



"Investing in Africa's Future"

COLLEGE OF BUSINESS PEACE LEADERSHIP AND GOVERNANCE

CSC 103: CALCULUS EXAMINATION

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2021

LECTURER: MR P TARAMBAWAMWE

DURATION: 5 HOURS

INSTRUCTIONS

YOU ARE REQUIRED TO ANSWER QUESTION NUMBER 1 AND
EITHER QUESTION 2 OR QUESTION 3. YOU ARE ANSWERING 2
QUESTIONS, Q1 AND Q2 OR Q1 AND Q3

Credit will be awarded for logical, systematic and neat presentations

Q1

a

Discuss and evaluate the methods of evaluating limits

[10 marks]

b. i.

Evaluate

$$\lim_{x \rightarrow 2} \frac{\sqrt{x^3 + 8}}{2x + 1}$$

[3 marks]

ii.

Evaluate

$$\lim_{x \rightarrow 0} \frac{\ln(1 + 2x)}{e^{3x} - 1}$$

[3 marks]

iii. Evaluate

$$\lim_{x \rightarrow 9} \frac{x - 9}{3 - \sqrt{x}}$$

[3 marks]

iv. Evaluate

$$\lim_{t \rightarrow \infty} (\sqrt{t} + t^2)/(2t - t^2) \text{ [3 marks]}$$

v.

Evaluate

$$\lim_{x \rightarrow 0^+} \sqrt{x} \ln x.$$

[3 marks]

Q2.

- a. Discuss using examples circumstances where you can use the substitution method and integration by parts during integration. [5 marks]

b. The chain rule states that $dy/dx = (dy/dt)(dt/dx)$. Use the chain rule to

- i. Find dy/dx in terms of t for: $x = te^{-2t}$ and $y = t+t^3$ and then find the slope of the curve defined by $x=te^{-2t}$ and $y = t+t^3$ at point $(e^{-2}, 2)$ [8 marks]

ii.

A baseball team plays in a 57,000 seat stadium. The team has found that if the cost of a ticket is $\$X$ then they will sell $57,000 - 3,000X$ tickets. What ticket price will maximize the income the team receives from ticket sales?

[5 marks]

- c. Find the area of the region between $y = -x^2 + 3x$ and the x -axis ($y = 0$) from $x = -2$ to $x = 4$ [7 marks]

Q3 a, Discuss using examples circumstances where you can use the substitution method and integration by parts during integration [5 marks]

b. Solve the (separable) differential equations

- i. $x \frac{dy}{dx} - y = 2x^2 y$ [4 marks]

ii..

$$\frac{dy}{dx} = \frac{x^2 y - 4y}{x + 2}$$

[4 marks]

ii. $\frac{dy}{dx} = x e^{x^2 - \ln(y^2)}$

[5 marks]

b.i. The population of fish in a pond is modelled by the differential equation

$$\frac{dP}{dt} = 480 - 4P$$

where time t is measured in years. Towards what number does the population of fish tend? If there are initially 10 fish in the pond, how long

does it take for the number of fish to reach 90% of the eventual population? **[7 marks]**

End of Examination Paper