



KOGI STATE UNIVERSITY, KABBA
FACULTY OF SCIENCE AND COMPUTING

Department of Mathematical Sciences

COURSE TITLE: ELEMENTARY MATHEMATICS II COURSE CODE: MTH102

UNITS: 2

Session: 2024/2025

Semester: SECOND

Date: 07/08/25

Time Allowed: 2Hours.

Instructions: ANSWER ALL QUESTION IN SECTION I AND TWO QUESTIONS IN SECTION II.

SECTION I

1. Find the $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$
A. -3
B. -6
C. 3
D. 6
2. At what value is $f(x) = \frac{x^2 - 4}{x - 3}$ undefined
A. $x = 0$
B. $x = -3$
C. $x = 3$
D. $x = \infty$
3. Differentiate $y = x^3 + 5x^2 - 4x + 2$ with respect to x
A. $3x^2 - 10x - 4$
B. $3x^2 + 10x + 4$
C. $3x^2 + 10x - 4$
D. $2x^3 + 10x - 4$
4. $\int 4^x dx$
A. $x4^{x-1}$
B. $\frac{4^x}{\ln x}$
C. $\frac{4^x}{\ln 4}$
D. 3^x
5. If $\int_0^1 x(x^2 + 1)dx$
A. $-\frac{3}{4}$
B. $\frac{3}{4}$
C. $\frac{1}{4}$
D. $-\frac{1}{4}$
6. Which of the following is an even function?
A. $2x + 7$
B. $x^3 - 1$
C. x^3
D. $x^2 + 1$
7. Find the $\lim_{x \rightarrow \infty} \frac{5x^3 + x^2 - 6}{7x^4 + 2}$
A. $-\infty$
B. ∞
C. 0
D. $\frac{5}{7}$
8. Given that $y = 10x^4 - 3x^3$, evaluate $\frac{dy}{dx}$ at $x = 2$
A. 284
B. 108
C. 132
D. 212
9. $\int_{-1}^0 3x^5 dx$
A. 0
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. -1
10. $\lim_{x \rightarrow \pi} (x^2 - \sin x)$
A. π
B. π^2
C. $-\pi$
D. 0
11. Differentiate $y = 4x^{-2}$
A. $8x^{-3}$
B. $8x^{-1}$
C. $-8x^{-3}$
D. $-\frac{x^{-3}}{3}$
12. Which of the following is correct for $y = x^p$
A. $y' = x^p$
B. $y' = px^{p-1}$
C. $y' = (p - 1)x^p$
D. $y' = \frac{x^{p+1}}{p+1}$
13. Differentiate $y = \cos(7x + 3)$
A. $-\sin(7x + 3)$

- B. $-7 \sin(7x + 3)$
 C. $3 \cos(7x + 3)$
 D. $3 \sin(7x + 3)$
 14. $\int e^{(3t+4)} dt$
 A. $\frac{e^{(3t+4)}}{4} + C$
 B. $\frac{e^{(3t+4)}}{3} + C$
 C. $3e^{(3t+4)} + C$
 D. $\frac{e^{(3t+4)}}{3}$

15. Find the area bounded by the curve $y = x^3 + 2x^2 + x + 1$ between $x = -1$ and $x = 2$
 A. $12\frac{1}{2}$
 B. $14\frac{1}{4}$
 C. $11\frac{1}{2}$
 D. $4\frac{1}{4}$

SECTION II (ANSWER TWO QUESTIONS ONLY)

1. (i) $\int e^{2x} \sin x dx$
 (ii) If $y = 3x^4 - 5x^3 + x^2 + 2x - 4$, obtain an expression for $\frac{dy}{dx}, \frac{d^2y}{dx^2}$, hence find the value of $\frac{dy}{dx}$ at $x = 4$
 2. (i) Given $f(x) = 2x - 4$ and $g(x) = x^2 + 3$, find (a) $f(g(x))$ (b) $g(f(x))$ (c) $g(f(-2))$
 (ii) Differentiate $y = x^4 \cos x$
 (iii) Discuss the continuity of $f(x) = \frac{x^2 - 4}{x - 2}$
 3. (i) $\int \frac{7x+8}{2x^2+11x+5} dx$
 (ii) Differentiate $y = (4x + 3)^6$
 4. (i) Calculate the area bounded by the curve $y = -6x^2 + 24x + 10$, the x-axis and the ordinates $x = 1$ and $x = 2$
 (ii) If $x^2 + y^3 + 3xy^2 = 8$, find $\frac{dy}{dx}$
 (iii) Differentiate $y = \frac{4x+1}{7x-4}$