

$$\begin{bmatrix} 2 & -1 & 0 & 0 & 0 \\ -1 & 4 & -1 & 0 & 0 \\ 0 & -1 & 4 & -1 & -2 \\ 0 & 0 & -1 & 2 & -1 \\ 0 & 0 & -2 & -1 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} w/k \\ w/k \\ w/k \\ w/k \\ w/k \end{bmatrix}$$

$$w/k = 1$$

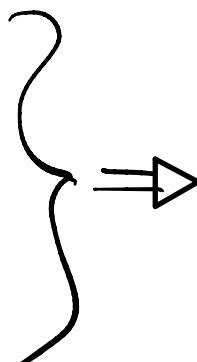
$$2x_1 - x_2 = 1$$

$$-x_1 + 4x_2 - x_3 = 1$$

$$-x_2 + 4x_3 - x_4 - 2x_5 = 1$$

$$-x_3 + 2x_4 - x_5 = 1$$

$$-2x_3 - x_4 + 3x_5 = 1$$



$$x_1 = \frac{1}{2}(1 + x_2)$$

$$x_2 = \frac{1}{4}(1 + x_1 + x_3)$$

$$x_3 = \frac{1}{4}(1 + x_2 + x_4 + 2x_5)$$

$$x_4 = \frac{1}{2}(1 + x_3 + x_5)$$

$$x_5 = \frac{1}{3}(1 + 2x_3 + x_4)$$

```

x_i = array(5)
j_i = array(5)
for i in range(5): x_i = 0
for n in range(N):
    for i in range(5):
        j_i = x_i

```

$$x_1 = \frac{1}{2}(1 + j_2)$$

$$x_2 = \frac{1}{4}(1 + j_1 + j_3)$$

$$x_3 = \frac{1}{4}(1 + j_2 + j_4 + 2j_5)$$

$$x_4 = \frac{1}{2}(1 + j_3 + j_5)$$

$$x_5 = \frac{1}{3}(1 + 2j_3 + j_4)$$

```
print x1 x2 x3 x4 x5
```

1-st iteration

Jacobi

$$x_1 = \frac{1}{2}(1 + 0) = 1/2$$

$$x_2 = \frac{1}{4}(1 + 0) = 1/4$$

$$x_3 = \frac{1}{4}(1 + 0 + 0 + 0) = 1/4$$

$$x_4 = \frac{1}{2}(1 + 0 + 0) = 1/2$$

$$x_5 = \frac{1}{3}(1 + 0 + 0) = 1/3$$

1-st iteration

Gauss-Seidel

$$x_1 = \frac{1}{2}(1 + 0) = 1/2$$

$$x_2 = \frac{1}{4}(1 + \frac{1}{2} + 0) = 3/8$$

$$x_3 = \frac{1}{4}(1 + \frac{3}{8} + 0 + 0) = 11/32$$

$$x_4 = \frac{1}{2}(1 + \frac{11}{32} + 0) = 43/64$$

$$x_5 = \frac{1}{3}(1 + \frac{2 \cdot 11}{32} + \frac{43}{64}) =$$

$$\frac{1}{3}(\frac{61}{64} + \frac{44}{64} + \frac{43}{64}) = \frac{151}{192}$$