

HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2011
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT 1 – TEST 1
1 hour 20 minutes

This examination paper consists of 2 printed pages.
 This paper consists of 7 questions.
 The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

- (i) Write your name clearly on each sheet of paper used
- (ii) Answer **ALL** questions
- (iii) Do **NOT** do questions beside one another
- (iv) Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures

EXAMINATION MATERIALS ALLOWED

- (i) Mathematical formulae
- (ii) Scientific calculator (non-programmable, non-graphical)

1. Prove that for $a \in \mathbb{R}$, and $b \in \mathbb{R}$, $a^2 + b^2 \geq 2ab$. [3]

Total 3 marks

2. Prove by mathematical induction that $8^n + 6$ is divisible by 7 $\forall n \in \mathbb{Z}^+$. [8]

Total 8 marks

3. Given that $(x + 2)$ is a factor of $15x^3 + 8mx^2 - mx - 16$
 (i) Find the value of m . [3]

(ii) Hence, or otherwise, solve for x , the equation $15x^3 + 8mx^2 - mx - 16 = 0$. [5]

Total 8 marks

4. Solve for y , the equations

(a) $5^y = 4$ [3]

(b) $2^{4y} - 8(2^y) = 0$ [5]

(c) $\log_3 y = 4 \log_y 3$ [6]

Total 14 marks

5. The function f is defined by $f: x \rightarrow 1 + 4x - x^2$, $x \geq 2$, $x \in \mathbb{R}$.

(i) Express f in the form $a(x + h)^2 + k$, where a , h and k are constants. [3]

(ii) Sketch the graph of f , showing its main features. [3]

(iii) State the range of f . [1]

(iv) Giving clear and concise reasons to support your answer, is f

(a) injective? [2]

(b) surjective? [2]

Total 11 marks

6. The equation $2x^2 + 4x + 3 = 0$ has real roots α and β . Without solving the equation,
 find the equation whose roots are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$. [6]

Total 6 marks

7. Solve for x , the following

(a) $\frac{2x - 4}{x - 1} > 3$, $x \neq 1$ [5]

(b) $\left| \frac{x + 2}{4 - 3x} \right| = 1$, $x \neq \frac{4}{3}$ [5]

Total 10 marks

END OF TEST