x^2 + 3x - 23}{(2x - 3)(x + 1)}$	
	in partial fractions. [8]	
		,
		,
		,
11787		

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Rowards

G. Rowerter

De p Learning

| Commission | C

D 7 Learning

Researche

Powerfor

Research

Research

Research

Research

Research

De paratria

De l'entre le l'entre

Daning Leaving

De leaveling

J. Learning

G. Rosensin

Remarks

A Learning



_	
	[Turn over
11787	Turn over



	$\cot \theta + \tan \theta \equiv \sec \theta \csc \theta $ [5]

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Remarks

G.

Learning Research

Dayling Learning Research

Proventing J. Learning Revolution

De planting
Remorting
Planting
Remorting
Remorting

Danserthe Danser

Described Research

De leaveling

J. Learning

G. Rosensin

Reading Journal

Remarding

J. Serving

Remarding

Remarding

Remarks

Parenting

Tuesday

G:



(0)	Solve $2\sec^2\theta$	$\theta$ – 5tan $\theta$ = 0
	for $0 \le \theta \le \pi$	[4]
	•••••	
		[Turn o



	$x = \cot \theta - 2 \qquad \qquad y = 6\sin \theta + 1$
(i)	Find the Cartesian equation of this curve.

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Rowards

G. Rowerter

De p Learning

| Commission | C

D 7 Learning

Researche

Powerfor

Research

Research

Research

Research

Research

De paratria

De l'entre le l'entre

Daning Leaving

De leaveling

J. Learning

G. Rosensin

Remarks

A Learning

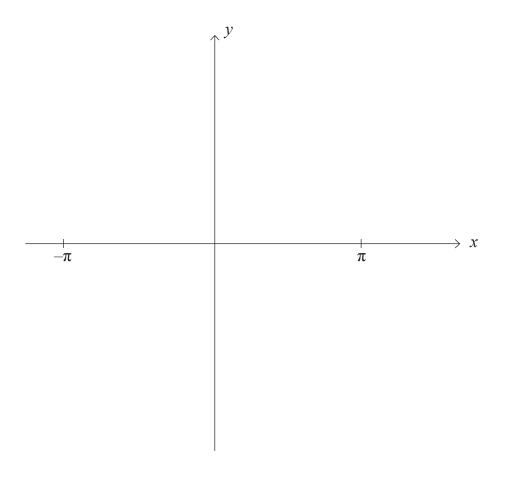


07 =	
Remarding i	
7	
GE Rowarding I	
CE	
Rowarding I	
9	
seming	
GE Rewarding I	
25	
Rewarding I	
9	
oming	
0	
GG Researching I	
rismarung i	
9	
-	
GG Rewarding I	
Rewarding I	
eming	
GG Rowarding I	
Rewarding I	
9	
ال	
eming	
Rewarding I	
25	
Rewarding I	
<b>D</b>	
seming	
GE Rewarding I	
25	
Rewarding I	
Ð	
GE Rewarding I	
Hewarong I	
9	
aming	
GG Rewarding I	
risma-sary.	
F)	
Distribution of the Community of the Com	
GG Remarking I	
GG Remarking I	
GE Remarking I	
GE Remarking I	
GE Remarking I	
Researching i	
Researching i	
Researching i	
Researching i	
According 1  According 1  According 1  According 1  According 1  According 1	
Researching i	
Rewarding I  Rewarding I  Rewarding I  Rewarding I  Rewarding I	
Rewarding I  Rewarding I  Rewarding I  Rewarding I  Rewarding I	
Remarkey I  Remarkey I  Remarkey I  Remarkey I  Remarkey I	
Anwardery I  Anwardery I  Anwardery I  Anwardery I  Anwardery I  Anwardery I	
Anwardery I  Anwardery I  Anwardery I  Anwardery I  Anwardery I  Anwardery I	
Remarkey I  Remarkey I  Remarkey I  Remarkey I  Remarkey I	
Rewarding I	
Rewarding I	
Rewarding I	
Researching I	
Researching I	
Researching I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I  Property I  Proper	
Remarkey I  Property I  Proper	
Remarkey I  Property I  Proper	
Remarkey I	
Remarkey I	
Remarkey 1  Parties of the control o	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	
Remarkey I	

11787

(ii) State the equation of the asymptote to this curve. [1]

**(b)** On the axes below, sketch the graph of  $y = \csc x$  for  $-\pi \le x \le \pi$  [2]



[Turn over



7 (a) (i)	Differentiate $5x \sec x$ [3	]
		•••
		• • •
		• ••
		. <b></b>
		· ••
		· ••
		. <b></b>
		· ••
		. <b></b>
		<b>.</b>
		••
		••
		• • •
		•••
		• • •
		· ••
		, <b></b>
		· ••
		· ••
		· ••
11787		

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Remarks

G. Rowerte

Learning Research

Dayling Learning Research

Proventing J. Learning Revolution

Louving
Reserving
J. Louving
Reserving

Roserdo

Por Roserdo

Remarks

Population

Remarding

J. Serving

Remarding

Remarding

Remarked 20 1 Loaning

Research

G:



(ii)	Differentiate $\frac{e^{4x}}{\cos 3x}$	[5]
		· · · · · · ·
		· · · · · · ·
		· · · · · · ·
		· · · · · · ·
		· · · · · · ·
		· · · · · · ·
11787	[Tur	n over



$y = \ln \sqrt{1 + \sin z}$	$\overline{x}$
at the point where $x = \pi$	

Partity

Research

Partity

Research

Research

Research

Research

Learning Research

20 7 Lecarding

Theoreting

Pleasering

Theoreting

Theoreting

Theoreting

De p Learning

| Commission | C

Daning Research

Powerfor

Research

Research

Research

Research

Research

Danserthe Danser

De l'entre le l'entre

Daning Leaving

Research

J. Learning

G. Rosensin

Remarks

A Learning



8	(a)	Find $\int \tan^2 x + 1 + \frac{3}{2x} - 5e^{-x} dx$
		$\int_{0}^{\infty} 2x$ [5]
		[Turn over
11787		

Comments of the control of the contr



**(b)** The entrance to a ghost train ride at an amusement park can be modelled as part of the area bounded by the curve

$$y = 2\sin 6x$$

20 7 Learning

20 7 Loaning

20

and the x-axis, as shown in **Fig. 3** below.

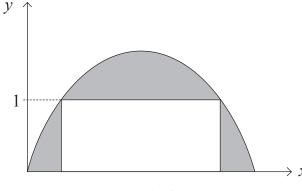


Fig. 3

The shaded area is to be painted.

Find this area.	[9]
	•••••••••••••••••••••••••••••••••••••••
	······································

11787





DO NOT WRITE ON THIS PAGE			
		For Exa	miner's
		For Exa use of Question Number	miner's only Marks
		Question	only
		Question Number	only
		Question Number  1 2 3	only
		Question Number  1 2 3 4	only
		Question Number  1 2 3 4 5	only
		Question Number  1 2 3 4 5	only
		Question Number  1 2 3 4 5	only
		Use 6   Question   Number   1   2   3   4   5   6   7   8     Total	only
	Examiner Number	Use 6   Question   Number   1   2   3   4   5   6   7   8	only
	Examiner Number	Use 6   Question   Number   1   2   3   4   5   6   7   8     Total	only
Permission to reproduce all copyright material has been applied for.  In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.	Examiner Number	Use 6   Question   Number   1   2   3   4   5   6   7   8     Total	only

