



UNIVERSITY OF EDUCATION, WINNEBA
INSTITUTE FOR TEACHER EDUCATION AND CONTINUING
PROFESSIONAL DEVELOPMENT (ITECPD)



END OF FIRST SEMESTER EXAMINATIONS, APRIL, 2024

LEVEL 300

COURSE CODE: JBM 352

COURSE TITLE: LEARNING, TEACHING AND APPLYING CALCULUS

TIME ALLOWED: 2 HRS

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GENERAL INSTRUCTIONS:

- This paper is made up of ONE SECTION.
- The Section is made up of five essay type questions.
- Answer any THREE questions in your answer booklet.
- Each question carries equal marks. You are expected to start each question on a new page.
- You are expected to hand over your answer booklet to the invigilator before you leave the examination hall.

Instruction: Answer any three (3) questions in the answer booklet provided.

1

a. Determine the local maximum and minimum values of $h(x) = x^3 - 12x + 1$ using the Second Derivative Test. (6 marks)

b. Integrate $\int_0^{\pi} \frac{1}{(1-\sin^2 x)} dx$ (6 marks)

c. Compute $\lim_{x \rightarrow \infty} 3x^3 e^{-x^2}$ (8 marks)

2

a. Does continuity imply differentiability? Explain the conditions of continuity of a function at a point.
(4 marks)

b. State the values of x for which $f(x) = \frac{(x-2)(x+3)}{x^2-2x}$ is discontinuous (3 marks)

c. Obtain from First Principles the derivatives of the following functions

i. $y = \sin x$ (7 marks)

ii. $y = \sqrt{x-1}$ (6 marks)

3.

a. Sketch the curve $y = x^3 + 3x^2 - 9x + 5$ using the Second Derivative Test. Indicate the local maximum and minimum and the intercepts on the axes. (15 marks)

b. Evaluate the limit $\lim_{x \rightarrow 0} \frac{5x}{\tan x}$ (5 marks)

4.

a. Find the derivative of the implicit function $\sqrt{xy} = 1 + x^2y$ simplifying your result to the lowest term. (14 marks)

b. Find the equation of the tangent line to $f(x) = (1 + 2x)^2$ at the point (1,9) (6 marks)

5.

a. A ball is thrown vertically upwards. Its height (h m) at time (t secs) is given by $h = 50 + 30t - 5t^2$. Find

i. the velocity of the ball at time $t = 2$ secs (5 marks)

ii. the greatest height the ball reaches (5 marks)

b. Differentiate $g(x) = (x^2 - 2x)\sqrt{2x - 1}$ with respect to x , hence state the concept used in differentiating the function $g(x)$. (10 marks)