



UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF EDUCATION (SOE)

DEGREE OF BACHELOR OF EDUCATION ARTS

MTH 222: CALCULUS 11 - INTEGRAL

DATE: 3RD AUGUST 2026

DURATION: 2 HOURS

MA

XIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provide**

QUESTION ONE

(a) Find $\int_1^4 (x^2 + 2x - 5) \, dx$ (5 marks)

(b) Evaluate $\int 2t\sqrt{1+t^2} \, dt$ (5 marks)

(c) Find $\int t^2 e^t \, dt$ using integration by parts formula (5 marks)

d) Find the area of the region bounded by the curves $y = 3 - x^2$, $y = x^2 + 5x$,

$x = -2$ and $x = 0$ (6 marks)

e) Find $\int \frac{x-11}{(x+3)(x-4)} \, dx$ by partial fractions (4 marks)

QUESTION TWO

a) Evaluate $\int_1^e \frac{x^2 + x + 1}{x} \, dx$ (4 marks)

b) Use substitution method to find: $\int x^3 \cos(x^4 + 2) \, dx$ (6 marks)

c) Use substitution method to evaluate $\int \frac{x-1}{(2x^2 - 4x + 1)^5} \, dx$ (5 marks)

QUESTION THREE

- a) Use integration by parts method to evaluate $\int x^2 e^{2x} dx$ (7 marks)
- b) Use trigonometric identities to find $\int \frac{\sin^2 x}{1 + \cos x} dx$ (5 marks)
- c) Find $\int x^3 \ln x dx$ (3 marks)

QUESTION FOUR

- a) Find the area of the region bounded by the curves $f(x) = 3x^3 - x^2 - 10x$ and $g(x) = -x^2 + 2x$ (8 marks)
- b) Find the area enclosed by the curve $y = x^2 - 10x + 9$, the x-axis and the lines $x = 4$ and $x = 10$ (7 marks)

QUESTION FIVE

- a) Use partial fractions to find $\int \frac{x}{25 - x^2} dx$ (7 marks)
- b) Use trapezoidal rule with $n = 4$ to estimate $\int_1^2 x^2 dx$ (8 marks)

QUESTION SIX

- a) Find the length of the arc in the first quadrant of $y = 2x^{\frac{3}{2}}$ from $x = 0$ to $x = \frac{1}{3}$ (8 marks)

- b)** Find the volume obtained by rotating the area under the curve $y = 1 + x$ between $x = 1$ and $x = 2$ about the axis of x
(7 marks)

MTH 222
TABLES and FORMUAE

1. $\int x^n dx = \frac{x^{n+1}}{n+1} + C$, if $n \neq -1$
2. $\int \frac{1}{x} dx = \int x^{-1} dx = \ln x + C$, if $n \neq -1$
3. $\int a^x dx = \frac{a^x}{\ln a} + C$, a is any positive constant
4. $\int e^x dx = e^x + C$
5. $\int \frac{u'}{u} dx = \ln u + C$
6. $\int \frac{u'}{u^n} dx = \int \frac{du}{u^n} du = \int u^{-n} du = \frac{u^{-n+1}}{-n+1} + C$
7. $\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$