HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2016

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION

SCHOOL BASED ASSESSMENT PREVIEW

PURE MATHEMATICS

UNIT 1 – TEST 3

1 hour 20 minutes

This examination paper consists of **2** printed pages.

This paper consists of **10** questions.

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

EXAMINATION MATERIALS ALLOWED

1. Mathematical formulae

2. Scientific calculator (non-programmable, non-graphical)

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1) a. Find

$$\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$$ [3]

b. Find

$$\lim_{x \to 0} \frac{sin5x}{sin2x}$$ [5]

2) Given that

$$\lim_{x \to 5}[3f(x)] = 11, evaluate \ \lim_{x \to 5}[f(x) - 4x]$$ [5]

3) Determine the real values of x for which the function

$$f(x) = \frac{5x}{|9x| - 4} \ is \ continuous.$$ [3]

4) Differentiate with respect to x, from first principles, the function $f(x) = 6x^2 - 3x + 15$. [5]

5) Find the equation of the normal to the curve $y = x^4 - 7$ at the point for which $x = -3$ [6]

6) A curve has equation

$$y = \frac{x^2 + 5}{3\sqrt{x}}, show\ that\ \frac{dy}{dx} = \frac{3x^2 - 5}{6\sqrt{x^3}}.$$

[5]

7) The gradient of a curve is given by $f'(x) = 6x^2 - 4x$. The curve passes through the point$(3, 24)$.
   a. Find the equation of the curve. [4]
   b. Find the coordinates of the stationary points and determine their nature. [6]

8) If $\int_0^b (2x - 1)dx = \frac{1}{3}\int_0^b (2x + 1)\ dx\ and\ b > 0, find\ the\ value\ of\ b.$ [4]

9) Determine the exact value of the integral
$\int_0^8 \sqrt{6x + 1}\ dx\ by\ using\ the\ substitution\ u = 6x + 1$ [6]

10) A robotic arm is programmed to use a reciprocating saw to cut decorative pieces from a thin sheet of metal. The path that the saw blade traces out is the curve $y = sint, 0 \le t \le 2\pi$, after t seconds.
   a. Sketch the curve traced out by the saw blade. [3]
   b. Calculate the exact area of a side of each decorative piece. [5]

Answers

1) a. 8   b. $\frac{5}{2}$

2) $\frac{-49}{3}$

3) $x \in \mathbb{R}, x \neq \frac{-4}{9}, \frac{4}{9}$

4) $12x - 3$

5) $y = \frac{1}{108}x + \frac{2665}{36}$

6) $proof$

7) a. $y = 2x^3 - 2x^2 - 12$ b. $(0, -12)\,maximum$ $\left(\frac{2}{3}, \frac{-332}{27}\right)\,minimum$

8) $b = 2$

9) 38

10) Sine curve $y = sint\ from\ t = 0\ to\ t = 2\pi$

     Area $= 4\ units^2$ [because of symmetry find area above the horizontal axis and multiply by 2]