



ADDIS ABABA UNIVERSITY SCIENCE FACULTY DEPARTMENT OF MATHEMATICS

MATH 231: Applied Mathematics I Mid-Semester Examination

	Time: $2\frac{1}{2}$ hrs.			
Name:	I.D. No			
Department:				

Instructions: This examination has two parts, Part I and Part II.

Part I has 15 short answer questions worth two points each to be answered in the blank spaces following each question.

Part II, worth a total of 20 points, has four workout problems; each problem allotted the points shown against it. Show all necessary steps and write clearly in the spaces provided for each problem.

Make sure that your examination paper has six pages.

For Instructor's Use only

Part I		Total			
	1	2	3	4	

Part I: Short Answer questions

- 1. If u = (1, 2, 3) and v = (4, 5, 6) then
 - a)
- U + V =______ b) U V =_____
- 2. The unit vector in the direction of

V = (-2, 1, 2) is _____

- The cosine of the angle between u = i + 2j + 2k and 3. v = -2i + j + 2k is _____
- If u = (0, 5, 6) and v = (1, 2, 3) then $\text{proj }_{v}^{u} = \underline{\hspace{1cm}}$ 4.
- 5. If u = (x, -3, 1) is orthogonal to v = (1, x, 2) then x =______
- If u and v are any two parallel vectors in \mathbb{R}^3 then $\mathbf{u} \times \mathbf{v} = \underline{\hspace{1cm}}$ 6.
- The area of the parallelogram having u = (2, -3, 4) and v = (3, 1, 2) as its 7. adjacent sides is _____
- The distance of the point P(4, 2, 3) from the plane 8. $\pi: 2x + 2y - z = 3 \text{ is}$ The distance of
- The distance of the point P(1, 2, 3) from the line 9. L: $(0, 2, 1) + t(1, 2, 2), t \in R$ is _____
- 10. The coordinates of v = (4, 3) relative to the basis $\{(2, 1), (-1, 0)\}$
- 11. If A and B are matrices such that det A = 8, det B = 4 and the product $A^{t}B^{-1}$ is defined then det $(A^{t}B^{-1}) =$
- 12. If $A = \begin{bmatrix} 1 & 9 & 1 \\ 1 & 2 & 3 \\ 0 & -1 & 1 \end{bmatrix}$ then rank $A = \underline{\hspace{2cm}}$
- 13. If $A = \begin{bmatrix} 4 & 2 \\ 3 & 2 \end{bmatrix}$ then $A^{-1} =$ ______

14. If
$$A = \begin{bmatrix} 3x & 1 & -2 \\ 3 & -2 & 1 \\ -x & -3 & 3 \end{bmatrix}$$
 then A is not invertible if

15. If
$$A = 2I_3$$
, $B = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 & 0 \\ 5 & 1 & 0 \\ 6 & 8 & 1 \end{bmatrix}$ then

Part II: Workout Problems

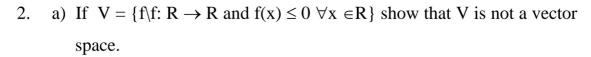
1. a) Find the distance between
$$\pi_1$$
: $2x - 2y - z = 4$ and

$$\pi_2$$
: $-6x + 6y + 3z = 0$ (3 pts)

b) Find the point of intersection of the line L whose parametric equations are: x = 1-2t, y = 3 + t and z = 5 + t, $t \in \mathbb{R}$, with the plane π : 2x + 3y - z - 1 = 0.

(3 pts)

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(3 pts)

b) If $V = R^2$ and $W = \{(x, y) \in V \setminus x + y = 0\}$ show that W is a subspace of V.

(3 pts)

3. Solve the following system of linear equations using Gaussian elimination method.

$$x + 2y - z = 6$$

$$2x - y + 4z = 2$$

$$4x + 3y - 2z = 14$$

(3 pts)

4. Solve the following system of linear equations using the method of matrix algebra

$$2x_1 + x_2 - 3x_3 = 1$$

 $3x_1 - x_2 - 4x_3 = 7$
 $5x_1 + 2x_2 - 6x_3 = 5$

(5 pts)