

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

“*”Barcode Area”*”
Front Page Bar Code

09 JUNE 2020 (p.m.)

FILL IN ALL THE INFORMATION REQUESTED CLEARLY IN CAPITAL LETTERS.

TEST CODE

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SUBJECT PURE MATHEMATICS – UNIT 1 – Paper 032

PROFICIENCY ADVANCED

REGISTRATION NUMBER

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SCHOOL/CENTRE NUMBER

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NAME OF SCHOOL/CENTRE

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CANDIDATE’S FULL NAME (FIRST, MIDDLE, LAST)

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DATE OF BIRTH

D	D	M	M	Y	Y	Y	Y
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SIGNATURE _____

“*”Barcode Area”*”
Current Bar Code

“*”Barcode Area”*”
Sequential Bar Code

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FORM TP 2020328



TEST CODE 02134032

MAY/JUNE 2020

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

PURE MATHEMATICS

UNIT 1 – Paper 032

ALGEBRA, GEOMETRY AND CALCULUS

1 hour 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This examination paper consists of THREE sections.
2. Each section consists of ONE question.
3. Answer ALL questions.
4. Write your answers in the spaces provided in this booklet.
5. Do NOT write in the margins.
6. Unless otherwise stated in the question, any numerical answer that is not exact MUST be written correct to three significant figures.
7. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
8. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

Examination Materials Permitted

Mathematical formulae and tables (provided) – Revised 2012

Mathematical instruments

Silent, non-programmable electronic calculator

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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SECTION A

Module 1

Answer this question.

1. (a) Prove by mathematical induction that $\sum_{t=1}^n (2t - 1) = n^2, n \in \mathbb{N}$.

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[8 marks]

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(b) Solve the equation $3(2^{x+4}) = 360$.

[4 marks]

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- (c) Using the Remainder Theorem, or otherwise, show that

$$x^6 - b^6 = (x + b)(x - b)(x^2 - bx + b^2)(x^2 + bx + b^2).$$

[8 marks]

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Module 2

Answer this question.

2. (a) Prove that $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = \frac{2}{\sin \theta}$

[5 marks]

(b) A curve is defined parametrically as $x = 3 \sin \theta, y = 4 \cos \theta$.

(i) Show that the Cartesian equation of the curve is $\frac{x^2}{9} + \frac{y^2}{16} = 1$.

[3 marks]

(ii) Show that the curve and the line $y = x$ intersect at $x = \frac{12}{5}$ and $x = -\frac{12}{5}$.

[2 marks]

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- (iii) Given that the gradient of the curve is $\frac{-16x}{9y}$, determine the equation of ONE tangent to the curve at a point where it intersects the line $y = x$.

[4 marks]

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- (c) Solve $\sec^2 x - 2 \tan x = 4$ for values $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$.

[6 marks]

Total 20 marks

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SECTION C

Module 3

Answer this question.

3. (a) Water is dripping from a tap into a cylindrical bowl of radius, $r = 10$ cm. The depth, h cm, of the water in the bowl at time, t seconds, is given by $h = \sqrt{1+4t}$.

Determine the rate of change of the volume of water in the bowl at $t = 2$ seconds.

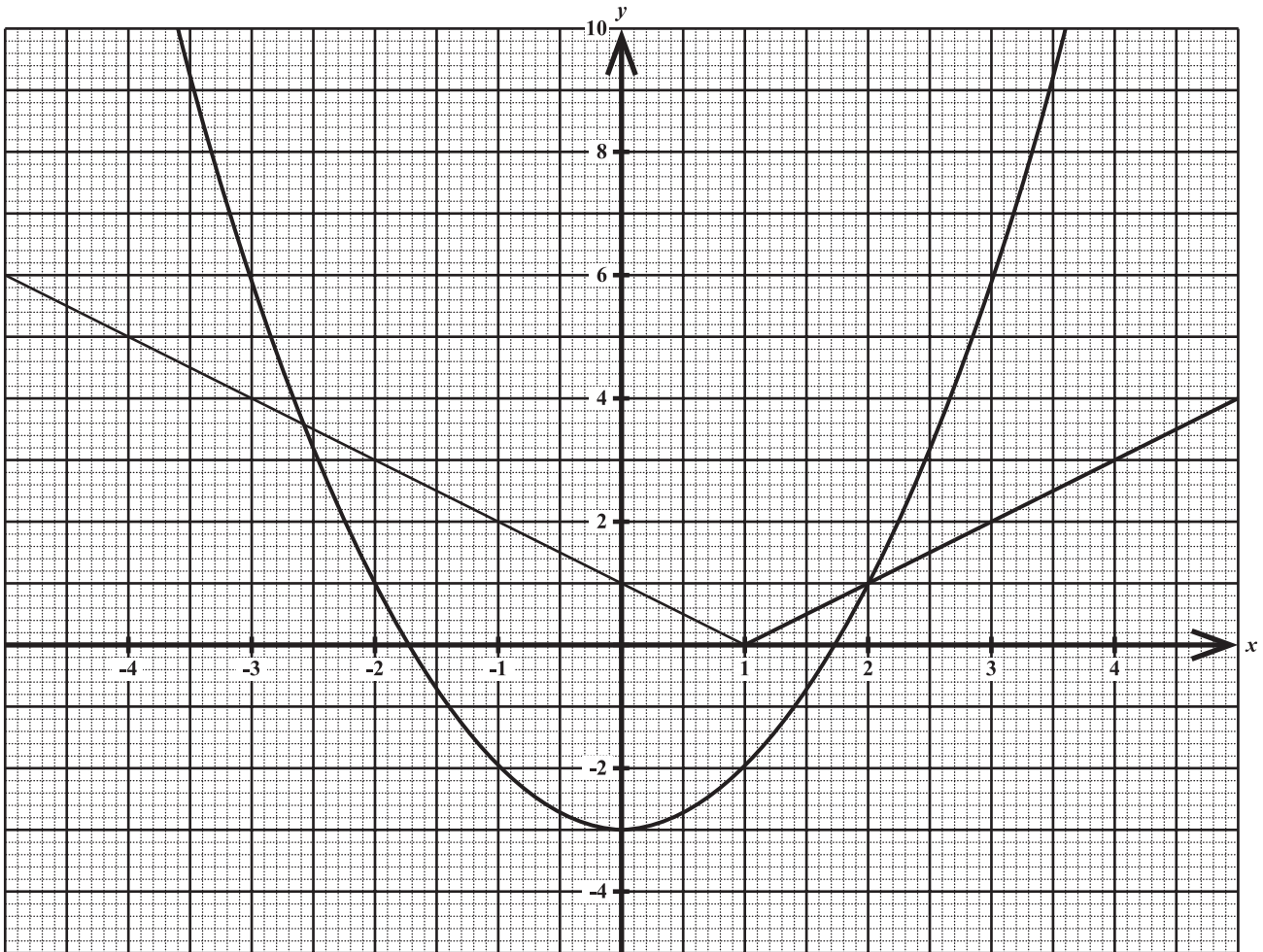
[4 marks]

- (b) Differentiate $f(x) = \sqrt{x^2 + 1}$ from first principles.

[7 marks]

- (c) The diagram below shows the graphs of $y = |x - 1|$ and $y = x^2 - 3$.

Calculate the area enclosed by the graphs.



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[9 marks]

Total 20 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

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EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No.

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EXTRA SPACE

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CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

1. **Fill in all the information requested clearly in capital letters.**

TEST CODE:

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SUBJECT: PURE MATHEMATICS – UNIT 1 – Paper 032

PROFICIENCY: ADVANCED

REGISTRATION NUMBER:

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FULL NAME: _____
(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**
3. **Keep it in a safe place until you have received your results.**
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INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____