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Practical - Gauss Jacobi

Q.1 Using Gauss Jacobi Method solve the system of linear equation

$$A = \begin{pmatrix} 4 & 1 & 1 \\ 1 & 5 & 2 \\ 1 & 2 & 3 \end{pmatrix}$$

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{{4, 1, 1}, {1, 5, 2}, {1, 2, 3}}
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$$d = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

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{{4, 0, 0}, {0, 5, 0}, {0, 0, 3}}
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$$l = \begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 2 & 0 \end{pmatrix}$$

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{{0, 0, 0}, {1, 0, 0}, {1, 2, 0}}
```

{{0, 0, 0}, {1, 0, 0}, {1, 2, 0}}

$$u = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$$

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{{0, 1, 1}, {0, 0, 2}, {0, 0, 0}}
```

$$b = \begin{pmatrix} 2 \\ -6 \\ -4 \end{pmatrix}$$

$$x[1] = \begin{pmatrix} 0.5 \\ -0.5 \\ -0.5 \end{pmatrix}$$

```
For[n = 1, n ≤ 20, n = n + 1, x[n + 1] = LinearSolve[d, - (l + u) .x[n] + b];
 Print[x^n, "=", N[MatrixForm[x[n]]]]]
```

```
{{2}, {-6}, {-4}}
```

```
{{0.5}, {-0.5}, {-0.5}}
```

$$x = \begin{pmatrix} 0.5 \\ -0.5 \\ -0.5 \end{pmatrix}$$

$$x^2 = \begin{pmatrix} 0.75 \\ -1.1 \\ -1.16667 \end{pmatrix}$$

$$x^{3}=\begin{pmatrix}1.06667\\-0.883333\\-0.85\end{pmatrix}$$

$$x^{4}=\begin{pmatrix}0.933333\\-1.07333\\-1.1\end{pmatrix}$$

$$x^{5}=\begin{pmatrix}1.04333\\-0.946667\\-0.928889\end{pmatrix}$$

$$x^{6}=\begin{pmatrix}0.968889\\-1.03711\\-1.05\end{pmatrix}$$

$$x^{7}=\begin{pmatrix}1.02178\\-0.973778\\-0.964889\end{pmatrix}$$

$$x^{8}=\begin{pmatrix}0.984667\\-1.0184\\-1.02474\end{pmatrix}$$

$$x^{9}=\begin{pmatrix}1.01079\\-0.987037\\-0.982622\end{pmatrix}$$

$$x^{10}=\begin{pmatrix}0.992415\\-1.00911\\-1.01224\end{pmatrix}$$

$$x^{11}=\begin{pmatrix}1.00534\\-0.993588\\-0.9914\end{pmatrix}$$

$$x^{12}=\begin{pmatrix}0.996247\\-1.00451\\-1.00605\end{pmatrix}$$

$$x^{13}=\begin{pmatrix}1.00264\\-0.996828\\-0.995744\end{pmatrix}$$

$$x^{14}=\begin{pmatrix}0.998143\\-1.00223\\-1.00299\end{pmatrix}$$

$$x^{15}=\begin{pmatrix}1.00131\\-0.998431\\-0.997894\end{pmatrix}$$

$$x^{16}=\begin{pmatrix}0.999081\\-1.0011\\-1.00148\end{pmatrix}$$

$$x^{17}=\begin{pmatrix}1.00065\\-0.999224\\-0.998958\end{pmatrix}$$

$$x^{18}=\begin{pmatrix}0.999545\\-1.00055\\-1.00073\end{pmatrix}$$

$x^{19} = \begin{pmatrix} 1.00032 \\ -0.999616 \\ -0.999484 \end{pmatrix}$

$x^{20} = \begin{pmatrix} 0.999775 \\ -1.00027 \\ -1.00036 \end{pmatrix}$

```
For[n = 1, n ≤ 20, n = n + 1, x[n + 1] = LinearSolve[d, - (l + u) . x[n] + b];
 Print[x^n, "=", N[MatrixForm[x[n]]]];
 If[Abs[Norm[x[n + 1], 2] - Norm[x[n], 2]] < 0.0001, Break]]
```

$x = \begin{pmatrix} 0.5 \\ -0.5 \\ -0.5 \end{pmatrix}$

$x^{2} = \begin{pmatrix} 0.75 \\ -1.1 \\ -1.16667 \end{pmatrix}$

$x^{3} = \begin{pmatrix} 1.06667 \\ -0.883333 \\ -0.85 \end{pmatrix}$

$x^{4} = \begin{pmatrix} 0.933333 \\ -1.07333 \\ -1.1 \end{pmatrix}$

$x^{5} = \begin{pmatrix} 1.04333 \\ -0.946667 \\ -0.928889 \end{pmatrix}$

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$x^{13} = \begin{pmatrix} 1.00264 \\ -0.996828 \\ -0.995744 \end{pmatrix}$

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