



THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

BACHELOR OF SCIENCE EXAMINATION

SEMESTER II – 2011 MAY

PROGRAMMES: MANAGEMENT INFORMATION SYSTEMS

COURSE NAME: CALCULUS I
CODE: (MATH3601)

YEAR GROUP: ONE

DATE: MONDAY, 2011 MAY 09

TIME: 9:00 A.M. – 12:00 NOON

DURATION: 3 HOURS

EXAMINATION TYPE: FINAL



This Examination paper has 4 pages

INSTRUCTIONS:

SECTION B: ANSWER ANY TWO (2) QUESTIONS IN THIS SECTION.

SECTION B

Instructions: Answer any **TWO (2)** questions in this section.

Question 1

a) Use first principles differentiation to differentiate the functions:

(i) $f(x) = 1 - 3x^2$ (ii) $f(x) = \frac{-2}{x}$ **(10 marks)**

b) Differentiate the following with respect to x . Where possible, simplify your results.

(i) $y = x^2 + 2\sqrt{x} - 5$

(ii) $5[\log_e(2 + 3x)]$

(iii) $(x^2 + 3)e^{4x}$

(iv) $\frac{3x - 1}{2x + 1}$

(15 marks)

(Total 25 marks)

Question 2

a) A curve has parametric equations given by $x = 2t - 5$
 $y = 4t - t^2$

where x and y are variables and t is the parameter, Find

(i) $\frac{dy}{dx}$ in terms of t **(4 marks)**

(ii) The value of “ t ” at the turning point on the curve. **(2 marks)**

(iii) The coordinates of the turning point **(2 marks)**

- b) A function is defined implicitly by the equation $x^2 + 2xy - 3y^2 = 5$,
find $\frac{dy}{dx}$ in terms of x and y . (6 marks)
- c) Find the equation of the tangent to the curve $y = 2x^2 - 5x + 6$ at the point where $x = 2$
(6 marks)
- d) The Volume of a sphere is given by $V = \frac{4}{3} \pi r^3$. Given that its radius is decreasing at a rate of 5
cm/sec. Find the rate of change of its volume when the radius is 6 cm. (5 marks)

(Total 25 marks)

Question 3

- a) Find (i) $\int [x^3 - 2x + 3\sqrt{x}] dx$ (3 marks)
- (ii) $\int (e^{2x} - 3) dx$ (3 marks)
- (iii) $\int_{-1}^1 (3x - 1)^4 dx$ (5 marks)
- (iv) $\int_0^2 (4x^3 - 3x + 5) dx$ (4 marks)
- b) A curve has gradient given by $\frac{dy}{dx} = 4x + 1$. Find the equation for y , in terms of x , given that
 $y = 3$ when $x = 2$. (5 marks)
- c) A curve has gradient given by $\frac{dy}{dx} = e^x - 2x + 1$. Find the equation for y , in terms of x , given that
 $y = 1$ when $x = 0$ (5 marks)

(Total 25 marks)

Question 4

- a) Find the area under the following curves between the points given.
- $y = 3x^2 + x - 2$ between $x = 1$ and $x = 2$ **(4 marks)**
 - $y = e^{3x}$ between $x = -1$ and $x = 1$ **(4 marks)**
- b) Find the coordinates of the turning point on the curve $y = 5 - 2x + x^2$ and determine its nature **(6 marks)**
- c) A stone is thrown straight up from the roof of a building. The height (in metres) of the stone at any time t (in seconds), is given by
- $$f(t) = -16t^2 + 64t + 80$$
- Find the time the stone will take to reach its maximum height **(3 marks)**
 - What is the maximum height reached? **(2 marks)**
 - By finding the second derivative, indicate why the height is a maximum. **(1 mark)**
- d) The percent of men, age 65 and above, in the workforce of a given country is given by the formula:
- $$f(t) = 0.0135t^2 - 1.126t + 41.2$$
- Find the value of t for which the percent of men, age 65 and above, in the workforce was smallest. **(3 marks)**
 - What is that percent? **(2 marks)**

(Total 25 marks)**END OF EXAMINATION**