



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR
SECOND YEAR SUPPLEMENTARY
EXAMINATION

**FOR THE DEGREE OF BACHELOR OF EDUCATION AND
BACHELOR OF SCIENCE**

COURSE CODE: MAT221 / MAA 213 / MAA 212

COURSE TITLE: INTEGRAL CALCULUS / CALCULUS II

DATE: FRI 22 /07/2022 TIME: 8:00 AM – 10:00 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE (30 MARKS): COMPULSORY

(a) Define the terms:

- (i) Integration (2 marks)
- (ii) Definite integral (2 marks)
- (iii) Differential coefficient (2 marks)

(b) Determine the area bounded by the curve $y = 3x^2 + 14x + 15$, the x -axis and the ordinates $x = -1$ and $x = 2$ (4 marks)

(c) Find the following:

(i) $\int x(3x^2 + 2)^4 dx$ (4 marks)

(ii) $\int \frac{4x}{\sqrt{x^2 + 1}} dx$ (4 marks)

(iii) $\int 2e^{8x+3} dx$ (4 marks)

(d) Find the volume generated when the plane figure bounded by $y = 5 \cos 2x$, the

x -axis and the ordinates $x = 0$ and $x = \frac{\pi}{4}$ rotates about the x -axis through

a complete revolution. (8 marks)

QUESTION TWO (20 MARKS)

(a) Evaluate $\int (1 - \cos 3x) \sin 3x dx$ (4marks)

(b) Find $\int \ln x dx$ (4 marks)

(c) Integrate $\frac{\tan^{-1} x}{1 + x^2} dx$ (4 marks)

(d) Find the volume generated when the plane figure bounded by the curve $y = x^2 + 5$,

the x -axis and the ordinates $x = 1$ and $x = 3$, rotates about the y -axis through a

complete revolution (8 marks)

QUESTION THREE (20 MARKS)

(a) Evaluate $\int_1^2 (2x - 3)^4 dx$ (4 marks)

(b) Find $\int \sin^3 x dx$ (4 marks)

(c) Parametric equations of a curve $x = 3t^2$, $y = 3t - t^2$. Find the volume generated when

the plane figure bounded by the curve, x -axis and the ordinates corresponding to

$t = 0$ and $t = 2$ rotates about the x -axis (8 marks)

(d) Find $\int \frac{dx}{25+x^2}$ (4 marks)

QUESTION FOUR (20 MARKS)

(a) Find $\int \frac{\sec^2 x}{\tan x} dx$ (4 marks)

(b) Given $y' = \left(r + \frac{1}{r}\right)^2 dr$, find the value of the arbitrary constant if $y = \frac{1}{3}$ when

$r = 1$ (4 marks)

(c) Evaluate $\int_0^{\pi/2} 2\theta \sin \theta d\theta$ (4 marks)

(d) Find the length of the curve $y^2 = x^3$ between $x = 0$ and $x = 4$ (8 marks)

QUESTION FIVE (20 MARKS)

(a) A curve has parametric equations $x = at^2$ and $y = 2at$. Find the area bounded by the curve, the x -axis and the ordinates $t = 1$ and $t = 2$ (6 marks)

(b) Find $\int_{-1}^1 \sqrt{t^5 + 2t} (5t^4 + 2) dx$ (6 marks)

(c) Find the mean value of $y = 3 \sin 5t + 2 \cos 3t$ between $t = 0$ and $t = \pi$ (4 marks)

(d) Evaluate $\int \frac{1}{\sqrt{4-x^2}} dx$ (4 marks)

END