

a)

Discretized Poisson equation

$$\frac{T_{i+1,j} - 2T_{i,j} + T_{i-1,j}}{h^2} + \frac{T_{i,j+1} - 2T_{i,j} + T_{i,j-1}}{h^2} = S_{i,j}$$

Rearranging for $T_{i,j}$

$$T_{i,j} = \frac{1}{4}(T_{i+1,j} + T_{i-1,j} + T_{i,j+1} + T_{i,j-1} - h^2 S_{i,j})$$

SOR iteration is

$$\therefore T_{i,j}^{n+1} = \frac{\beta}{4}(T_{i+1,j}^n + T_{i-1,j}^{n+1} + T_{i,j+1}^n + T_{i,j-1}^{n+1} - h^2 S_{i,j}) + (1 - \beta)T_{i,j}^n$$

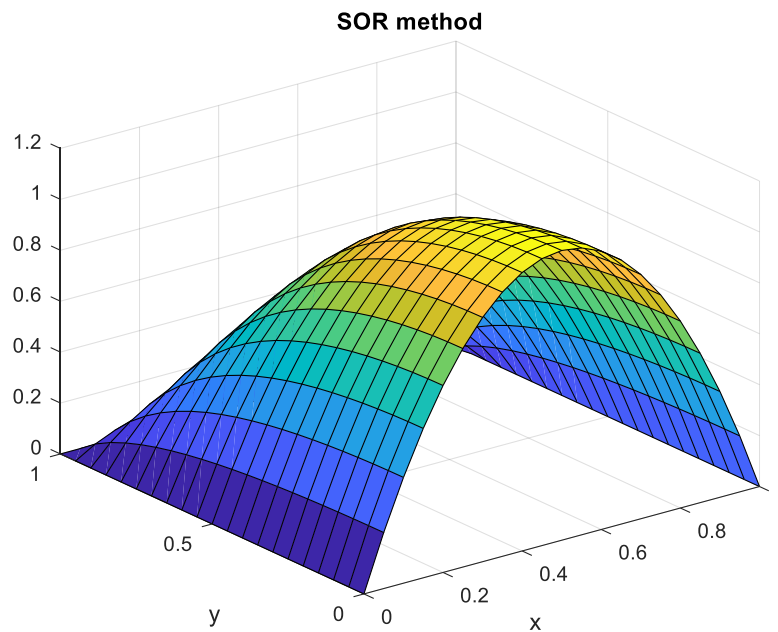
b)

$$-\frac{1}{4}\tilde{T}_{i-1,j} + \tilde{T}_{i,j} - \frac{1}{4}\tilde{T}_{i+1,j} = \frac{1}{4}(T_{i,j-1}^{n+1} + T_{i,j+1}^n - h^2 S_{i,j})$$

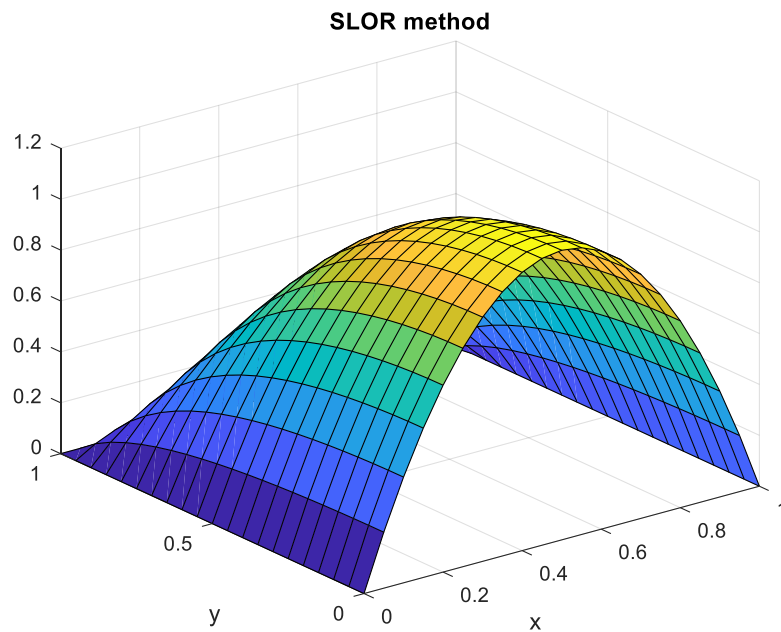
and then overrelax

$$\therefore T_{i,j1}^{n+1} = \beta \tilde{T}_{i,j} + (1 - \beta)T_{i,j}^n$$

c) (programming)



d) (programming)



e) (programming)

