

JANUARY 2023
EMA 112SW
TEACHING AND LEARNING CALCULUS
FOR CONCEPTUAL UNDERSTANDING
1 HOUR, 20 MINUTES

CANDIDATES INDEX NUMBER:	
IE/MAT/S	
SIGNATURE:	

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME
LEVEL 300, END-OF-SECOND SEMESTER EXAMINATION, JANUARY 2023

8TH JANUARY 2023 TEACHING AND LEARNING CALCULUS 9:40 AM - 11:00 AM
FOR CONCEPTUAL UNDERSTANDING

SECTION B
(60 Marks)

Answer THREE questions in this section.

1.
 - a. The diffusion of a chemical in a clinical trial is represented by $f(t) = (t + 3)(2t^2 - 5t)$ grams. Determine the rate of diffusion of the chemical at $t = 2$ secs
5 marks
 - b. A farmer has 120 m length of fencing. He wants to use it to fence three sides of a rectangular enclosure against an existing wall, which produces the fourth side. Find the maximum area he can enclose.
10 marks
 - c. If the gradient of the curve $x^2 - 3ay - 2x + 3 = 0$ at $T(-1, -2)$ is 12, find the value of a .
5 marks

2.
 - a. Given that $y = Ax^2 + B\frac{1}{x} + C$. If $K(1,5)$, $\frac{dy}{dx} = 12$ and $\frac{dy^2}{dx^2} = 18$, find the values of A and B.
8 marks
 - b. A 4% error is made in measuring the radius of a sphere. Find the percentage error in the surface area.
7 marks
 - c. Find the value of k for which the line $y = 2x + k$ is normal to the curve $y = x^2 - 1$
5 marks

3.

a. Evaluate the definite integrals $\int_1^2 \left(t^2 + 2t + \frac{1}{t^2} \right) dt$. **10 marks**

b. Find the gradient of the curve $x^2 + 2xy = 2y^2 + x + 2$ at the point $(-4, 1)$. **10 marks**

4. A particle Q is projected from a point with velocity 30m/s and it moves in a straight line in such a way that its velocity after t seconds is given by $v = a + 7t + bt^2$, where a and b are constants. If one second after projection, the acceleration of the particle is 5m/s^2 . Find:

α). The values of a and b **6 marks**

β). The time when the particle is momentarily at rest **5 marks**

γ). The distance travelled by the time it is momentarily at rest (correct your answer to two decimal places). **9 marks**

5.

a. Using the trapezium rule with interval of 0.5, calculate the approximate value of $\int_{1\frac{1}{2}}^{4\frac{1}{2}} \sqrt{(n^2 + 1)} dn$. **10 marks**

b. Given that $y = \frac{4}{\sqrt{x^3+1}}$, show that $2(x^3 + 1) \frac{dy}{dx} = -3x^2y$. **10 marks**