

HARRISON COLLEGE INTERNAL EXAMINATION APRIL 2022
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT I – TEST 3 **PREVIEW**
Time: 1 hour and 20 minutes

NAME OF STUDENT: _____
SCHOOL CODE: 030014
DATE: _____

This examination paper consists of **8** printed pages and **1** blank page for extra working.

The paper consists of **3** questions.

The maximum mark for this examination is **60**.

INSTRUCTIONS TO CANDIDATES

1. Write your name clearly in the space above.
2. Answer **EACH** question in the **SPACE PROVIDED. SHOW ALL WORKING.**
3. 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.
4. Number your questions **carefully and identically to those on the question paper.**
5. 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

1. Mathematical formulae
 2. Scientific calculator (non-programmable, non-graphical)
-

1. Evaluate

(a) (i) $\lim_{x \rightarrow 1} \frac{x^3 - 2x^2 + 1}{x - 1}$

Ans. -1

(ii) $\lim_{x \rightarrow \infty} \frac{4x^2 + 1}{2 + 3x^2}$

Ans. $\frac{4}{3}$

(b) The function f on \mathbb{R} is defined by $f(x) = \begin{cases} 2x^2, & x < 1 \\ 4 - x, & x \geq 1 \end{cases}$

Graph f , and use the graph to determine the following:

(i) $\lim_{x \rightarrow 1^+} f(x)$

Ans. 3

(ii) $\lim_{x \rightarrow 1^-} f(x)$

Ans. 2

(iii) $\lim_{x \rightarrow 1} f(x)$

Ans. DNE

2. (a) From first principles, find the values of the derivative of the function
 $f(x) = -x^2$.

Ans. $-2x$

- (b) Differentiate with respect to x , $\sin x \cos x$.

Ans. $\cos^2 x - \sin^2 x$

(c) The curve $y = hx^2 - \frac{k}{x}$ passes through the point $P(1,1)$ and has a gradient of 5 at P . Find

(i) the values of the constants h and k .

Ans. 2, 1

(ii) the equation of the tangent to the curve at the point where $x = \frac{1}{2}$.

Ans. $2y - 12x + 9 = 0$

(d) The equation of a curve is given by $f(x) = x^3 - 3x^2 + 4$

(i) Find $f'(x)$.

Ans. $3x^2 - 6x$

(ii) Find the stationary points of f .

Ans. (0, 4); (1, 2); (2, 0)

(iii) Determine the nature of the stationary points of f .

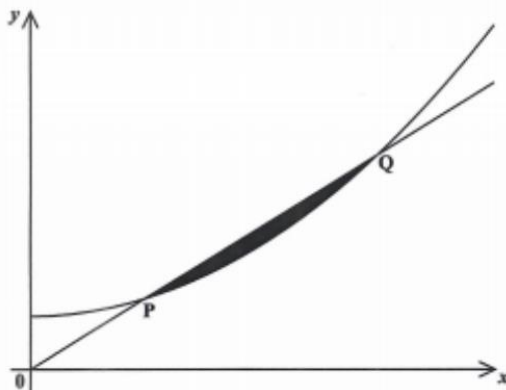
Ans. Max; Inflex; Min

(iv) Sketch the curve.

3. (a) By using the substitution $u = 1 - 2x^3$, evaluate $\int_{-1}^0 x^2(1 - 2x^3)^4 dx$.

Ans. $\frac{121}{15}$

(b) The diagram below, not drawn to scale, shows the graphs of $y = x^2 + 3$ and the line $y = 4x$.



(i) Find the coordinates of **P** and **Q** at which the curve and line intersect. **Ans.** (1, 4); (3, 12)

(ii) Find the area of the shaded region. **Ans.** $\frac{4}{3}$ sq. units

(iii) Find the volume generated when the shaded area is rotated completely about the x -axis. **Ans.** $\frac{304}{15} \pi$ cubic units

End of Examination

EXTRA SPACE

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

Question No.