JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGYUNIVERSITY EXAMINATIONS 2012/2013

1ST YEAR 2ND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE COMMUNITY HEALTH AND DEVELOPMENT

(KISUMU L. CENTRE)

COURSE CODE: SMA 3112

COURSE TITLE: MATHEMATICS II

DATE: 13/8/2013 **TIME: 11.00-1.00 PM**

DURATION: 2 HOURS

INSTRUCTIONS

1. **This paper consists of 5 Questions.**
2. **Answer Question 1 (Compulsory) and any other 2 questions.**
3. **Write your answers on the answer booklet provided.**

QUESTION ONE (30 marks)

a) Find the mid-point of the line joining points $(5,-11)$ and $(-1,3)$. Hence find the equation of the perpendicular bisector of the line joining the given points (6 marks)

b) Use Cramer's Rule, if applicable to solve the system of equations

$$\begin{aligned} 7x + 6y &= 1 \\ 5x + 4y &= -3 \end{aligned}$$

(4 marks)

c) Determine the point of discontinuity (if any) of the function $f(x)$

$$f(x) = \frac{x^2 + x - 12}{x + 4}$$

If the continuity is removable, define the function to make it continuous. (6 marks)

d) Evaluate

$$\lim_{x \to \infty} \frac{2x^4 - 3x^2 + 1}{6x^4 + x^3 - 3x}$$

(4 marks)

e) Find the second derivative of the function

$y = x^2(3x + 1)$ (5 marks)

f) Evaluate the given definite integral

$$\int_{-1}^{0} \left(-3x^5 - 3x^2 + 2x + 5\right) dx$$

(5 marks)

QUESTION TWO (20 marks)

a) Find the equation of the straight line through $(0,-1)$ perpendicular to $3x - 2y + 5 = 0$. (4 marks)

b) Find the point of intersection of the following pair of straight lines $2x - 3y = 6$ and $4x + y = 19$. (4 marks)

c) Calculate the area of the triangle formed by the line $3x - 7y + 4 = 0$ and axes. (4 marks)

d) Determine the equation of the straight line which is drawn through point $(4,6)$ and makes an angle of 45^0 with the positive direction of the x-axis. (5 marks)

e) The points $A(-7,-7)$, $B(8,-1)$, $C(4,9)$, D are the vertices of a rectangle. Find the coordinates of D. (3 marks)

QUESTION THREE (20 marks)

a) Use the following matrices:

$$A = \begin{bmatrix} 0 & 3 & -5 \\ 1 & 2 & 0 \end{bmatrix},\ B = \begin{bmatrix} 4 & 1 & 0 \\ -2 & 3 & -2 \end{bmatrix} \text{ and } C = \begin{bmatrix} 4 & 1 \\ 6 & 2 \\ -2 & 3 \end{bmatrix}$$

to evaluate the given expression

$C\left(A+B\right)$. (5 marks)

b) Solve for x:

$$\begin{vmatrix} 3 & 2 & 4 \\ 1 & x & 5 \\ 0 & 1 & -2 \end{vmatrix} = 0$$ (5 marks)

c) Solve the system of equations below using Cramer's Rule if it is applicable. If Cramer's rule is not applicable say so:

$$\begin{cases} x - 2y + 3z = 7 \\ 2x + y + z = 4 \\ -3x + 2y - 2z = -10 \end{cases}$$ (10 marks)

QUESTION FOUR (20 marks)

a) Evaluate the integral by using a substitution to reduce it to standard form

$$\int_1^3 \frac{10x}{\sqrt{5x^2-6}}\,dx$$ (5 marks)

b) Find the derivative of y with respect to x

$$y = \ln \frac{\cos x}{\sqrt{4-3x^2}}$$ (6 marks)

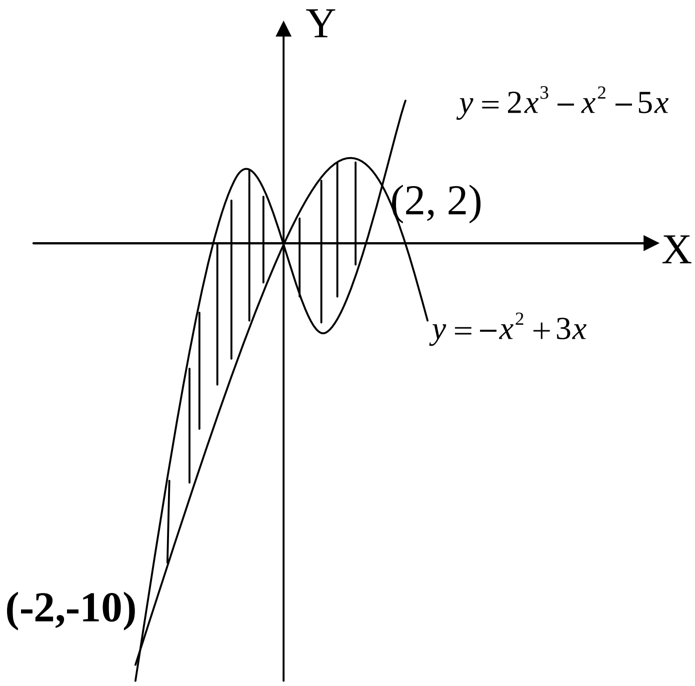
c) By separating the fraction and using a substitution (if necessary) to reduce to standard form, evaluate

$$\int \frac{1+\cos x}{\sin^2 x}\,dx$$ (5 marks)

d) Use implicit differentiation to find $\frac{dy}{dx}$, if $5y^2 + \sin y = x^2$ (4 marks)

QUESTION FIVE (20 marks)

a) Find the total area of the shaded region



(9 marks)

b) A medical research team determine that t days after an epidemic begins, $N(t) = 10t^3 + 5t + \sqrt{t}$ people will be infected, for $0 \le t \le 20$. At what rate is the infected population increasing on the ninth day? (5 marks)

c) Find the general solution of the differential equation

$$\frac{dy}{dx} = \frac{2x + y}{x}.$$

(6 marks)