

PWANI UNIVERSITY COLLEGE
A CONSTITUENT COLLEGE OF KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2008/2009 ACADEMIC YEAR

1ST YEAR 1ST SEMESTER EXAMINATION FOR THE DEGREE OF
STREAM: B.Ed (SCIENCE), B.SC AND B.Ed(ARTS)

SMA 103: ANALYTICAL GEOMETRY

END SEMESTER: I

TIME: 3 HOURS

DAY/TIME: WEDNESDAY : 8.00 – 11.00A.M.

DATE: 3/12/2008

INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO FROM THE REMAINING QUESTIONS

QUESTION ONE (COMPULSORY -30 MARKS)

(a) A curve has the equation $x = \frac{\sqrt{144 - 16y^2}}{3}$. Find the equation of a tangent and the normal to this curve at $(2, \frac{3\sqrt{3}}{2})$ (8 marks)

(b) A Line L_1 whose gradient is $\frac{3}{2}$ passes through the point of intersection of the lines L_2 and L_3 whose equations are $y + 2x = 5$ and $3x = 10 - 4y$ respectively. Find the equation and the intercepts of L_1 (4 marks)

(c) Given the equation $M - lc = kc^2 + z$ where k, l and z are constants, find an expression of the gradient of the normal to this curve (3 marks)

(d) A given curve has the equation $\frac{2x^2}{15 + x - 2y^2} + \frac{4y}{15 + x - 2y^2} = 1$. Find the equation of the tangent and the normal at the point $(3, 0)$ (7 marks)

(e) Find the co-ordinates (x, y, z) which satisfies the system of equation $x + 2y + z = 4$, $2x - y - z = 0$ and $2x - 2y + z = 1$ (3 marks)

(f) Given that $A = \frac{2i^2 - 3i + 4i^3}{2i^5 - 3i - 2i^2}$ find (i) $|A|$ (ii) $\arg A$
 (7 marks).

QUESTION TWO (20 MARKS)

(a) Define the terms positive correlation and negative correlation. Use diagrams for illustrations
 (4 marks)

(b) Research have found out that as you increase your walking speed in (metres per second), you also increase the length of your step (in metres). The table below gives the average walking speeds and step lengths for several people. Approximate the best fitting line for the data (6 marks)

Speed	0.8	0.85	0.9	1.3	1.4	1.6	1.75	1.9	2.15	2.5	2.8	3.0
step	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.05	1.15
	3.1	3.3	3.35	3.4								
	1.25	1.15	1.2	1.2								

(c) Show that the area of an ellipse is given by $A = \pi ab$ (10 marks)

QUESTION THREE (20 MARKS)

(a) Show that the general equation of an ellipse with horizontal major axis is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
 (10 marks)

(b) Identify the focus and the directrix of the parabola given by $x = -\frac{1}{6}y^2$. Draw the parabola
 (6 marks)

(c) A circle centre origin has its centre translated to (a_1, a_2) . Find the locus of the new circle
 (4 marks)

QUESTION FOUR (20 MARKS)

(a) θ and β are the roots of the equation $ax^2 + bx + c = 0$ find an expression of

(i) The Sum of the roots (ii) The products of the roots of the equation in terms of a, b, and c.
 (5 marks)

(b) Using the results in (a) above answer (i) and (ii) below

(i) If the roots of the equation $4x^2 - 6x + 1 = 0$ are θ and β , find the value of θ^3 and β^3 and find the equation whose roots are $(\theta + \frac{1}{\beta})$ and $(\beta + \frac{1}{\theta})$ (8 marks)

(ii) If θ and β are the roots of the equation $ax^2 + bx + c = 0$ find the value of $(1 - \theta^3)(1 - \beta^3)$ (4 marks)

(c) Write the polar form of the complex number $\frac{3 - i^2 + 2i^5 - 2}{-2i^3 + 3i^2}$ (3 marks)