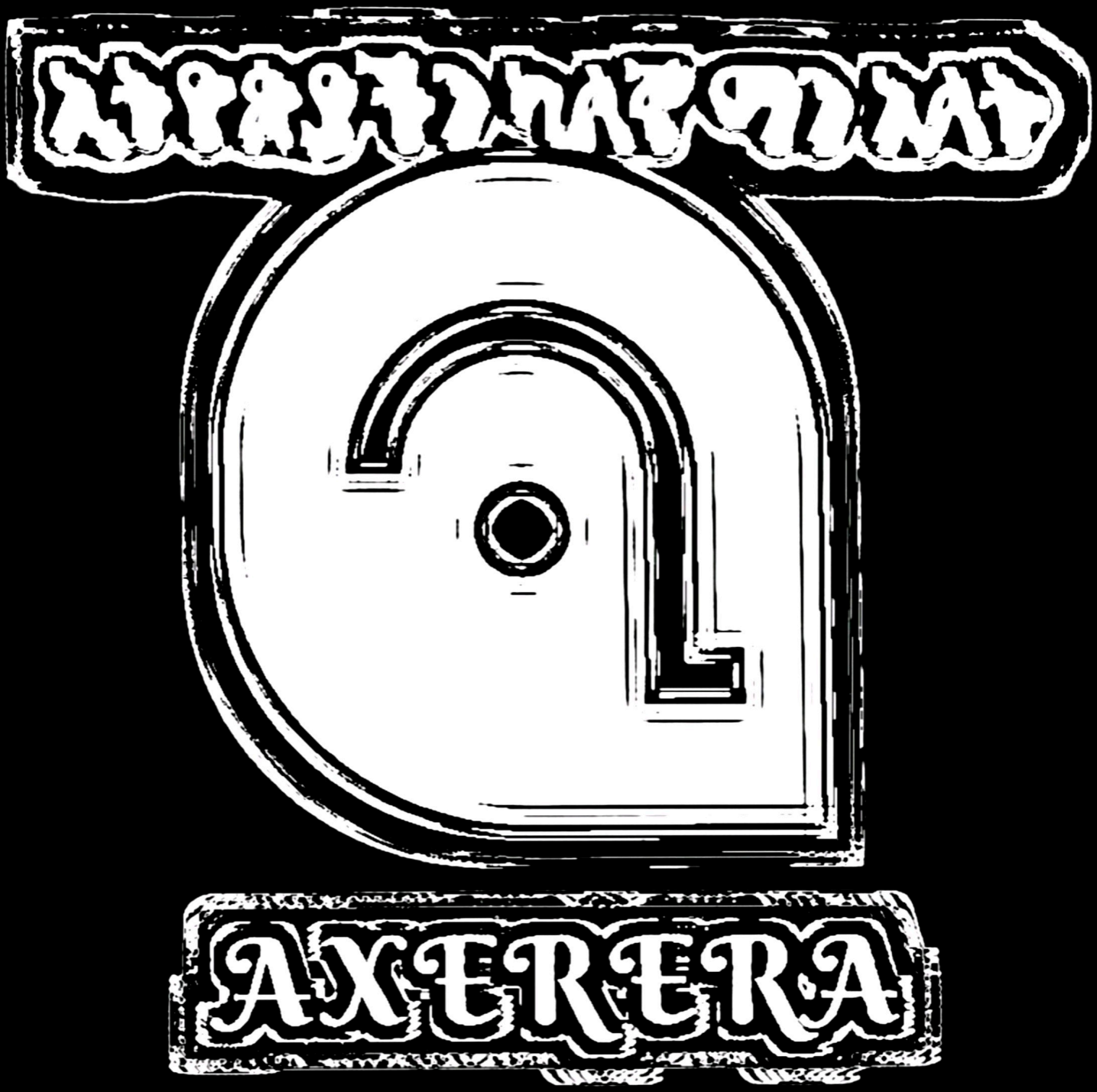
AXERA

ADDIS ABABA UNIVERSITY
SCIENCE FACULTY
DEPARTMENT OF MATHEMATICS
MATH 231B: Mid-Semester Examination

Date:
Time:

Name: _____ I.D. No. _____

Department: _____

Instruction: Attempt all questions and give the answers with the necessary work steps clearly and neatly on the answer sheets.

1. Points A = (3, 4, 5), B = (4, 5, 6), C = (7, 9, 3) and D = (10, 12, 6) are given. Show that $\overrightarrow{AB}$ and $\overrightarrow{CD}$ vectors are parallel?
2. Find the angle between the vectors $\vec{i}+\vec{j}+\vec{k}$ and $2\vec{i}-3\vec{j}+\vec{k}$
3. Find the coordinates of vector $\vec{v} = \langle -1, 3, 1\rangle$ relative to the ordered basis B = {⟨2, 1, 0⟩, ⟨2, 1, 1⟩, ⟨2, 2, 1⟩}
4. Let $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 5 & 0 \\ 0 & 2 & 4 \end{bmatrix}$

   If 3A + 2x = I find x?
5. Let $x_1 = a_{11}y_1 + a_{12}y_2$

   $x_2 = a_{21}y_1 + a_{22}y_2$ and let $y_1 = b_{11}z_1 + b_{12}z_2$

   $x_3 = a_{31}y_1 + a_{32}y_2$ $y_2 = b_{21}z_1 + b_{22}z_2$

   Express x_1, x_2 and x_3 in terms of z_1 and z_2

6. Evaluate the determinant of the following matrix using only properties of determinant

$$\begin{bmatrix} abc & a^2 & ac \\ b^2 & ab & bc \\ bc & ac & c^2 \end{bmatrix}$$

7. Find the equation of the plane containing the lines:

L_1: (2, 0, 1) + t(5, 0, -5)

L_2: (1, 3, 5) + s(1, 1, 0) where t and s are real.

8. For what values of a, b and d does the following system has more than one solutions

$$-x + ay = d$$
$$2x + 3y = b$$

9. Given $A = \begin{bmatrix} 3 & 6 & -8 \\ 0 & 0 & 6 \\ 0 & 0 & 2 \end{bmatrix}$

Find the eigenvectors corresponding to the non-zero eigenvalues of matrix A.