



CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

PURE MATHEMATICS

UNIT 2 – Paper 032

ANALYSIS, MATRICES AND COMPLEX NUMBERS

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 lined 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.

SECTION A

Module 1

Answer this question.

1. (a) Use the trapezium rule with 5 ordinates (4 divisions) to estimate $\int_0^1 \sqrt{1+x^3} dx$.

[4 marks]

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- (b) A complex number is given as $z = 4 - 4i$. Show that $z^8 = 32^4$.

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[6 marks]

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- (c) Show that the equation of the tangent to the curve

$$\tan(x + y) = \sin(xy) \text{ at the point } (\sqrt{\pi}, -\sqrt{\pi}) \text{ is the line } y = \frac{\sqrt{\pi} - 1}{1 + \sqrt{\pi}}x - \frac{2\pi}{1 + \sqrt{\pi}}.$$

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[10 marks]

Total 20 marks

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“*”Barcode Area”
Sequential Bar Code

SECTION B

Module 2

Answer this question.

2. (a) A geometric progression is such that $S_{\infty} = 9$ and $S_2 = 5$. Given that the common ratio is greater than 0, calculate S_1 of the series.

[10 marks]

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- (b) (i) Use the Intermediate Value Theorem to show that $f(x) = (1 + x)e^x - 2$ has a root in the interval $[0, 1]$.

[3 marks]

- (ii) Use three iterations of the Newton–Raphson method with the initial estimate $x_1 = 0$ to approximate the root of f in the interval $[0, 2]$.

[5 marks]

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- (c) Determine the coefficient of the term in x^5 in the binomial expansion of $(3x + 4)^9$.

[2 marks]

Total 20 marks

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SECTION C

Module 3

Answer this question.

3. (a) A committee of six individuals is to be formed from nine women and three men.
- (i) In how many ways can the committee be formed with at least one man included?

[4 marks]

- (ii) What is the probability that the committee will include five women?

[4 marks]

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- (b) How many arrangements can be made using the letters of the word
LEATHERETTE?

[3 marks]

- (c) Find the general solution of the differential equation $4y'' + 5y' + y = e^x$.

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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.