

KFUPM PREP MATH PROGRAM
MATH002 – TERM 243

11.1 Recitation Exercises

1. Determine whether the following systems is *dependent*, *inconsistent* or has a *unique solution*

a)
$$\begin{cases} x - 2y + z = 1 \\ y + 2z = 5 \\ x + y + 3z = 8 \end{cases}$$

b)
$$\begin{cases} x + y + z = 2 \\ y - 3z = 1 \\ 2x + y + 5z = 0 \end{cases}$$

c)
$$\begin{cases} x + 2y + z = 1 \\ 5x + 2y + 3z = 4 \\ 3x - 2y + z = 2 \end{cases}$$

2. Use the Gauss Jordan method to solve the following linear system

$$\begin{cases} x + y + 6z = 3 \\ x + y + 3z = 3 \\ x + 2y + 4z = 7 \end{cases}$$

3. If the echelon form of the linear system

$$\begin{cases} x - 3y + z = 8 \\ 2x - 5y - 3z = 6 \\ x - 6y + 7z = -7 \end{cases} \quad \text{is} \quad \left[\begin{array}{ccc|c} 1 & -3 & 1 & 8 \\ 0 & 1 & m & n \\ 0 & 0 & 1 & p \end{array} \right], \quad \text{then } (m, n, p) =$$

- A) $(-5, -10, 5)$
B) $(3, -6, -3)$
C) $(-5, 10, -3)$
D) $(-2, 7, -1)$
E) $(-3, 6, -2)$

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11.2 Recitation Exercises

1. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, and $B = \begin{bmatrix} 2 & 3 & 5 \\ 0 & -4 & 2 \\ 0 & 0 & -3 \end{bmatrix}$, then find

a) $A + B$

b) BA

c) B^2

2. If A, B and C are square matrices and I_n is the identity matrix, which one of the following statement is True?

A) $(A + B)(A^2 - AB + B^2) = A^3 + B^3$

B) $(A + I_n)(A - I_n) = A^2 - I_n$

C) $(A - B)^2 = A^2 - 2AB + B^2$

D) $AB = 0$ implies $A = 0$ or $B = 0$

E) $I_n A = I_n$

3. If $A = \begin{bmatrix} 1 & 3 & 4 \\ -2 & 2 & 5 \\ 1 & 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 6 & 0 & 2 \\ 0 & 1 & 3 \\ -1 & 2 & 5 \end{bmatrix}$, and $C = AB$, then $c_{32} + c_{13} =$

A) 52

B) 11

C) 38

D) -15

E) 9

4. If $A = \begin{bmatrix} 1 & 2 & 4 \\ -1 & 0 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2 & 1 \\ 3 & -1 & 2 \end{bmatrix}$, then find the matrix X that satisfies $4X + B = 2X + 3A$.

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11.3 Recitation Exercises

1. Find the inverse of the matrix if it exists

a) $A = \begin{bmatrix} 3 & 2 \\ 6 & 4 \end{bmatrix}.$

b) $B = \begin{bmatrix} 2 & 4 & 1 \\ -1 & 1 & -1 \\ 1 & 4 & 0 \end{bmatrix}.$

2. Use the inverse of the coefficient matrix to solve the following system

$$\begin{cases} 2x + y = -7 \\ 3x + 2y = 19 \end{cases}$$

3. Use the inverse of the coefficient matrix (if possible) to solve the following systems

a) $\begin{cases} x + 2y + 3z = 1 \\ 4x + 5y - z = 2 \\ x - y - 10z = -3 \end{cases}$

b) $\begin{cases} x + 2y + 3z = 1 \\ 4x + 5y - z = 3 \\ x - y - 10z = 0 \end{cases}$

4. Given that $M^{-1} = \begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$ and $N^{-1} = \begin{bmatrix} -1 & -1 \\ 4 & 3 \end{bmatrix}$, find the sum of the elements in the second column of $(MN)^{-1}$.

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11.4 Recitation Exercises

1. If $A = \begin{bmatrix} 2 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 6 & 2 & 2 \\ 1 & 1 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 2 & 1 \\ 3 & 0 & 1 & -1 \\ -1 & 2 & -2 & 1 \\ -3 & 2 & 3 & 2 \end{bmatrix}$, then

a) Find the sum of the cofactors of A_{23} and B_{44} .

b) Find $|A|$.

2. Evaluate the following determinants

a) $\begin{vmatrix} 3 & 5 \\ 2 & 4 \end{vmatrix}$

b) $\begin{vmatrix} 2 & 0 & 0 \\ 4 & 1 & 0 \\ 7 & 3 & -2 \end{vmatrix}$

c) $\begin{vmatrix} 3 & 0 & 0 \\ 2 & 1 & 1 \\ 1 & 2 & 2 \end{vmatrix}$

c) $\begin{vmatrix} 4 & 0 & 2 & 1 \\ 5 & 0 & 4 & 2 \\ 2 & 0 & 3 & 4 \\ 1 & 0 & 2 & 3 \end{vmatrix}$

e) $\begin{vmatrix} 5 & -13 & -3 \\ -2 & 5 & 1 \\ -2 & 6 & 2 \end{vmatrix}$

3. Let A and B be 4×4 invertible matrices. Determine whether each of the following statements is true or false:

a) $|A^2| = |A|^2$

b) $|2B| = 8|B|$

c) $|A \cdot B| = |A| \cdot |B|$

d) $|A + B| = |A| + |B|$

e) $|I_n| = 1$

f) $|A^{-1}| = |A|$.

4. If $\det(M - xI) = 0$, $M = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $x =$

A) 1

B) 2

C) 3

D) -1

E) -1/2.

5. If A and B are 3×3 matrices such that $|A| = 5$ and $|B| = -2$, then $|3(AB^2)^{-1}| =$

A) $\frac{27}{20}$

B) $\frac{15}{10}$

C) $\frac{-30}{4}$

D) $\frac{10}{27}$

E) 540