

HARRISON COLLEGE INTERNAL EXAMINATION, 2019 (PREVIEW)

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)
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1. (a) Determine the real values of x for which the function

$$f(x) = \frac{x+3}{x^2-2x-8} \text{ is continuous. } [x \neq 4, x \neq -2] \quad [3]$$

(b) Evaluate (i) $\lim_{x \rightarrow \frac{1}{4}} \frac{1-16x^2}{1-4x} \quad [2] \quad [3]$

(ii) $\lim_{x \rightarrow 0} \frac{5 \sin 6x}{\sin 4x} \quad \left[\frac{15}{2}\right] \quad [4]$

(c) Differentiate from first principles $y = \sqrt{x} \quad [7]$

(d) The function f is defined by $f = \begin{cases} 3x+1 & x \leq 5 \\ 6-ax & x > 5 \end{cases}$

Find (i) $\lim_{x \rightarrow 5^-} f(x) \quad [16] \quad [1]$

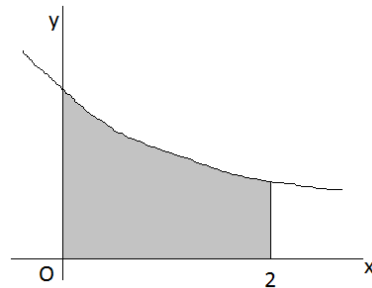
(ii) the value of a so that the function is continuous. $[-2] \quad [2]$

TOTAL 20 marks

2. (a) A curve has equation $y = \frac{1}{x-2} + x$.
- (i) Write down expressions for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. [$-(x-2)^{-2} + 1$; $2(x-2)^{-3}$] [2]
- (ii) Find the coordinates of the maximum point A and the minimum point B on the curve. [(1, 0) max; (3, 4) min] [5]
- (b) Given that $y = \frac{\sin x}{1+\cos x}$, find $\frac{dy}{dx}$, simplifying your answer. $\frac{1}{1+\cos x}$ [4]
- (c) Given that $y = (x+4)\sqrt{x-4}$.
- (i) Show that $\frac{dy}{dx} = \frac{3x-4}{2\sqrt{x-4}}$ [4]
- (ii) Find the equation of the normal where $x = 8$. [$y - 24 = -\frac{1}{5}(x - 8)$] [3]
- (d) The parametric equation of a curve are $x = t^3 - 3$ and $y = t^2 - 5t$
Find an expression for $\frac{dy}{dx}$. $\frac{2t-5}{3t^2}$ [3]

TOTAL 21 marks

3. (a) (i) Using the substitution $u = 5 + x^2$, find $\int 3x(\sqrt{5+x^2}) dx$ [5]
 $(5+x^2)^{\frac{3}{2}} + c$
- (ii) Evaluate $\int_{\pi/6}^{\pi/2} (2 \sin x + 3 \cos 2x) dx$ $\frac{\sqrt{3}}{4}$ [5]
- (b) The diagram shows part of the curve $y = \frac{1}{(3x+1)^{\frac{1}{3}}}$. 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. [1.33] [4]
- (ii) The shaded region is rotated completely about the x-axis.
Find the volume of the solid formed. [0.91π] [5]

TOTAL 19 marks

END OF EXAMINATION