THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

BACHELOR OF SCIENCE EXAMINATION

SEMESTER I – 2018 DECEMBER

PROGRAMME:	**MANAGEMENT INFORMATION SYSTEMS**
COURSE NAME:	**CALCULUS I**
CODE:	**MATH3601**
YEAR GROUP:	**THREE**
DATE:	**TUESDAY, 2018 DECEMBER 4**
TIME:	**9:00 A.M. – 11:00 A.M.**
DURATION:	**2 HOURS**
EXAMINATION TYPE:	**FINAL**

This Examination paper has **9** *pages*

INSTRUCTIONS:

1. **ANSWER ALL QUESTIONS FROM SECTION A**
2. **SECTION B CONSISTS OF FOUR (4) QUESTIONS. ANSWER ANY TWO (2)**

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SECTION B

Instruction: In the booklet provided, answer any TWO (2) questions from this section.

Question 1

A. Evaluate the following limits:

i. $\lim_{x \to -3} \sqrt{2x^2 + 7}$ ***(2 marks)***

ii. $\lim_{x \to \infty} \frac{3x^5 - 9}{1 - 2x^3 - 7x^5}$ ***(3 marks)***

iii. $\lim_{x \to -3} \frac{x^2 + 6x + 9}{x^2 + 3x}$ ***(5 marks)***

B. Differentiate the following with respect to x:

i. $y = x^2 \ln(2x + 1)$ ***(4 marks)***

ii. $y = \frac{(3x-1)^3}{(8x+1)^5}$ ***(6 marks)***

C. Find all points of discontinuity of the function $f(x) = \frac{9x - 10}{x^3 - 4x}$. ***(6 marks)***

D. The proportion of people in an undeveloped country who have been infected by a certain communicated disease prior to time t is given by $P(t) = 5(2^t)$. What is the average rate of change in proportion between time t = 1 and t = 3. ***(4 marks)***

(Total 30 marks)

Question 2

A. Given the $f(x) = 4x^3 - 15x^2 + 12x - 8$:

i. Find the stationary points *(8 marks)*
ii. Determine the nature of the points *(8 marks)*
iii. Determine the y intercept *(2 marks)*
iv. Find the inflection point *(4 marks)*

B. Hence sketch the graph of $f(x)$ *(8 marks)*

(Total 30 marks)

Question 3

A. Find:

i. $\int \left(x^{\frac{3}{2}} + \frac{6}{x^2} - 5 \right) dx$ *(4 marks)*

ii. $\int \left[\frac{4x^3 - 3x^2}{x^4 - x^3} \right] dx$ *(4 marks)*

iii. $\int x e^{x^2 - 9} dx$ *(6 marks)*

B. Show that $\int_{\frac{1}{2}}^{3} \left(\frac{3x+1}{2x} \right) dx = \frac{3}{2} + \frac{1}{2} ln6$ *(12 marks)*

C. A study of Dutch manufacturers found that the total cost **C.** (in thousands of guilders) incurred by a company for hiring (or firing) **x** workers were approximated by:

$$C = 0.0071x^2.$$

Find the rate of change of costs with respect to workers hired when 100 workers are hired. *(4 marks)*

(Total 30 marks)

Question 4

A. Differentiate $f(x) = 3x^2 - 4x$ from first principles *(6 marks)*

B. Given that $y = \dfrac{x+2}{2x-1}$,

i. Find $\dfrac{d^2y}{dx^2}$ when $x = 0$ *(4 marks)*

ii. Find the equation of the normal to the curve at the point $x = 1$ *(6 marks)*

C. Find the equation of the tangent to the curve $x^3 - 3xy^2 + y^3 = 1$ at the point $(2, -1)$. *(8 marks)*

D. Find $\dfrac{dy}{dx}$ in terms of t for the curve parametrically defined by $x = 3t + 4$ and $y = 6t^3 - 3$. Hence find the point on curve at which the gradient is zero. *(6 marks)*

(Total 30 marks)

END OF EXAMINATION