

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

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

This examination paper consists of **9** 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)
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1. Evaluate

(a) (i) $\lim_{x \rightarrow 5} \frac{2x^2 - 7x - 15}{x - 5}$

[3]

(ii) $\lim_{x \rightarrow \infty} \frac{7 - 3x}{6x + 5}$

[3]

(iii) $\lim_{x \rightarrow 0} \frac{\sin 5x}{x}$

[2]

(b) The function f on \mathbb{R} is defined by $f(x) = \begin{cases} 2x + 3, & x > 5 \\ -1 + 4x, & x \leq 5 \end{cases}$

(i) Find $\lim_{x \rightarrow 5^+} f(x)$ [2]

(ii) Find $\lim_{x \rightarrow 5^-} f(x)$ [2]

(iii) Determine whether $f(x)$ is continuous or not at $x = 5$. [2]

Total: 14 marks

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

[5]

(b) Differentiate with respect to x , $3x^2\cos x$. [3]

(c) F is the point on the curve $y = x^3 - kx + 7$ where $x = 2$ and the gradient is -3 . Find

(i) the value of k . [3]

(ii) the value of $\frac{d^2y}{dx^2}$ at F . [2]

(iii) the equation of the normal to the curve at F .

[3]

(d) Kevin hit a tennis ball into the air. The path of the ball can be modelled by the equation:

$$y = 2x^3 - 15x^2 + 24x + 6$$

(i) Find $\frac{dy}{dx}$.

[1]

(ii) Using your solution to part (i), find the coordinates of the stationary points.

[5]

- (iii) Determine when the tennis ball
- a) reaches its maximum point
 - b) falls to its lowest point

[6]

- (iv) Sketch the curve $y = 2x^3 - 15x^2 + 24x + 6$, for $0 \leq x \leq 5$, showing clearly, the maximum and minimum points of the tennis ball.

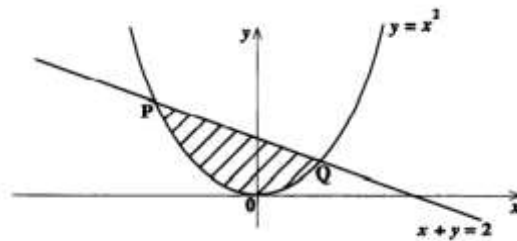
[3]

Total: 31 marks

3. (a) By using the substitution $u = x - 2$, evaluate $\int_2^3 x\sqrt{x-2} dx$.

[6]

(b) The diagram below shows the graphs of $y = x^2$ and $x + y = 2$.



(i) Find the coordinates of P and Q .

[5]

(ii) Find the area of the shaded region

[4]

Total: 15 marks

End of Examination

EXTRA SPACE

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

Question No.