

## 11.1 Recitation Exercises

---

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

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

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

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

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)  $(-3, 6, -2)$

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  $4X + B = 2X + 3A$ .

### 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  $(MN)^{-1}$ .

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  $4 \times 4$  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  $3 \times 3$  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