

HARRISON COLLEGE INTERNAL EXAMINATION, 2019
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT

PURE MATHEMATICS

UNIT 1 – TEST 3

Time: 1 Hour & 20 minutes

This examination paper consists of 2 printed pages.

The paper consists of 3 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write your name clearly on each sheet of paper used.
2. Answer **ALL** questions.
3. Number your questions carefully and do **NOT** write your solutions to different questions beside one another.
4. 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. Electronic calculator (non – programmable, non – graphical)

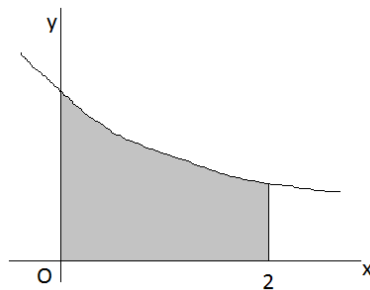
1. (a) Determine the real values of x for which the function
$$f(x) = \frac{x}{x^2 - 5x - 14}$$
 is continuous. [3]
- (b) Evaluate (i) $\lim_{x \rightarrow \frac{1}{3}} \frac{1 - 9x^2}{1 - 3x}$ [3]
(ii) $\lim_{x \rightarrow 0} \frac{3 \sin 4x}{\sin 3x}$ [4]
- (c) Differentiate from first principles $y = x\sqrt{x}$ [7]
- (d) The function f is defined by $f = \begin{cases} 2x + 1 & x \leq 3 \\ 10 - ax & x > 3 \end{cases}$
Find (i) $\lim_{x \rightarrow 3^-} f(x)$ [1]
(ii) the value of a so that the function is continuous [2]

TOTAL 20 marks

2. (a) A curve has equation $y = \frac{1}{x-3} + x$.
- (i) Write down expressions for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. [2]
- (ii) Find the coordinates of the maximum point A and the minimum point B on the curve. [5]
- (b) Given that $y = \frac{\cos x}{1-\sin x}$, find $\frac{dy}{dx}$, simplifying your answer. [4]
- (c) Given that $y = (x+3)\sqrt{2x-3}$.
- (i) Show that $\frac{dy}{dx} = \frac{3x}{\sqrt{2x-3}}$ [4]
- (ii) Find the equation of the normal where $x = 2$. [3]
- (d) The parametric equation of a curve are $x = t^2 - 4$ and $y = t^3 - 3t$
Find an expression for $\frac{dy}{dx}$. [4]

TOTAL 22 marks

3. (a) (i) Using the substitution $u = 3 + x^2$, find $\int x(\sqrt{3+x^2}) dx$ [5]
- (ii) Evaluate $\int_{\pi/6}^{\pi/2} (3 \cos x + 2 \sin 2x) dx$ [5]
- (b) The diagram shows part of the curve $y = \frac{1}{(2x+1)^{\frac{1}{3}}}$. The shaded region is bounded by the curve and the lines $x = 0, x = 2$ and $y = 0$.



- (i) Find the area of the shaded region. [4]
- (ii) The shaded region is rotated completely about the x-axis.
Find the volume of the solid formed. [4]

TOTAL 18 marks

END OF EXAMINATION