

FORM TP 2015266



TEST CODE **02134032**

MAY/JUNE 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

PURE MATHEMATICS

UNIT 1 – Paper 032

ALGEBRA, GEOMETRY AND CALCULUS

1 hour 30 minutes

10 JUNE 2015 (p.m.)

5266

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This examination paper consists of THREE sections.
2. Answer ALL questions from the THREE sections.
3. Each section consists of ONE question.
4. Write your solutions, with full working, in the answer booklet provided.
5. Unless otherwise stated in the question, any numerical answer that is not exact MUST be written correct to three significant figures.

Examination Materials Permitted

Graph paper (provided)
Mathematical formulae and tables (provided) – Revised 2012
Mathematical instruments
Silent, non-programmable, electronic calculator

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02134032/CAPE 2015



SECTION A

Module 1

Answer this question.

1. (a) Let p and q be two propositions.

(i) Copy and complete the truth table below.

p	q	$\sim p$	$\sim q$	$p \vee q$	$\sim p \wedge \sim q$	$(p \vee q) \vee (\sim p \wedge \sim q)$
T	T					
T	F					
F	T					
F	F					

[5 marks]

(ii) Hence, or otherwise, state if $(p \vee q) \vee (\sim p \wedge \sim q)$ is a tautology. Justify your response. [1 mark]

(b) Solve the equation $\log_4(x^2 + 1) - \log_2(2x - 1) = 0$. [8 marks]

(c) Let $x, y, k \in \mathbb{R}$. An operation $*$ is defined as $x * y = \frac{xy}{x + y - k}$ where $x + y \neq k$.

Show that $*$ is associative.

[6 marks]

Total 20 marks

SECTION B

Module 2

Answer this question.

2. (a) $ABCD$ is a parallelogram such that A has coordinates $(0, 0)$. The position vectors B and D are \mathbf{a} and \mathbf{b} respectively. Using vector algebra show that

$$(AC)^2 + (BD)^2 = (AB)^2 + (BC)^2 + (DC)^2 + (AD)^2. \quad [7 \text{ marks}]$$

- (b) The equation of a circle, C_1 , is given by $x^2 + y^2 - 4x - 6y + 3 = 0$.

Find the equation of the tangent to C_1 at the point $(5, 2)$. [6 marks]

- (c) Angles $2A$ and $2B$ are obtuse angles with $\sin(2A) = \frac{3}{5}$ and $\cos(B) = \frac{4}{5}$.

Without calculating the value of A and B find the EXACT value of

(i) $\cos(2A)$ [2 marks]

(ii) $\cos(A + B)$. [5 marks]

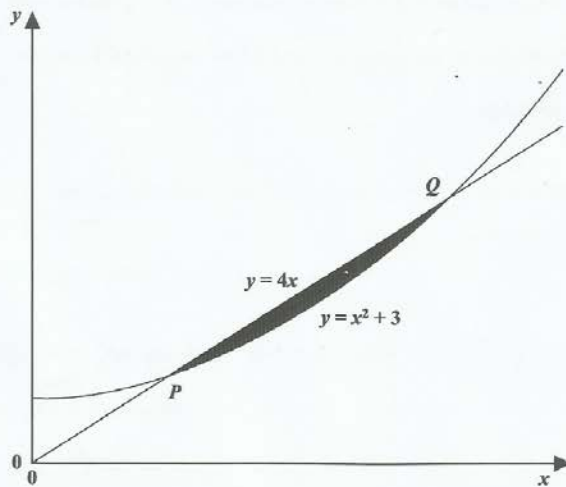
Total 20 marks

SECTION C

Module 3

Answer this question.

3. (a) Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos^2(2x)}{x^2}$. [4 marks]
- (b) A spherical shaped ice cream is melting in such a way that its volume is decreasing at a rate of 2 cm^3 per minute. Find the rate at which the radius decreases when the diameter is 8 cm. [6 marks]
- (c) The diagram below (not drawn to scale) is a sketch of the curve $y = x^2 + 3$ and the line $y = 4x$.



- (i) Find the coordinates of P and Q , the points of intersection of the curve and the line. [5 marks]
- (ii) Calculate the volume of the solid generated when the shaded region is rotated completely about the x -axis. [5 marks]

Total 20 marks

END OF TEST

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