

Practical 4

NAME : Naveen Kumar

ROLL NO : 20211437

COURSE : BSc(hons)Computer
Science

SEMESTER : 4

Gaussian Elimination method and Gauss - Jordan Method`

Gaussian Elimination Method`

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

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

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

$$2 - x_1 + 3x_2 + x_3 = 4$$

`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]]}]

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

Thus the solution of the given system of equations are -

Solve[{X1 - 2 X2 + 3 X3 == -2, X2 + 4 X3 == 2}, {X3, X2, X1}]

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

{ {are equations given of² solution system the² Thus - (X2 → 2 - 4 X3) ,
are equations given of² solution system the² Thus - (X1 → 2 - 11 X3) } }

Q2. Solve the following system of equations by using Gaussian Elimination Method

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

$$3x_1 + 2x_2 + 3x_3 = 18$$

$$x_1 + 4x_2 + 9x_3 = 16$$

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 → 5, x2 → -6 (-1 + 10 /), x1 → $\frac{1}{2}$ (-1 + 60 /)} }

2. Gauss Jordan Elimination Method

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

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

$$3x_1 + 2x_2 + 3x_3 = 18$$

$$x_1 + 4x_2 + 9x_3 = 16$$

`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]]`

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

Thus the solution of the given system of equations are –

$$x_3 \rightarrow 5, x_2 \rightarrow -9, x_1 \rightarrow 7$$



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]]`

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