

## MATH 172 PROBLEM SET 5

1. Perform the indicated operations

$$\text{a) } \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} - 3 \begin{bmatrix} d & e & f \\ a & b & c \end{bmatrix}$$

$$\text{b) } \begin{bmatrix} -1 \\ 3 \\ -2 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$

$$\text{c) } \begin{bmatrix} 1 & 2 & 3 \\ 3 \\ -2 \end{bmatrix}$$

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

2. Find  $c_{24}$ ,  $c_{35}$ ,  $c_{21}$ ,  $c_{53}$  if

$$\mathbf{A} = [\mathbf{a}_{ij}] \quad (4 \times 3), \quad \mathbf{B} = [\mathbf{b}_{ij}] \quad (3 \times 5) \quad \text{and} \quad \mathbf{AB} = \mathbf{C} \quad \text{Hint : } c_{ij} = \sum_{k=1}^3 a_{ik} b_{kj}$$

3. Construct  $\mathbf{AB}$  if  $a_{ij} = (-1)^i (i+j)$  size  $(2 \times 2)$ ,  $b_{ij} = (i^2 + j^2)$  size  $(2 \times 3)$

4. Solve the given system of equations by using matrix reduction

$$\begin{array}{lll} \text{a) } \begin{array}{l} 3x + 2y = 18 \\ 2x - y = 5 \end{array} & \begin{array}{l} x + y + z = 6 \\ 3x - y - z = -2 \\ x + 2y - z = 2 \end{array} & \text{c) } \begin{bmatrix} 1 & 2 & 4 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \\ 6 \end{bmatrix} \end{array}$$

5. Solve the given homogeneous systems using matrix reduction

$$\begin{array}{lll} \begin{array}{l} x - y + z = 0 \\ x + 2y - z = 0 \\ -3x + y - z = 0 \end{array} & \begin{array}{l} x + y + z = 0 \\ x - y = 0 \\ x - 5y - 2z = 0 \end{array} & \text{c) } \begin{array}{l} 6x + 8y = 0 \\ x - 2y = 0 \\ x + 0.5y = 0 \\ 2x + 3y = 0 \end{array} \end{array}$$

6. If the given matrix is invertible, find its inverse  $\begin{bmatrix} \frac{1}{4} & \frac{3}{8} \\ 0 & -\frac{1}{6} \end{bmatrix}$

7. Compute the required matrix if  $A = \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix}$   $B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$

$$\text{a) } (2\mathbf{A})^T - 3\mathbf{I}^2$$

$$\text{b) } \mathbf{A} (2\mathbf{I}) - \mathbf{A} \mathbf{O}^T$$

$$\text{c) } \mathbf{B}^3$$

8. Solve the given system by using the inverse of its coefficient matrix

$$x - 2y = -3$$

$$y + z = 5$$

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