KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2007/2008
INSTITUTIONAL BASED PROGRAM
EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION

SMA 103: ANALYTICAL GEOMETRY

DATE: Tuesday 8ᵗʰ July 2008   TIME: 10.30am – 12.30pm

INSTRUCTIONS: Answer question 1 and any other TWO questions.

Question 1

(a) Find the equation of the straight line which passes through the points (3,0) and (0,-1)   [3 marks]

(b) Find the equation of a circle with its centre at the point (2,1) given that the circle passes through the origin.   [4 marks]

(c) A parabola is given by the equation

$5y^4 = 16x$. Find

    (i)   the focus

    (ii)   the equation of the directrix

    (iii) the length of the latus rectum   [6 marks]

(d) Find the equation of the ellipse with its centre at $(-2, -1)$, vertex at

$(4, -1)$ and eccentricity $e = \frac{2}{3}$. Sketch the curve.   [6 marks]

(e) Determine the equation of the hyperbola having its centre at the origin, transverse

axis on the x-axis, eccentricity $e = \frac{\sqrt{7}}{2}$ and length of latus rectum 6 units.

[7 marks]

(f) Change the following Cartesian equation into polar form, hence sketch the graph

on polar coordinates. $x^2 + y^2 - by = 0$ [4 marks]

Question Four

a) Given that one focus of a hyperbola is at $(1, -3)$ and the corresponding directrix is the line $y = 2$. Find the equation of the hyperbola if its eccentricity is $\frac{3}{2}$.

(7 marks)

b) Find the centre, vertices, foci and asymptotes of the hyperbola
$$x^2 - y^2 - 4x + 2y + 11 = 0$$
(7 marks)

c) If a hyperbola passes through the point $(12, 9)$ and has foci at the point $(0, 4)$ and the origin, find its equation.

(6 marks)

Question Five

a) i) Define an ellipse and eccentricity of an ellipse. (2 marks)

ii) Show that the standard equation of an ellipse with centre $(0, 0)$ is given by
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \quad a > b > 0.$$
(4 marks)

b) The end points of the major and minor axes of an ellipse are $(-1, 1)$, $(5, 1)$, $(2, 3)$ and $(2, -1)$. Give the equation of the ellipse in standard from and find its foci, eccentricity and directrices.

(8 marks)

c) Discuss and sketch the graph of the equation
$$4x^2 + 9y^2 - 32x - 36y + 64 = 0$$
(6 marks)