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

END-OF-SECOND SEMESTER EXAMINATIONS, NOVEMBER, 2023

LEVEL 400
COURSE CODE: 481
COURSE TITLE: LEARNING, TEACHINGA AND APPLYING ANALYTICAL GEOMETRY
TIME ALLOWED: 2 HRS

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. The midpoint of the line PQ is (2,3). If the coordinate of P is $(-5,1)$, find the coordinate of the point Q.
   b. Given that $A(x_1, y_1)$ and $B(x_2, y_2)$, show that the midpoint of the line joining A and B is given by $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$.

2. a. What is the length of the radius of the circle $3x^2 - 12x + 3y^2 + 6y = 60$?
   b. Using a sheet of graph, determine the point where the circle $(x+2)^2 + (y-4)^2 = 5$ meet the line $y + 2x - 4 = 0$. [Scale: 2cm to 2 units on both axes].

3. a. If the length of the perpendicular distance from the point (2,1) to the line $3y = 4x + k$ is 2, find the possible values of k.
   b. Find the vertex, focus and directrix of the parabola $x^2 = 6y$. Sketch its graph.

4. a. What is the standard form of the equation of the ellipse that has vertices $(-2,-8)$ *and* $(-2,2)$ and foci $(-2,7)$ *and* $(-2,1)$?

   b. Find the asymptotes of a hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$.

5. a. Convert the polar coordinates $\left(-8, \frac{2\pi}{3}\right)$ into rectangular coordinates.

   b. Convert the following points into polar coordinates:

      i. $(-3,4)$

      ii. $\left(-2, -2\sqrt{3}\right)$