Exercise Class Solutions 6

1 Systems of Linear Equations

1.2 Gaussian Elimination

1.2.16

Find the circle $x^2+y^2+ax+by+c=0$ passing through the following points.

b) $(1,1)$, $(5,-3)$, and $(-3,-3)$

2 Matrix Algebra

2.1 Matrix Addition, Scalar Multiplication, and Transposition

2.1.2

Compute the following:

b) $3\begin{bmatrix} 3 \\ -1 \end{bmatrix} - 5\begin{bmatrix} 6 \\ 2 \end{bmatrix} + 7\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

2.1.3

Let $A = \begin{bmatrix} 2 & 1 \\ 0 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$. Compute (if possible)

f) $(A+C)^T$

2.1.4

Find A if

b) $3A + \begin{bmatrix} 2 \\ 1 \end{bmatrix} = 5A - 2\begin{bmatrix} 3 \\ 0 \end{bmatrix}$

2.2 Matrix Multiplication

2.2.7

Write each of the following systems of linear equations in matrix form.

b)

$$\begin{aligned} -x_1 + 2x_2 - x_3 + \ x_4 &= 6 \\ 2x_1 + \ x_2 - x_3 + 2x_4 &= 1 \\ 3x_1 - 2x_2 \qquad + \ x_4 &= 0 \end{aligned}$$

2.3 Matrix Inverses

2.3.1

In each case, show that the matrices are inverses of each other.

a) $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}, \begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 2 & 3 \\ 1 & 3 & 1 \end{bmatrix}, \begin{bmatrix} 7 & 2 & -6 \\ -3 & -1 & 3 \\ 2 & 1 & -2 \end{bmatrix}$

2.3.2

Find the inverse of each of the following matrices.

b) $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$

d) $\begin{bmatrix} 1 & -1 & 2 \\ -5 & 7 & -11 \\ -2 & 3 & -5 \end{bmatrix}$

2.3.3

In each case, solve the systems of equations by finding the inverse of the coefficient matrix.

b)

$$\begin{aligned} 2x - 3y &= 0 \\ x - 4y &= 1 \end{aligned}$$

2.3.4

Given $A^{-1} = \begin{bmatrix} 1 & -1 & 3 \\ 2 & 0 & 5 \\ -1 & 1 & 0 \end{bmatrix}$:

a) Solve the system of equations $AX = \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}$.