



GARISSA UNIVERSITY COLLEGE

(A Constituent College of Moi University)

**UNIVERSITY EXAMINATION 2016/2017 ACADEMIC YEAR ONE
SECOND SEMESTER EXAMINATION**

SUPPLEMENTARY/SPECIAL EXAMINATION

SCHOOL OF BUSINESS AND ECONOMICS

FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT

COURSE CODE: ECO 112

COURSE TITLE: INTRODUCTION TO MATHEMATICS I

EXAMINATION DURATION: 3 HOURS

DATE: 26/09/17

TIME: 2.00-5.00 PM

INSTRUCTION TO CANDIDATES

- **The examination has SIX (6) questions**
- **Question ONE (1) is COMPULSORY**
- **Choose any other THREE (3) questions from the remaining FIVE (5) questions**
- **Use sketch diagrams to illustrate your answer whenever necessary**
- **Do not carry mobile phones or any other written materials in examination room**
- **Do not write on this paper**

This paper consists of NINE (9) printed pages

Supplementary / special exam

1

please turn over

Good Luck – Exams Office



QUESTION ONE (COMPULSORY)

- (a) Define a rational number. [3 Marks]
- (b) Express 0.8333..... as a rational number [2 Marks]
- (c) $f(x) = 2x + 3$ and $g(x) = x^2 - 1$ Find $fg(x)$ [2 Marks]
- (d) Find the value of x for which $\frac{2x+5}{x^2-4x+3}$ does not exist [2 Marks]
- (e) State whether the following sets are finite or infinite.
- i. A set of all even numbers [1 Mark]
 - ii. A set of all babies born in Garissa County at 8.am this morning [1 Mark]
- (f) Give the appropriate terminology for the following
- i. $\frac{3}{8}, -\frac{5}{6}, \frac{22}{7}, \frac{x}{y}$ [1 Mark]
 - ii. $\sqrt{2}, \sqrt{5}, e, \pi$ [1 Mark]
- (g) For each of the following, state the set description, the type and draw the picture.
- (i) $(a,b]$ (ii) (a,b) [2 Marks]
- (h) Let a, b, c , be real numbers. State the properties of each of the following:
- i. If $a = b$ and $b = c$ then $a = c$ [1 Mark]
 - ii. $a = a$ [1 Mark]
 - iii. If $a = b$ then $b = a$ [1 Mark]
- (i) Find the distance between -2 and -11 [1 Mark]
- (j) A linear equation is given by $3x - 4y - 6 = 0$.
Find its slope and state the point at which it crosses the $y - axis$. [3 Marks]
- (k) Use matrices to solve the simultaneous equations
- $$m - n = -5$$
- $$3m - 2n = -14$$
- [2 Marks]
- (l) Differentiate the function $f(k) = k^x$ [1 Mark]



QUESTION TWO

(a) Express 0.2333..... as a fraction [3 Marks]

(b) Evaluate $\begin{vmatrix} 6 & 13 \\ -2 & -4 \end{vmatrix}$ [2 Marks]

(c) Use matrices to solve the simultaneous equations.

$$3p + 2q = 12$$

$$4p - q = 5$$

[3 Marks]

(d) Show that $\begin{pmatrix} 1 & 5 & 2 \\ 1 & 1 & 7 \\ 0 & 3 & 4 \end{pmatrix}$ is the inverse of

$$\begin{pmatrix} -25 & 26 & -33 \\ 4 & -4 & 5 \\ 3 & -3 & 4 \end{pmatrix}$$

[4 Marks]

(e) The matrix $\begin{pmatrix} x & x^2 \\ 1 & 1 \end{pmatrix}$ is singular. Find x [3 Marks]

QUESTION THREE

(a) Differentiate $4x^2 + 2x$ from the first principles. [4 Marks]

(b) Find the equation of the tangent to the curve $y = 4 + x - 2x^2$ at the point on the curve with an x -coordinate of 1. [5 Marks]

(c) Find the coordinates of any stationary points on the curve $y = x^4 + 2x^3$ and distinguish between them. [6 Marks]

QUESTION FOUR

(a) Use the chain rule to find the derivative of y with respect to x given that;

$$y = (3x^2 - 2)^4 \quad \text{[4 Marks]}$$

(b) Differentiate with respect to x , the function $y = (2x + 1)^3(x - 1)^4$ [5 Marks]

(c) Find the derivative of the function.

$$y = \frac{(3x+1)^4}{(5x-2)^3} \quad \text{[6 Marks]}$$



QUESTION FIVE (15MARKS)

- (a) Show that the midpoint of the line segment with endpoint (a, b) and (c, d) is the point with coordinates **[6 Marks]**

$$\left(\frac{a + c}{2}, \frac{b + d}{2} \right)$$

- (b) Obtain the distance between the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ and hence find the distance between $P(1,5)$ and $Q(6,2)$ leaving your result as a surd. **[4 Marks]**

- (c) For each of the following, let a, b, c represent real numbers. State the real number properties with respect to addition.

- | | | | |
|---|---|---------------------------|------------------|
| For example $a + b = b + a$ | : | Commutative | |
| i. $a + b$ is real | : | | [1 Mark] |
| ii. $a + (b + c) = (a + b) + c$ | : | | [1 Mark] |
| (m) $a(b + c) = ab + ac$ | : | Define a rational number. | [3 Marks] |
| (n) Express 0.8333..... as a rational number | | | [2 Marks] |
| (o) $f(x) = 2x + 3$ and $g(x) = x^2 - 1$ Find $fg(x)$ | | | [2 Marks] |
| (p) Find the value of x for which $\frac{2x+5}{x^2-4x+3}$ does not exist. | | | [2 Marks] |
| (q) State whether the following sets are finite or infinite. | | | |
| iii. A set of all even numbers. | | | [1 Mark] |
| iv. A set of all babies born in Garissa County at 8.am this morning | | | [1 Mark] |
| (r) Give the appropriate terminology for the following | | | |



iii. $\frac{3}{8}, -\frac{5}{6}, \frac{22}{7}, \frac{x}{y}$ [1 Mark]

iv. $\sqrt{2}, \sqrt{5}, e, \pi$ [1 Mark]

(s) For each of the following, state the set description, the type and draw the picture.

(i) (a,b] (ii) (a,b) [2 Marks]

(t) Let a, b, c , be real numbers. State the properties of each of the following:

iv. If $a = b$ and $b = c$ then $a = c$ [1 Mark]

v. $a = a$ [1 Mark]

vi. If $a = b$ then $b = a$ [1 Mark]

(u) Find the distance between -2 and -11 [1 Mark]

(v) A linear equation is given by $3x - 4y - 6 = 0$.

Find its slope and state the point at which it crosses the y - axis. [3 Marks]

(w) Use matrices to solve the simultaneous equations

$$m - n = -5$$

$$3m - 2n = -14$$
 [2 Marks]

(x) Differentiate the function $f(k) = k^x$ [1 Mark]

QUESTION TWO

a) Express $0.2333\dots$ as a fraction [3 Marks]

b) Evaluate $\begin{vmatrix} 6 & 13 \\ -2 & -4 \end{vmatrix}$ [2 Marks]

c) Use matrices to solve the simultaneous equations.

$$3p + 2q = 12$$

$$4p - q = 5$$
 [3 Marks]



d) Show that $\begin{pmatrix} 1 & 5 & 2 \\ 1 & 1 & 7 \\ 0 & 3 & 4 \end{pmatrix}$ is the inverse of

$$\begin{pmatrix} -25 & 26 & -33 \\ 4 & -4 & 5 \\ 3 & -3 & 4 \end{pmatrix}$$

[4 Marks]

e) The matrix $\begin{pmatrix} x & x^2 \\ 1 & 1 \end{pmatrix}$ is singular. Find x

[3 Marks]

QUESTION THREE

(d) Differentiate $4x^2 + 2x$ from the first principles.

[4 Marks]

(e) Find the equation of the tangent to the curve $y = 4 + x - 2x^2$ at the point on the curve with an x- coordinate of 1.

[5 Marks]

(f) Find the coordinates of any stationary points on the curve $y = x^4 + 2x^3$ and distinguish between them.

[6 Marks]

QUESTION FOUR (15MARKS)

(d) Use the chain rule to find the derivative of y with respect to x given that;

$$y = (3x^2 - 2)^4$$

[4 Marks]

(e) Differentiate with respect to x , the function $y = (2x + 1)^3(x - 1)^4$

[5 Marks]

(f) Find the derivative of the function.

$$y = \frac{(3x+1)^4}{(5x-2)^3}$$

[6 Marks]

QUESTION FIVE (15MARKS)



(d) Show that the midpoint of the line segment with endpoint (a, b) and (c, d) is the point with coordinates. **[6 Marks]**

$$\left(\frac{a+c}{2}, \frac{b+d}{2} \right)$$

(e) Obtain the distance between the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ and hence find the distance between $P(1,5)$ and $Q(6,2)$ leaving your result as a surd. **[4 Marks]**

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|------|-----------------------------|---|-------------|-----------------|
| | For example $a + b = b + a$ | : | Commutative | |
| iii. | $a + b$ is real | : | | [1 Mark] |
| iv. | $a + (b + c) = (a + b) + c$ | : | | [1 Mark] |
| v. | $a(b + c) = ab + ac$ | : | | [1 Mark] |
| vi. | $a + 0 = 0 + a$ | : | | [1 Mark] |
| vii. | $a + (-a) = (-a) + a = 0$ | : | | [1 Mark] |

QUESTION SIX (15 MARKS)

(a) A city has three newspapers: A, B and C. Of the adult population, 1% read none of these newspapers, 36% read A, 40% read B and 52% read C, 8% read A and B, 11% read B and C, 13% read A and C and 3% read all the three newspapers.



- i. Illustrate this information on a Venn diagram. **[4 Marks]**
- ii. What percentage of the adult population reads A only? **[1 Mark]**
- iii. What percentage of the adult population reads B or C **[2 Marks]**
- iv. What percent of the adult population reads A or B but not C **[2 Marks]**

$$(b) U = \{a, b, c, d, e, f, g, h, i, j, k, l\}$$

$$M = \{b, c, d, e, f\}$$

$$N = \{d, e, f, g, h, i, \}$$

$$Q = \{h, i, d, e, f\}$$

Find;

i. $M \cup N \cup Q$ **(2Marks)**

ii. $M \cap N \cap Q$ **(2Marks)**

iii. $M \cup N \cap Q$ **(2Marks)**

viii. $a + 0 = 0 + a$ **[1 Mark]**

ix. $a + (-a) = (-a) + a = 0$ **[1 Mark]**

QUESTION SIX

- (c) A city has three newspapers: A, B and C. Of the adult population, 1% read none of these newspapers, 36% read A, 40% read B and 52% read C, 8% read A and B, 11% read B and C, 13% read A and C and 3% read all the three newspapers.



- v. Illustrate this information on a Venn diagram. **[4 Marks]**
- vi. What percentage of the adult population reads A only? **[1 Mark]**
- vii. What percentage of the adult population reads B or C **[2 Marks]**
- viii. What percent of the adult population reads A or B but not C **[2 Marks]**

(d) $U = \{a, b, c, d, e, f, g, h, i, j, k, l\}$
 $M = \{b, c, d, e, f\}$
 $N = \{d, e, f, g, h, i, \}$
 $Q = \{h, i, d, e, f\}$

Find;

- iv. $M \cup N \cup Q$ **[2 Marks]**
- v. $M \cap N \cap Q$ **[2 Marks]**
- vi. $M \cup N \cap Q$ **[2 Marks]**

