Practical 4
Prakhar Khugshal | BSc(H) Computer Science | Sem - IV | 20211441

1. Gaussian Elimination Method

Q1. Solve the following system of equations by using Gaussian Elimination Method

$2x_1-3x_2+10x_3=-2$

$x_1-2x_2+3x_3=-2$

$-x_1+3x_2+x_3=4$

```
MatrixForm[A = {{2, -3, 10, -2}, {1, -2, 3, -2}, {-1, 3, 1, 4}}]
```
$$\begin{pmatrix} 2 & -3 & 10 & -2 \\ 1 & -2 & 3 & -2 \\ -1 & 3 & 1 & 4 \end{pmatrix}$$

```
MatrixForm[A = {A[[2]], A[[1]], A[[3]]}]
```
$$\begin{pmatrix} 1 & -2 & 3 & -2 \\ 2 & -3 & 10 & -2 \\ -1 & 3 & 1 & 4 \end{pmatrix}$$

```
MatrixForm[A = {A[[1]], A[[2]] - 2 A[[1]], A[[3]] + A[[1]]}]
```
$$\begin{pmatrix} 1 & -2 & 3 & -2 \\ 0 & 1 & 4 & 2 \\ 0 & 1 & 4 & 2 \end{pmatrix}$$

```
MatrixForm[A = {A[[1]], A[[2]], A[[3]] - A[[2]]}]
```
$$\begin{pmatrix} 1 & -2 & 3 & -2 \\ 0 & 1 & 4 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

```
Solve[{x1 - 2 x2 + 3 x3 == -2, x2 + 4 x3 == 2}, {x3, x2, x1}]
```

▪ Solve: Equations may not give solutions for all "solve" variables.

$\{\{x2 \to 2 - 4\,x3,\ x1 \to 2 - 11\,x3\}\}$

Q1. Solve the following system of equations by using Gaussian Elimination Method

$2x1+x2+x3=10$

$3x1+2x2+3x3=18$

$x1+4x2+9x3=16$

```
MatrixForm[A = {{2, 1, 1, 10}, {3, 2, 3, 18}, {1, 4, 9, 16}}]
```

$$\begin{pmatrix} 2 & 1 & 1 & 10 \\ 3 & 2 & 3 & 18 \\ 1 & 4 & 9 & 16 \end{pmatrix}$$

```
MatrixForm[A = {A[[1]], A[[2]] - 3/2 A[[1]], A[[3]] - 1/2 A[[1]]}]
```

$$\begin{pmatrix} 2 & 1 & 1 & 10 \\ 0 & \frac{1}{2} & \frac{3}{2} & 3 \\ 0 & \frac{7}{2} & \frac{17}{2} & 11 \end{pmatrix}$$

```
MatrixForm[A = {A[[1]], A[[2]], A[[3]] - 7 A[[2]]}]
```

$$\begin{pmatrix} 2 & 1 & 1 & 10 \\ 0 & \frac{1}{2} & \frac{3}{2} & 3 \\ 0 & 0 & -2 & -10 \end{pmatrix}$$

```
Solve[{2 x1 + x2 + x3 == 10, 1/2 x2 + 3/2 x3 == 3, -2 x3 == -10}, {x3, x2, x1}]
```

$\{\{x3 \to 5,\ x2 \to -9,\ x1 \to 7\}\}$

2. Gauss Jordan Elimination Method

Q1. Solve the following system of equations by using Gauss Jordan Elimination Method

$2x1+x2+x3=10$

3x1+2x2+3x3=18

x1+4x2+9x3=16

MatrixForm[B = {{2, 1, 1, 10}, {3, 2, 3, 18}, {1, 4, 9, 16}}]

$$\begin{pmatrix} 2 & 1 & 1 & 10 \\ 3 & 2 & 3 & 18 \\ 1 & 4 & 9 & 16 \end{pmatrix}$$

MatrixForm[RowReduce[B]]

$$\begin{pmatrix} 1 & 0 & 0 & 7 \\ 0 & 1 & 0 & -9 \\ 0 & 0 & 1 & 5 \end{pmatrix}$$

Solve[{x1 == 7, x2 == -9, x3 == 5}, {x3, x2, x1}]

$\{\{x3 \rightarrow 5, x2 \rightarrow -9, x1 \rightarrow 7\}\}$

Inverse

MatrixForm[B = {{2, 1, 1, 1, 0, 0}, {3, 2, 3, 0, 1, 0}, {1, 4, 9, 0, 0, 1}}]

$$\begin{pmatrix} 2 & 1 & 1 & 1 & 0 & 0 \\ 3 & 2 & 3 & 0 & 1 & 0 \\ 1 & 4 & 9 & 0 & 0 & 1 \end{pmatrix}$$

MatrixForm[RowReduce[B]]

$$\begin{pmatrix} 1 & 0 & 0 & -3 & \frac{5}{2} & -\frac{1}{2} \\ 0 & 1 & 0 & 12 & -\frac{17}{2} & \frac{3}{2} \\ 0 & 0 & 1 & -5 & \frac{7}{2} & -\frac{1}{2} \end{pmatrix}$$