

MATH 116  
QUIZ 5

Name \_\_\_\_\_

Show all work for each question, full credit will be given only if all work is shown.  
Problems are worth one point unless otherwise indicated. Good luck!

1. Which of the following is the augmented matrix of the system of equations:

$$y - 3z = 5$$

$$2x + z = -1$$

$$4x - y = 0$$

a.  $\begin{bmatrix} 1 & -3 \\ 2 & 1 \\ 4 & -1 \end{bmatrix}$

c.  $\begin{bmatrix} 1 & -3 & : & 5 \\ 2 & 1 & : & -1 \\ 4 & -1 & : & 0 \end{bmatrix}$

b.  $\begin{bmatrix} 0 & 1 & -3 \\ 2 & 0 & 1 \\ 4 & -1 & 0 \end{bmatrix}$

d.  $\begin{bmatrix} 0 & 1 & -3 & : & 5 \\ 2 & 0 & 1 & : & -1 \\ 4 & -1 & 0 & : & 0 \end{bmatrix}$

2. (2 points) Solve the system of equations using matrices **by hand**. Show all work.

$$3x + 2y = 5$$

$$7x - 6y = 1$$

3. (2 points) Write the matrix below in **reduced** row echelon form **by hand**. Show all work.

$$\begin{bmatrix} 1 & 2 & -1 & 4 \\ 0 & 2 & 1 & -3 \\ 0 & 0 & 2 & -4 \end{bmatrix}$$

4. (2 points) Solve the system of equations using matrices. You may use your **calculator** if you show the original matrix and the reduced row-echelon matrix.

$$x - 3z = -2$$

$$3x + y - 2z = 5$$

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

5. Solve the system of equations using matrices. You may use your **calculator** if you show the original matrix and the reduced row-echelon matrix.

$$2x + 3y + 3z = 6$$

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

- a.  $(2a - 4, 2 - a, a)$       b.  $(0, 2 - a, a)$       c.  $(2a, 2 + a, a)$       d. none of these

6. (2 points) Given matrices A and B below, find  $2A - 2B$  **by hand**. Show all work.

$$A = \begin{bmatrix} 2 & 4 & -1 \\ 1 & 0 & 4 \\ 8 & 1 & 2 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 0 \\ 4 & 10 & -2 \end{bmatrix}$$

7. (2 points) Given matrices C and D below, find CD **by hand**. Show all work.

$$C = \begin{bmatrix} 2 & 3 & 4 \\ -1 & 0 & 2 \end{bmatrix} \quad D = \begin{bmatrix} -1 & 4 \\ 0 & 1 \\ 5 & 2 \end{bmatrix}$$

8. Given matrices A and B below, find BA using your **calculator**.

$$A = \begin{bmatrix} 2 & 0 & 1 & 2 \\ 0 & 1 & 0 & 1 \\ -1 & -2 & 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 2 & -1 & 2 \end{bmatrix}$$

9. (2 points) Find the determinant of the matrix **by hand**. Show all work.

$$\begin{vmatrix} 6 & -4 \\ 2 & -1 \end{vmatrix}$$

10. (2 points) Find the determinant of the matrix **by hand**. Show all work.

$$\begin{vmatrix} 0 & -1 & 2 \\ 3 & 5 & 0 \\ 1 & -1 & 3 \end{vmatrix}$$

11. Find the determinant of the matrix using your calculator.

$$\begin{vmatrix} 1 & 5 & 0 & 6 \\ 0 & -1 & 1 & 0 \\ -2 & 2 & 3 & 0 \\ 0 & 0 & 7 & 2 \end{vmatrix}$$

- a. -54      b. 74              c. 54              d. -74              e. none of these

12. (2 points) Find the inverse of matrix A by hand. Show all work.

$$A = \begin{bmatrix} 2 & 3 \\ -3 & -3 \end{bmatrix}$$

13. (2 points) Given the system of linear equations with coefficient matrix A, use the given matrix  $A^{-1}$  to find the solution  $(x, y, z)$  **by hand**. Show all work.

$$3x + 2y + z = 5$$

$$x - 4y = 6$$

$$x - y + 3z = 6$$

$$A^{-1} = \frac{1}{39} \begin{bmatrix} 12 & 7 & -4 \\ 3 & -8 & -1 \\ -3 & -5 & 14 \end{bmatrix}$$

14. The encoding matrix E is shown below. Find the decoding matrix D using your calculator.

$$E = \begin{bmatrix} 3 & -1 \\ -5 & 2 \end{bmatrix} \quad D =$$

15. (2 points) Using the decoding matrix D you found above, decode the message below using your calculator. Use the same chart shown below that we used in class (with 27 used as an extra space) for decoding the message.

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13

N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Φ
14	15	16	17	18	19	20	21	22	23	24	25	26	27

$$\begin{bmatrix} 14 & 24 & 10 \\ 8 & 10 & 21 \end{bmatrix}$$

Message: \_\_\_\_\_