



KABARAK

UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION & COMPUTER

SCIENCE

COURSE CODE: MATH 112

COURSE TITLE: GEOMETRY AND ELEMENTARY

APPLIED MATHEMATICS

STREAM: Y1S1

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M.

DATE: 16/12/2010

INSTRUCTION

- Answer question one and any other two questions

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

- a) Find the equation of the line which passes through the point of intersection of the lines $x - 3y = 4$, $3x + y = 2$ is perpendicular to $3x + 4y = 0$ (5 marks)
- b) The equation of a circle is $3x^2 - 6x + 21y = -3y^2 + 54$. find the coordinates of the centre and its radius. (5 marks)
- c) Find an equation in standard form for the ellipse that has centre $(-1, -4)$, focus $(-1, 8)$ and length of major axis 10 units, then calculate its eccentricity. (5 marks)
- d) Find the vector equation of a line that passes through the point $A(2, -3, 5)$ and is parallel to the vector $\vec{B} = 2\hat{i} - \hat{j} + 3\hat{k}$. (3 marks)
- e) Use the inverse method to solve the system $2x - y = 4$
 $4x + y = 5$ (4 marks)
- f) Write $\sqrt{3} + i$ in its polar form. (5 marks)
- g) Change the cartesian equation $x^2 + y^2 - 6y = 0$ to polar equation. (4 marks)

QUESTION TWO (20 MARKS)

- a) Find the values of a and b such that $(a + bi) = i$. hence or otherwise solve the equation $z^2 + 2z + 1 - i = 0$ giving your answer in the form $p + iq$ where p and q are real numbers. (7 marks)
- b) Find a unit vector that perpendicular to the vectors $A = 2\hat{i} - \hat{j} + \hat{k}$ and $B = \hat{i} + 2\hat{j} - 2\hat{k}$. (5 marks)
- c) A circle passes through the points $(2, 7)$, $(7, 2)$ and $(-3, 2)$. Find (i) the equation of the circle, (ii) the radius of the circle. (8 marks)

QUESTION THREE (20 MARKS)

- a) Show that $9x^2 - 4y^2 - 18x - 16y + 29 = 0$ represent a hyperbola. Find its centre, vertices, foci, eccentricity and asymptotes. (10 marks)
- b) Show that the graph of $y = 2x^2 - 6x + 4$ is a parabola. Find its vertex, focus, directrix and intercepts. Sketch the graph showing these features. (10 marks)

QUESTION FOUR (20 MARKS)

a) Identify the conic section $4x^2 + 72y = 16x - 124 - 9y^2$ and then find its (i) centre (ii) focal length (iii) foci (iv) the length of the minor and major axes. (10 marks)

b) Use the inverse method to solve the linear system of equation defined by

$$2x + y = 5$$

$$3y - z = 4$$

$$x + 2y = 4$$

(10 marks)

QUESTION FIVE (20 MARKS)

a) (i) Calculate the distance between the line with equation $2x + 5 = 2y$ and the point $(5, -4)$.

(ii) Given equation of $L_1 : 2x + 4y - 8 = 0$ and $L_2 : 3x - 2y - 4 = 0$, find the point of intersection of L_1 and L_2 and the angle between the lines. (10 marks)

b) Use De Moivre's theorem to evaluate $(\sqrt{3} - i)^{24}$ (10 marks)