UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS/ STATISTICS

UNIVERSITY EXAMINATIONS

SEMESTER I, 2013/14

FIRST YEAR EXAMINATIONS FOR BACHELOR OF SCIENCE

(FM, B.ECON & GEN)

CALCULUS I

DATE: 10TH DECEMBER 2013

TIME: 9:00 – 12:00 NOON

Instructions:

i) Attempt five (5) questions.

ii) Show all the working.

Question One

a.) Define the following:

i.) A function f

ii.) The domain D of a function

iii.) The range. (6mks)

b.) Let $f(x) = \frac{x-5}{x^2+4}$. Find the following:

i.) $f(2)$ (2mks)

ii.) $f(a) + f(1)$ (3mks)

c.) Differentiate from first principles: $f(x) = \sqrt{x}$ (6mks)

d.) Find $\int (x^3 - 3x)dx$ (3mks)

Question Two

a.) Let $f(x) = \frac{x}{x+1}$ and $g(x) = \sqrt{x-1}$. Find

i.) $\frac{f(3)}{g(3)}$ (3mks)

ii.) $f(2)g(2)$ (3mks)

b.) For each of the following functions, find the limit if it exists

i.) $\lim_{x\to 0} \frac{2x^3-3x^2+x}{6x^3}$ (3mks)

ii.) $\lim_{x\to \pi} xsinx$ (3mks)

iii.) $\lim_{x\to 2} \frac{x-1}{x^2+x-2}$ (3mks)

c.) Use L'Hopital's rule to evaluate $\lim_{x\to 0} \frac{sinx}{x^2-x}$ (5mks)

Question Three

a.) Let f(x) be a function. When is f(X) said to be continuous at a given point a? (3mks)

b.) Sketch the graph $f(x) = \begin{cases} x+2, & x<0 \\ 2x+2, & x>0 \end{cases}$ and determine the limit of f(x) as x→0 if it exists. (5mks)

c.) Sketch the graph $y=x^2-4$ (12mks)

Question Four

a.) Find the constant k that makes the function continuous at x=a.

$$f(x) = \begin{cases} (x-k)(x+k), & x \leq 2 \\ kx+5, & x>2 \end{cases} \qquad a=2$$ (5mks)

b.) Using the technique of implicit differentiation, find $\frac{dy}{dx}$ of the indicated functions.

i.) $xsiny = ycosx$ (5mks)

ii.) $x^2 + y^2 = 0$ (5mks)

c.) Use the product rule to find the derivative of $2x^3 \cos x$ (5mks)

Question Five

a.) Find all the critical values of the functions below and determine their nature.

i.) $f(x) = x^2(x-4)$ (6mks)

ii.) $f(x) = x^3 - 3x$ (5mks)

b.) Evaluate $\int (9-x^2)\,dx$ (3mks)

c.) Evaluate:

i.) $\lim_{x\to -1}(x^3 - 6x + \frac{2x}{x^4})$ (3mks)

ii.) $\lim_{x\to 0} \frac{x^4-2^4}{x-2}$ (3mks)

Question Six

a.) Define

i.) An even function (2mks)

ii.) Odd function (2mks)

b.) Show whether the function is even, odd or neither.

i.) $f(x) = cosx$ (3mks)

ii.) $f(x) = x^3 + x$ (3mks)

iii.) $f(x) = sinx$ (3mks)

c.) State the Sandwich law of limits. Hence evaluate $\lim_{x\to 0} xsin\frac{1}{x}$ (7mks)

Question Seven

a.) Let $f(x) = x^2$ *and* $g(x) = 2x + 1$. Find

i.) $(fog)(x)$ (3mks)

ii.) $(gof)(x)$ (2mks)

b.) Write out the sums and evaluate:

i.) $\sum_{i=1}^{5}(2i - 1)$ (2mks)

ii.) $\sum_{i=1}^{5}(3i^2 - 4)$ (3mks)

c.) Using the method of approximating sums, find the $\int_0^3 x^2 + 2\ dx$ (10mks)

Formulae

Chain rule: $\frac{dy}{dx} = \frac{dy}{du} * \frac{du}{dx}$

Product rule: $\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + g'(x)f(x)$

Model. **(20 marks)**

3. a) What is active listening? **(5 marks)**

   b) What techniques of active listening would you advise a poor listener to adopt? **(20 marks)**

4. "It is important for lecturers to capture and sustain the attention of the students during lectures," explain the strategies that lecturers can use to do so. **(25 marks)**

5. A friend of yours is to appear before a panel of interviewers for Job as a Research Assistant with Bank of Uganda. Explain the tips you would you give him or her to pass the interview. **(25marks)**

6. Imagine that you are campaigning for the position of Guild President in Uganda Martyr's University, what strategies would you use to make the introduction of your speech appealing?

(25 marks)

SUCCESS

Wishing You a Merry Christmas and happy new year.